JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) :: ANANTAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE
B.Tech. (Regular) Four Year Degree Course
R13 REGULATIONS

I B.Tech I Semester

S.No	Subject	L	T	P	Credits
1.	English	3	1		3
2.	Mathematics-I	3	1		3
3.	Applied Physics	3	1		3
4.	Environmental Studies	3	1		3
5.	Basic Engineering Drawing	2		2	3
6.	Applied Physics Lab			3	2
7.	Engineering & IT Workshops			3	2
8.	English Language Communication Skills Lab			3	2
Contact periods/week		14	4	11	
		Total/Week		29	
Total Credits (5 Theory + 3 Labs)					21

I B.Tech II Semester

S.No	Subject	L	T	P	Credits
1.	Mathematics-II	3	1		3
2.	Mathematical Methods	3	1		3
3.	Engineering Chemistry	3	1		3
4.	Computer Programming	3	1		3
5.	Circuit Theory	3	1		3
6.	Electrical Technology	3	1		3
7.	Engineering Chemistry Lab	-	-	3	2
8.	Electrical Technology Lab	-	-	3	2
Contact periods/week		18	6	6	
		Total/Week		30	
Total Credits (6 Theory + 2 Labs)					22

II B.Tech I Semester

S.No	Subject	L	T	P	Credits
1.	Managerial Economics and Financial Accountacy	3	1		3
2.	Complex Variables & Special Functions	3	1		3
3.	Data Structures	3	1		3
4.	Signals and Systems	3	1		3
5.	Switching Theory and Logic Design	3	1		3
6.	Electronic Devices and Circuits	3	1		3
7.	Computer Programming & Data Structures Lab			3	2
8.	Electronic Devices and Circuits Lab			3	2
Contact periods/week		18	6	6	
		Total/Week		30	
Total Credits (6 Theory +2 Labs)					22

II B.Tech II Semester

S.No	Subject	L	T	P	Credits
1.	Probability Theory and Stochastic Processes	3	1		3
2.	Pulse & Digital Circuits	3	1		3
3.	Electronic Circuit Analysis & Design	3	1		3
4.	Electromagnetic Field Theory	3	1		3
5.	Networks and Transmission Lines	3	1		3
6.	Analog Communication Systems	3	1		3
7.	Electronic Circuit Analysis & Design Lab	-		3	2
8.	Pulse & Digital Circuits Lab	-		3	2
9.	Human Values and Professional Ethics(**Audit Course**)	2			-
Contact periods/week		20	6	6	
		Total/Week		32	
Total Credits (6 Theory + 2 Labs)					22

III B.Tech I Semester

S.No	Subject	L	T	P	Credits
1.	Management Science	3	1		3
2.	Linear IC Applications	3	1		3
3.	Digital System Design	3	1		3
4.	Antennas and Wave Propagation	3	1		3
5.	Digital Communication Systems	3	1		3
6.	Control Systems Engineering	3	1		3
7.	IC Applications Lab			3	2
8.	Analog Communication Systems Lab			3	2
Contact periods/week		18	6	6	
		Total/Week		30	
Total Credits (6 Theory + 2 Labs)					22

III B.Tech II Semester

S.No	Subject	L	T	P	Credits
1.	Computer Organization	3	1	-	3
2.	Microprocessors and Micro Controllers	4	1	-	4
3.	Digital Signal Processing	3	1	-	3
4.	Microwave & Radar Engineering	3	1	-	3
5.	VLSI Design	3	1	-	3
6.	Digital Communication Systems Lab			3	2
7.	Microprocessors and Micro Controllers Lab	-		3	2
8.	Digital Signal Processing Lab	-		3	2
9.	Advanced English Communication Skills Lab **(Audit Course)**	-		3	-
Contact periods/week		16	5	12	
		Total/Week		33	
Total Credits (5 Theory + 3 Labs)					22

IV B.Tech I Semester

S.No	Subject	L	T	P	Credits
1.	Electronic Measurements and Instrumentation	3	1		3
2.	Optical Fiber Communication	3	1		3
3.	Embedded Systems	3	1		3
4.	Digital Image Processing	3	1		3
5.	**Open Elective** a. Concepts of Communication Systems b. Neural Networks & Fuzzy Logic c. Industrial Electronics	3	1	-	3
6.	**Elective-I (MOOC)**	3	1	-	3
7.	VLSI & Embedded Systems Lab	-		3	2
8.	Microwave & Optical Communications Lab	-		3	2
9.	Project Work – A	-			2
Contact periods/week		18	6	6	
		Total/Week		30	
Total Credits (6 Theory + 2 Labs)					24

IV B.Tech II Semester

S.No	Subject	L	T	P	Credits
1.	Mobile & Satellite Communications	3	1		3
2.	Computer Networks	3	1		3
3.	**Elective-II** a. Wireless Sensor Networks b. Advanced Data Structures c. Embedded C	3	1		3
4.	**Elective-III** a. Spread Spectrum Techniques b. DBMS c. FPGA & CPLD Architectures and Applications	3	1		3
5.	Seminar & Comprehensive Viva-voce				3
6.	Project work - B				10
Contact periods/week		12	4		
		Total/Week	16		
Total Credits (4 Theory + Seminar & Comprehensive viva + Project work)					25

Total 180 credits

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. I Sem

	L	P	C
	3+1*	**0**	**3**

ENGLISH
(Common to all Branches)

1. INTRODUCTION:

English is an international language as well as a living and vibrant one. People have found that knowledge of English is a passport for better career, better pay, advanced knowledge and for communication with the entire world. As it is a language of opportunities in this global age, English is bound to expand its domain of use everywhere. The syllabus has been designed to enhance communication skills of the students of engineering and technology. The prescribed books serve the purpose of preparing them for everyday communication and to face the global competitions in future.

The first text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and student-centered. They should be encouraged to participate in the classroom activities keenly.

The text for non-detailed study is meant for extensive reading/reading for pleasure by the students. They may be encouraged to read some select topics on their own, which could lead into a classroom discussion. In addition to the exercises from the texts done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

2. OBJECTIVES:

1. To enable the students to communicate in English for academic and social purpose
2. To enable the students to acquire structure and written expressions required for their profession.
3. To develop the listening skills of the students
4. To inculcate the habit of reading for pleasure
5. To enhance the study skills of the students with emphasis on LSRW skills

3. SYLLABUS:

UNIT –I

Chapter entitled *Humour* from “Using English”
Chapter entitled ‘*Homi Jehangir Bhabha'* from “New Horizons”

L- Listening -Techniques - Importance of phonetics
L- Meet & Greet and Leave taking, Introducing Oneself and Others (Formal and Informal situations)
R- -Reading Strategies -Skimming and Scanning
W- Writing strategies- sentence structures
G-Parts of Speech –Noun-number, pronoun-personal pronoun, verb- analysis
V-Affixes-prefix and suffix, root words, derivatives

UNIT –II

Chapter entitled *Inspiration* from “Using English”
Chapter entitled ‘My Struggle for an Education’ from “New Horizons”

L- Listening to details
S- Apologizing, Interrupting, Requesting and Making polite conversations
R-note making strategies
W- Paragraph-types- topic sentences, unity, coherence, length , linking devices
G-Auxiliary verbs and question tags
V- synonyms-antonyms, homonyms, homophones, homographs, words often confused

UNIT –III

Chapter entitled *Sustainable Development* from "Using English"
Chapter entitled 'The Autobiography of Abraham Lincoln' from "New Horizons"
L- Listening to themes and note taking
S- Giving instructions and Directions, making suggestions, Accepting ideas, fixing a time and Advising
R- Reading for details -1
W- Resume and cover letter
G- Tenses – Present tense, Past tense and Future tense
V-Word formation and One-Word Substitutes

UNIT –IV

Chapter entitled *Relationships* from "Using English"
Chapter entitled ' T*he Happy Prince* from "New Horizons"
L- Listening to news
S- Narrating stories, Expressing ideas and opinions and telephone skills
R- Reading for specific details and Information
W- Technical Report writing-strategies, formats-types-technical report writing
G- Voice and Subject – Verb Agreement
V- Idioms and prepositional Phrases

UNIT –V

Chapter entitled Science and Humanism from "Using English"
Chapter entitled 'If'from "New Horizons"
L- Listening to speeches
S- Making Presentations and Group Discussions
R- Reading for Information
W- E-mail drafting
G- Conditional clauses and conjunctions
V- Collocations and Technical Vocabulary and using words appropriately

4.EXPECTED OUTCOME:

The students will get the required training in LSRW skills through the prescribed texts and develop communicative competence

Prescribed Books:

1. **Using English (for detailed study)** published by Orient Black Swan, 2013
2. **New Horizons** published by Pearson, 2013

Suggested Reading:

1. **Raymond Murphy's English Grammar with CD,** Murphy, Cambridge University Press, 2012.
2. **English Conversation Practice –**Grant Taylor, Tata McGraw Hill, 2009.
3. **Communication Skills, Sanjay Kumar & Pushpalatha** Oxford University Press, 2012.
4. **A Course in Communication Skills**- Kiranmai Dutt & co. Foundation Books, 2012.
5. **Current English grammar and usage-**S M Guptha, PHI, 2013.
6. **Modern English Grammar-**Krishna SWAMI .McMillan, 2009.
7. **Powerful Vocabulary Builder**- Anjana Agarwal New Age International Publishers, 2011.
8. **Writing with a Purpose, Tickoo and Sasi Kumar, OUP, 2011**
9. **Strengthen Your Writing, Orient Blackswan**

I B.Tech I Sem

	L	P	C
	3+1	0	3

MATHEMATICS – I
(Common to All Branches)

Objectives

- To train the students thoroughly in Mathematical concepts of ordinary differential equations and their applications in electrical circuits, deflection of beams, whirling of shafts.
- To prepare students for lifelong learning and successful careers using mathematical concepts of differential and Integral calculus, ordinary and partial differential equations.
- To develop the skill pertinent to the practice of the mathematical concepts including the students abilities to formulate the problems, to think creatively and to synthesize information.

UNIT – I

Exact, linear and Bernoulli equations. Applications to Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, sin ax, cos ax, polynomials in x, e^{ax} V(x), xV(x), method of variation of parameters. Applications to oscillatory electrical circuits, Deflection of Beams, whirling of shafts.

UNIT – II

Taylor's and Maclaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrange's method of undetermined Multipliers with three variables only. Radius of curvature, center of curvature, Involutes, evolutes and envelopes..

UNIT – III

Curve tracing – Cartesian, polar and parametric curves. Length of curves.

UNIT – IV

Multiple integral – Double and triple integrals – Change of Variables – Change of order of integration. Applications to areas and volumes, surface area of solid of revolution in Cartesian and polar coordinates using double integral.

UNIT – V

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one dimensional wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - I, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.

REFERENCES:

1. Engineering Mathematics Volume-I, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publication.
2. Engineering Mathematics, Volume - I, by G.S.S.Raju, CENGAGE publisher.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.
4. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
5. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

Outcomes:

- The students become familiar with the application of differential and integral calculus, ordinary and partial differential equations to engineering problems.
- The students attain the abilities to use mathematical knowledge to analyze and solve problems in engineering applications.

I B.Tech I Sem

	L	P	C
	3+1*	0	3

APPLIED PHYSICS

(Common to EEE, ECE, CSE)

UNIT I : PHYSICAL OPTICS, LASERS AND FIBRE OPTICS

Physical Optics: Introduction - Interference in thin films by reflection – Newton's Rings – Fraunhofer diffraction due to single slit, double slit and diffraction grating.

Lasers: Introduction - Characteristics of laser – Spontaneous and stimulated emission of radiation –- Einstein's coefficients –– Population inversion – Pumping mechanisms - Ruby laser - He-Ne laser – Applications of lasers.

Fibre optics: Introduction– Construction and working principle of optical fiber –Numerical aperture and acceptance angle – Types of optical fibers –Optical fiber communication system – Applications of optical fibers.

UNIT II: CRYSTALLOGRAPHY AND QUANTUM MECHANICS

Crystallography: Introduction – Space lattice –Unit cell – Lattice parameters –Bravias lattice – Crystal systems – Packing fractions of SC, BCC and FCC -Directions and planes in crystals – Miller indices – Interplanar spacing in cubic crystals – X-ray diffraction - Bragg's law –Bragg's Spectrometer.

Quantum Mechanics: Introduction to matter waves – de'Broglie hypothesis - Schrodinger's time independent wave equation – Significance of wave function - Particle in a one dimensional infinite potential well.

UNIT III: FREE ELECTRON THEORY AND SEMICONDUCTORS

Free electron theory: Classical free electron theory –- Sources of electrical resistance - Equation for electrical conductivity - Quantum free electron theory – Fermi-Dirac distribution –Kronig-Penny model(qualitative) – Origin of bands in solids – Classification of solids into conductors, semiconductors and insulators.

Semiconductor physics: Introduction – Intrinsic and extrinsic semiconductors – Drift & diffusion currents and Einstein's equation – Continuity equation -Hall Effect.

UNIT IV: **DIELECTRICS AND MAGNETIC MATERIALS**

Dielectrics: Introduction – Dielectric Polarization – Types of Polarization – Lorentz field – Clausius-Mosotti equation – Dielectric strength, loss, breakdown.

Magnetic materials: Introduction and basic definitions – Origin of magnetic moment – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials – Hysteresis - Soft and hard magnetic materials – Applications of magnetic materials.

UNIT V: **SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS**

Superconductivity: Introduction - Properties of superconductors – Meissner effect– Type I and type II superconductors – Flux quantization – London penetration depth – ac and dc Josephson effects – BCS theory(qualitative) - Applications of superconductors.
Physics of Nanomaterials: Introduction - Significance of nanoscale - Surface area and quantum confinement – Physical properties, optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterials: ball milling, chemical vapour deposition, sol-gel – Carbon nanotubes & its properties.

Text books:
1. Engineering physics – S. ManiNaidu, Pearson Education
2. Engineering Physics – P.K.Palanisamy, Scitech Publications

Reference Books:
1. Engineering Physics – V. Rajendran, K.Thyagarajan Tata MacGraw Hill Publishers
2. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
3. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish University Press
4. Engineering Physics – M. Arumugam, Anuradha Publications
5. Engineering physics – M.N. Avadhanulu and P.G. KrshiSagar, Chand and Co
6. Nanomaterials – A.K.Bandopadhyaya, New Age Publishers
7. Carbon nanotubes and Graphene Device Physics – H.S. Philip Wong, Deji Akinwande, Cambridge University Press

ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech I Semester	L	P	C
	3+1*	0	3

ENVIRONMENTAL STUDIES
(Common to all Branches)

OBJECTIVE: To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

UNIT – I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: – Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – II

ECOSYSTEMS : Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological sucession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-soports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

ENVIRONMENTAL POLLUTION : Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution

f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT : Causes**,** effects and control measures of urban and industrial wates – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Proggramme. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds – river, hill slopes, etc..

TEXT BOOKS :

(1) Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
(2) Environmental Studies by Palaniswamy – Pearson education
(3) Environmental Studies by R.Rajagopalan, Oxford University Press.

REFERENCES :

(1) Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Pubilications.
(2) Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
(3) Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
(4) Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
(5) Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. I Sem	**L**	**P**	**C**
	3	**0**	**3**

BASIC ENGINEERING DRAWING
(CIVIL, EEE, ECE, CSE & CHEMICAL)

UNIT-I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance Drawing Instruments and their Use – BIS Conventions in drawing and Lettering.

Curves used in practice:

a) Conic sections including the Rectangular Hyperbola
b) Cycloid, Epicycloid and Hypocycloid –Normals and Tangents
c) Involute of a circle –Normals and Tangents

Principles of orthographic projection, I and III angle projections –Conventions –Projections of points.

UNIT –II

Projection of lines inclined to both planes –traces, Projection of plane figures inclined to both planes.

UNIT –III

Projection of simple solids inclined to both planes.

UNIT –IV

Sections and Developments: Sections and Sectional views of Regular solids –Prism, Cylinder, Pyramid, Cone – True shapes.

UNIT –V

Isometric projections: Principles of pictorial representations-Isometric projection- Isometric scale-Isometric views- conventions- Isometric views of plane figures, solids-Isometric projection of objects with non isometric lines-Isometric projection of spherical parts.

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhat, Charotar Publishers
2. Engineering Drawing, K.L. Narayana& P. Kannaih, Scitech Publishers, Chennai.

REFERENCES:

1. Engineering Drawing, Johle, Tata McGraw-Hill Publishers.
2. Engineering Drawing, Shah and Rana,2/e, Pearson Education
3. Engineering Drawing and Graphics, Venugopal/New age Publishers
4. Engineering Graphics, John&john.

Suggestions:

Student is expected to buy a book mentioned under 'Text books' for better understanding.

Student should prepare rough sketches for all the problems given at the end of each chapter to improve his / her imaginations.

Student should also practice Auto CAD or any other drawing software to help understanding better.

ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech I Sem

L	P	C
0	3	2

APPLIED PHYSICS LABORATORY

Any EIGHT of the following experiments has to be performed during the SEMESTER

1. Determination of wavelengths of various colours of mercury spectrum using diffraction grating in normal incidence method.
2. Determination of dispersive power of the prism
3. Determination of thickness of thin object by wedge method.
4. Determination of radius of curvature of lens by Newton's rings.
5. Laser : Diffraction due to single slit
6. Laser : Diffraction due to double slit
7. Laser: Determination of wavelength using diffraction grating
8. Determination of Numerical aperture of an optical fiber.
9. Meldes experiment: Determination of the frequency of tuning fork
10. Sonometer: Verification of the three laws of stretched strings
11. Energy gap of a material using p-n junction diode
12. Electrical conductivity by four probe method
13. Determination of thermistor coefficients (α, β)
14. Hall effect : Determination of mobility of charge carriers in semiconductor
15. B-H curve
16. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
17. Determination of lattice constant using X-ray spectrum.

ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech I Sem	**L**	**P**	**C**
	0	**3**	**2**

Engineering & IT Workshop
(Common to All Branches)

Part – A: Engineering Workshop
1. TRADES FOR EXERCISES:
At least 2 exercise In each:

1. Carpentry
2. Fitting
3. House-wiring
4. Black Smithy
5. Tin smithy
6. Power Tools Demonstration

TEXT BOOK:

1. Work shop Manual / P.Kannaiah/ K.L.Narayana/ Scitech Publishers.

Objective : The objective of this subject is to provide the basic concepts about different manufacturing processes and use of various workshop tools the exposer to the Power tools used in the inclusion

Codes / Tables : Nil

Question Paper pattern : Test in any two out of 6 trades.

PART – B (IT Workshop)

Course Objective:

- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations
- To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
- Disassemble and Assemble a Personal Computer and prepare the computer ready to use
- Prepare the Documents using Word processors
- Prepare Slide presentations using the presentation tool
- Install single or dual operating systems on computer

Preparing your Computer (4 weeks)

Task 1: Identify the internal parts of a computer of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram.

Task 2: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available. Students should record the process of assembling and trouble shooting a computer.

Task 3: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4: Students should record the various features that are supported by the operating system installed and submit it.

Productivity tools (3 weeks)

Task 5: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables etc, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages etc at the end of the task. Students should submit a user manual of the word processor considered.

Task 6: Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

Task 7: Presentations : creating, opening, saving and running the presentations; Selecting the style for slides, formatting the slides with different fonts, colours; creating charts and tables, inserting and deleting text, graphics and animations; bulleting and numbering; hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

References:

1. “Introduction to Computers”, Peter Norton, Mc Graw Hill
2. “LaTeX Companion” – Leslie Lamport, PHI/Pearson.
3. “MOS study guide for word, Excel, Powerpoint & Outlook Exams”, Joan Lambert, Joyce Cox, PHI.
4. “Introduction to Information Technology”, ITL Education Solutions limited, Pearson Education.
5. “Networking your computers and devices”, Rusen, PHI
6. “Trouble shooting, Maintaining & Repairing PCs”, Bigelows, TMH.

I B.Tech I Sem	L	P	C
	0	3	3

ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

OBJECTIVES:

- To train students to use language effectively in everyday conversations, to participate in group discussions, to help them face interviews, and sharpen public speaking skills
- To expose the students to a varied blend of self-instructional learner-friendly modes of language learning through computer-aided multi-media instruction.
- To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To help the second language learners to acquire fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

SYLLABUS:

UNIT- I

Phonetics – Introduction to Sounds of Speech – Vowels – Consonants – Phonetic Transcription & Orthographic Transcription

UNIT – II

Syllabification – Word Stress – Rules of word stress – Intonation – Falling tone and Rising tone

UNIT – III

Situational Dialogues – Role-play – Expressions in various situations – Self Introduction – Introducing others – Greetings – Apologies – Requests – Social and Professional etiquettes – Telephone Etiquettes

UNIT – IV

JAM – Describing object/person/place/situation – Giving directions

UNIT – V

Debates and Group Discussions

EXPECTED OUTCOMES:

- Becoming active participants in the learning process and acquiring proficiency in spoken English of the students
- Speaking with clarity and confidence thereby enhancing employability skills of the students

MINIMUM REQUIREMENT FOR ELCS LAB:

The English Language Lab shall have two parts:

1. Computer Assisted Language Learning (CALL) Lab:
   The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
2. The Communication Skills Lab with movable chairs and audio-visual aids with a P.A. system, Projector, a digital stereo-audio & video system and camcorder etc.

System Requirement (Hardware component):

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

- i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- ii) Headphones of High quality

SUGGESTED SOFTWARE:

1. Clarity Pronunciation Power – Part I (Sky Pronunciation)
2. Clarity Pronunciation Power – part II
3. K-Van Advanced Communication Skills
4. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
5. *DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.*
6. Lingua TOEFL CBT Insider, by Dreamtech
7. English Pronunciation in Use (Elementary, Intermediate, Advanced) CUP
8. Cambridge Advanced Learners' English Dictionary with CD.

REFERENCE BOOKS:

1. **A Textbook of English Phonetics for Indian Students** 2nd Ed T. Balasubramanian. (Macmillian),2012.
2. **A Course in Phonetics and Spoken English**, Dhamija Sethi, Prentice-Hall of India Pvt.Ltd
3. **Speaking English Effectively**, 2nd Edition Krishna Mohan & NP Singh, 2011. (Mcmillan).
4. **A Hand book for English Laboratories**, E.Suresh kumar, P.Sreehari, Foundation Books,2011
5. **English Pronunciation in Use. Intermediate & Advanced** ,Hancock, M. 2009. CUP
6. **Basics of Communication in English** ,Soundararaj, Francis. 2012.. *New Delhi: Macmillan*
7. **Spoken English** (CIEFL) in 3 volumes with 6 cassettes, OUP.

English Pronouncing Dictionary, Daniel Jones Current Edition with CD.Cambridge, 17th edition, 2011.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II-Sem

	L	P	C
	3+1*	**0**	**3**

MATHEMATICS - II
(Common to All Branches)

Objectives: Our emphasis will be more on conceptual understanding and application of Fourier series, Fourier, Z and Laplace transforms and vector calculus.

UNIT – I

Fourier Series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

UNIT – II

Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

UNIT – III

z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

UNIT – IV

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

Differentiation and integration of transform – Application of Laplace transforms to ordinary differential equations of first and second order.

UNIT – V

Vector Calculus: Gradient – Divergence – Curl and their properties; Vector integration – Line integral - Potential function – Area – Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss's Divergence Theorem (Without proof). Application of Green's, Stoke's and Gauss's Theorems.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - II, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.

REFERENCES:

1. Engineering Mathematics, Volume - II, by G.S.S.Raju, CENGAGE publisher.
2. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

Outcomes:

- The student gains the knowledge to tackle the engineering problems using the concepts of Fourier series, various transforms and vector calculus.

I B.Tech II Sem

	L	P	C
	3+1*	0	3

MATHEMATICAL METHODS
(Common to All Branches)

Objectives:

- This course aims at providing the student with the concepts of Matrices, Numerical Techniques and Curve fitting.

UNIT – I

Elementary row transformations-Rank – Echelon form, normal form – Consistency of System of Linear equations. Linear transformations. Hermitian, Skew-Hermitian and Unitary matrices and their properties. Eigen Values, Eigen vectors for both real and complex matrices. Cayley – Hamilton Theorem and its applications – Diagonolization of matrix. Calculation of powers of matrix. Quadratic forms – Reduction of quadratic form to canonical form and their nature.

UNIT – II

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method.

UNIT – III

Interpolation: Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula,

UNIT – IV

Curve fitting: Fitting of a straight line – Second degree curve – Exponentional curve-Power curve by method of least squares. Numerical Differentiation and Integration – Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

UNIT – V

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods – Predictor-Corrector Method – Milne's Method. Numerical solutions of Laplace equation using finite difference approximation.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher.

REFERENCES:

1. Engineering Mathematics, Volume - II, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.
2. Engineering Mathematics, Volume - II, by G.S.S.Raju, CENGAGE publisher.
3. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.
4. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
5. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

Outcomes:

The student will be able to analyze engineering problems using the concepts of Matrices and Numerical methods.

ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II Sem	L	P	C
	3+1*	0	3

ENGINEERING CHEMISTRY

(Common to EEE,ECE,CSE)

Knowledge in chemistry serves as basic nutrient for the understanding and thereby design of materials of importance in life. Thus the advancement in Engineering depends on the outcome of basic sciences. Many advances in engineering either produce a new chemical demand as in the case of polymers or wait upon chemical developments for their applications as in the case of implants and alloys. Currently the electronics and computer engineers are looking forward for suitable biopolymers and nano materials for use in miniature super computers, the electrical materials engineers are in search of proper conducting polymers, the mechanical engineers are on lookout for micro fluids and the civil engineers are looking for materials that are environmental friendly, economical but long lasting.

COURSE OBJECTIVES (CO):

- The Applied Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
- The main aim of the course is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
- The lucid explanation of the topics will help students to understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
- The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.
- After the completion of the course, the student would understand about the concepts of chemistry in respect of Electrochemical cells, fuel cells, mechanism of corrosion and factors to influence, polymers with their applications and engineering materials.

UNIT.1: ELECTROCHEMISTRY

i).Review of electrochemical cells, Numerical calculations, Batteries: Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries),Fuels cells: (Hydrogen-Oxygen and Methanol-Oxygen)

ii).Electrochemical sensors: Potentiometric Sensors and voltammetric sensors. Examples : analysis of Glucose and urea

iii).Corrosion: Electrochemical Theory of corrosion, Factors affecting the corrosion. Prevention: Anodic and cathodic protection and electro and electroless plating

UNIT.2: POLYMERS

i).Introduction to polymers, Polymerisation process, mechanism: cationic, anionic, free radical and coordination covalent.

Elastomers (rubbers), Natural Rubber; Compounding of Rubber

Synthetic Rubber: Preparation, properties and engineering applications of Buna-S, buna-N, Polyurethene, Polysulfide (Thiokol) rubbers

Plastomers: Thermosetting and Thermoplatics, Preparation, properties and Engineering applications , PVC, Bakelite, nylons.

ii).Conducting polymers: Mechanism, synthesis and applications of polyacetyline, polyaniline.

iii).Liquid Crystals: Introduction, classification and applications

iii).Inorganic Polymers: Basic Introduction, Silicones, Polyphospazins (-(R)2-P=N-) applications

UNIT.3: FUEL TECHNOLOGY

i).Classifications of Fuels – Characteristics of Fuels- Calorific Value – Units, Numerical Problems.

Solid Fuels–Coal, Coke : Manufacture of Metallurgical Coke by Otto Hoffmann's by product oven processes.

ii).Liquid Fuels:

Petroleum: Refining of Petroleum, Gasoline: Octane Number, Synthetic Petrol: Bergius Processes, Fischer Troph's synthesis

Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

iii). Gaseous Fuels: Origin, Production and uses of Natural gas, Producer gas, Water gas, Coal gas and Biogas.

iv). Nuclear Fuels: Controlled and uncontrolled reactions. Breeder reactor and Power reactors.

UNIT.4: CHEMISTRY OF ENGINEERING MATERIALS

i).Electrical Insulators or Dielectric materials: Definition and classification, Characteristics of electrical insulators. Applications of electrical insulating materials (Gaseous, liquid and solid insulators)

iii).Semiconducting and Super Conducting materials-Principles and some examples

iii).Magnetic materials – Principles and some examples

UNIT.5: PHOTOCHEMISTRY & COMPOSITE MATERIALS

i). Photochemical Reactions, Difference between Photochemical reactions and thermo chemical reactions. Absorption of light: Beer-Lambert's law . Photo-physical Processes: a) Fluorescence, (b) Phosphorescence and (c) Chemi-luminiscence and their applications ii). Composite Materials: Classification of Composites materials, Constituents of Composite materials. Disperse Phase composite materials Ex. a) Glass fibre reinforced polymer composite and b) Carbon fibre reinforced polymer composite materials. Advantages and applications of Composites.

EXPECTED OUTCOMES (EO): The student is expected to:

- Understand the electrochemical sources of energy
- Understand industrially based polymers, various engineering materials.
- Differentiation and uses of different kinds of Photochemical reactions.

Text Books:

1. Engineering Chemistry by KNJayaveera, GVSubba Reddy and C. Ramachandraiah, McGraw Hill Higher Education, Foruth Edition, New Delhi
2. A Text book of Engineering Chemistry by SS Dhara, S. Chand Publications, New Delhi

References:

1. A Text Book of Enigneering Chemistry, Jain and Jain, Dhanapathi Rai Publications, New Delhi
2. Engineering Chemistry by K.B.Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH Pubblications India Pvt Limited.
3. Concepts of Engineering Chemistry- Ashima Srivastavaf and N.N. Janhavi
4. Text Book of Engineering Chemistry – C. Parameswara Murthy, C.V.Agarwal and Andra Naidu
5. Chemistry of Engineering Materials, C.V.Agarwal, C.Parameswaramurthy and Andranaidu
6. Text Book of Engineering Chemistry, Shashichawla, Dhanapathirai Publications.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II Sem

	L	P	C
	3+1*	**0**	**3**

Computer Programming
(Common to All Branches)

Course Objective:

- To understand the core aspects of computer problem solving techniques
- To understand the programming language constructs
- To understand the programming paradigms
- To understand the compound data types
- To understand dynamic memory allocation concepts
- Able to design the flowchart and algorithm for real world problems
- Able to learn and understand new programming languages
- Able to construct modular and readable programs
- Able to write C programs for real world problems using simple and compound data types
- Adapt programming experience and language knowledge to other programming language contexts
- Employee good programming style, standards and practices during program development

Unit - I :
Introduction to Computers: Computer Systems, Computing Environment, Computer Languages, Creating and Running Programs, System Developments.
Introduction to the C Language: Introduction, C programs, Identifiers, Types, Variables, Constants, Input and Output, Programming Examples.
Introduction to Computer Problem Solving: Introduction , The Problem-Solving Aspect, Top-down Design, Bottom - up Approach, Flowcharts, Implementation of Algorithms, Program Verification, The Efficiency of Algorithms, The Analysis of Algorithms.

Unit – II:
Structure of C program: Expressions, Precedence and Associatively, Evaluating Expressions, Type Conversion, Statements, Sample Programs.
Selections and Making Decisions: Logical Data and Operators, Two way Selection, Multiway Selection.
Repetition: Concept of Loop, Pretest and Posttest Loops, Initialization and Updation, Event and Counter Controller Loop, Loops in C, Looping Applications.
Fundamental Algorithms: Exchanging the values between two variables, Counting, Summation of a set numbers, Factorial Computation, Sine Function Computation, Generation of the Fibonacci Sequence, Reversing the digits of a integer, Basic conversions, Character to Number Conversion

Unit – III :
Factoring Methods: Finding Square root of a Number, The Smallest Deviser of an Integer, The GCD of two Integers, Generating Prime Numbers, Computing Prime Factor of an Integer, Computing the prime factors of an Integer, Generation of Pseudo Random Number, Raising the

number to Large Power, Computing the n^{th} Fibonacci.
Functions: Introduction, User Defined Functions, Inter Function Communication, Standard Functions, Scope, Programming Examples.
Array Techniques: Array Order Reversal, Array Counting, Finding the Maximum Number Set, Removal Duplicates from an Ordered Array, Partitioning an Array, Finding k^{th} smallest Element, Longest Monotone Subsequence.
Arrays: Introduction, Two Dimensional Arrays, Multi Dimensional Arrays, Inter Function Communication, Array Applications, Exchange Sort, Binary Search, Linear Search.

Unit – IV :
Strings: String Concepts, C Strings, Sting Input/Output Functions, Arrays of Strings, String Manipulation Functions, String/Data Conversion.
Enumerated, Structure, and Union Types: The Type Definition, Enumerated Types, Structure, Unions, Programming Applications.
Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators, Mask.

Unit – V :
Pointers: Introduction, Pointers for Inter Function Communication, Pointers to Pointers, Compatibility, Lvalue and Rvalue.
Pointer Applications: Array and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications.
Binary Input/output: Text Versus Binary Streams, Standard Library Functions for Files, Converting File Type.

Text Books :

1. How to Solve it by Computer by R.G. Dromey, Pearson
2. Computer Science, A Structured Programming Approach Using C by Behrouz A. Forouzan & Richard F. Gilberg, Third Edition, Cengage Learning

Reference Books :

1. Programming in C: A Practical Approach, Ajay Mittal, Pearson.
2. The C programming Language, B. W. Kernighan and Dennis M. Ritchi, Pearson Education.
3. Problem Solving and Programming Designs in C, J. R. Hanly and E.B. Koffman.,
4. Programming with C Rema Theraja, Oxford
5. Problem Solving with C, M.T.Somashekara, PHI
6. C Programming with problem solving, J.A. Jones & K. Harrow,Dreamtech Press
7. Programming with C, R.S.Bickar, Universities Press.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II Sem	**L**	**P**	**C**
	3+1*	**0**	**3**

CIRCUIT THEORY

Course Objectives:

- To study about basic laws that govern flow of current, different sources of voltage and currents
- To study about different network theorems
- To study about principles of coupling
- To study about different parameters associated with two port networks

Course Outcomes:

After completion of the course the students will be able to

- Analyze different electronic and electrical circuits by employing basic laws that govern flow of current.
- Apply different network theorems to electrical circuits
- Understand basic principles of coupling
- Analyze two port networks with their equivalent representations using two port parameters

UNIT I

Circuit Analysis Techniques: Voltage and Current Laws, Loop and Nodal methods of analysis of Networks with dependent and independent voltage and current sources, Duality & Dual networks.

Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, f-circuit matrix and f-cutset matrix, Tie set and Cutset Matrices for planar networks.

UNIT – II

Magnetically Coupled Circuits: Self inductance, Mutual inductance, Dot rule, Coefficient of coupling, Analysis of multi-winding coupled (series and parallel) circuits, Energy Considerations, The Linear Transformer, The Ideal Transformer.

A.C Circuit Power Analysis: Instantaneous Power, Average Power, Effective Values of Current and Voltage, Apparent Power and Power Factor, Complex Power.

UNIT – III

Network Theorems: Linearity and Superposition, Reciprocity, Thevenin’s & Norton’s, Maximum Power Transfer, Milliman, Miller, Tellegan’s Theorems. Source Transformation.

UNIT IV

Transient Analysis: Basic RL and RC Circuits- The Source free RL Circuit, The Source free RC Circuit, Properties of Exponential Response, Natural response and forced response, Characteristics of

Sinusoids, Forced Response of Sinusoidal Functions, The Complex forcing Function, The Phasor, Phasor relationships for R,L, and C, Impedance, Admittance Transient response of RC, RL and RLC circuits to excitation by DC and exponential sources, Complete response of RC, RL and RLC circuits to sinusoidal excitation.

UNIT V

Two Port Networks: Relationship of two port variables, Short circuit Admittance parameters, Open circuit Impedance parameters, Transmission Parameters, Hybrid Parameters, Relationship between parameter sets, Interconnection of two port networks, Lattice networks.

Symmetrical and Asymmetrical networks:

Symmetrical Network - Concept and significance of characteristic impedance, propagation constant, attenuation constant (with expression in terms of Zo, Zoc for T network, Pi-network).

Asymmetrical Network - Concept and significance of iterative impedance, image impedance, image transfer constant and insertion loss.

Text Books:

1. Hayt, Kemmerly and Durbin, "Engineering Circuit Analysis", 6th edition, Tata McGraw-Hill
2. M.E.Van Valkenburg, "Network Analysis," McGraw Hill, 3rd Edition.

References:

1. John D. Ryder, "Networks, Lines, and Fields," PHI publications, Second Edition, 2012.
2. D Roy Choudary, "Network and Systems" New Age International,
3. A. Sudhakaar & Shyanmugam S.Palli "Circuits & Network Analysis & Synthesis", 2nd Edition, Tata McGraw Hill, 1994
4. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech. II Sem	L	P	C
	3+1*	0	3

ELECTRICAL TECHNOLOGY

Objective:
Electrical Technology contains Single phase transformers, Induction motors, DC generators and motors which are widely used in industry are covered and their performance aspects will be studied.

UNIT- I DC GENERATORS
D.C. Generators – Principle of Operation – Constructional Features – E. M.F Equation– Numerical Problems – Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of E.M.F - Critical Field Resistance and Critical Speed - Load Characteristics of Shunt, Series and Compound Generators- Applications

UNIT – II *D.C. MOTORS*
D.C Motors – Principle of Operation – Back E.M.F. –Torque Equation – Characteristics and Application of Shunt, Series and Compound Motors-Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods. Three Point Starter-Losses – Constant & Variable Losses – Calculation of Efficiency - Swinburne's Test.

UNIT-III SINGLE PHASE TRANSFORMERS
Single Phase Transformers- Constructional Details- Emf Equation - Operation on No Load and on Load - Phasor Diagrams-Equivalent Circuit - Losses and Efficiency-Regulation-OC and SC Tests - Predetermination of Efficiency and Regulation.

UNIT-IV 3-PHASE INDUCTION MOTORS
Polyphase Induction Motors-Construction Details of Cage and Wound Rotor Machines- - Principle of Operation – Slip- Rotor Emf and Rotor Frequency - Torque Equation- Torque Slip Characteristics.

UNIT – V SYNCHRONOUS MACHINES
Principle And Constructional Features of Salient Pole and Round Rotor Machines – E.M.F Equation- Voltage Regulation by Synchronous Impedance Method- Theory of Operation of Synchronous Motor.

OUTCOME:
After going through this course the student gets a thorough knowledge on DC Motors & Generators, Transformers and Induction motors with which he/she can able to apply the above conceptual things to real-world problems and applications.

TEXT BOOKS:

1. Electric Machines –by I.J.Nagrath & D.P.Kothari,Tata Mc Graw Hill, 7th Edition.2005
2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press.

REFERENCE BOOKS:

1. Fundamentals of Electric Machines by B. R. Gupta, Vandana singhal, 3rd Edition, New age international Publishers.
2. Electromachanics – III by S. Kamakashiah, overseas publishers Pvt Ltd.
3. Principles of Electrical Engineering by V.K Mehta, S.Chand Publications.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II Sem	L	P	C
	0	3	2

ENGINEERING CHEMISTRY LAB

The experiments are designed in a manner that the students can validate their own theory understanding in chemistry by self involvement and practical execution. Thus the execution of these experiments by the student will reinforce his/her understanding of the subject and also provide opportunity to refine their understanding of conceptual aspects. As a result, the student gets an opportunity to have feel good factor at the laboratory bench about the chemical principles that he/she learned in the classroom.

Objective:

- Will learn practical understanding of the redox reaction
- Will able to understand the function of fuel cells, batteries and extend the knowledge to the processes of corrosion and its prevention
- Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineer these to suit diverse applications
- Will also learn the hygiene aspects of water would be in a position to design methods to produce potable water using modern technology

LIST OF EXPERIMENTS

1. Determination of total hardness of water by EDTA method.
2. Determination of Copper by EDTA method.
3. Estimation of Dissolved Oxygen by Winkler’s method
4. Determination of Copper by Iodometry
5. Estimation of iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
6. Determination of Alkalinity of Water
7. Determination of acidity of Water
8. Preparation of Phenol-Formaldehyde (Bakelite)
9. Determination of Viscosity of oils using Redwood Viscometer I
10. Determination of Viscosity of oils using Redwood Viscometer II
11. Conductometric titration of strong acid Vs strong base (Neutralization titration).
12. Conductometric titration of Barium Chloride vs Sodium Sulphate (Precipitation Titration)
13. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
14. Estimation of Chloride ion using potassium Chromite indicator (Mohrs method)

(Any 10 experiments from the above list)

Outcomes:

- Would be confident in handling energy storage systems and would be able combat chemical corrosion
- Would have acquired the practical skill to handle the analytical methods with confidence.
- Would feel comfortable to think of design materials with the requisite properties
- Would be in a postion to technically address the water related problems.

TEXT BOOKS:

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – J. Mendham et al, Pearson Education.
2. Chemistry Practical – Lab Manual by Chandra Sekhar, GV Subba Reddy and Jayaveera.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II Sem	L	P	C
	0	3	2

ELECTRICAL TECHNOLOGY LAB

PART-A

1. Verification of KVL And KCL.
2. Serial and Parallel Resonance – Timing, Resonant Frequency, Bandwidth and Q-Factor Determination for RLC Network.
3. Time Response of First Order RC/RL Network for Periodic Non-Sinusoidal Inputs – Time Constant and Steady State Error Determination.
4. Two Port Network Parameters – Z-Y Parameters, Chain Matrix and Analytical Verification.
5. Two Port Network Parameters – ABCD and H-Parameters.
6. Verification of Superposition and Reciprocity Theorems.
7. Verification of Maximum Power Transfer Theorem. Verification on DC, Verification on AC with Resistive and Reactive Loads.
8. Experimental Determination of Thevenin’s and Norton’s Equivalent Circuits and Verification by Direct Test.
9. Constant – K Low Pass Filter and High Pass Filter

PART-B

1. Magnetization Characteristics of D.C.Shunt Generator. Determination of Critical Field Resistance.
2. Swinburne’s Test on DC Shunt Machine (Predetermination of Efficiency of a Given DC Shunt Machine Working as Motor and Generator).
3. Brake Test on DC Shunt Motor. Determination of Performance Characteristics.
4. OC & SC Tests on Single-Phase Transformer (Predetermination of Efficiency and Regulation at Given Power Factors and Determination of Equivalent Circuit).
5. Load Test on Single Phase Transformer.

Note: Any 12 of the above Experiments are to be Conducted

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech. I Sem	**L**	**P**	**C**
	3+1*	**0**	**3**

MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS

Objective: The objectives of this course are to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to enrich analytical skills in helping them take sound financial decisions for achieving higher productivity.

UNIT I: INTRODUCTION TO MANAGERIAL ECONOMICS

Managerial Economics - Definition, nature and scope – contemporary importance of Managerial Economics - Demand Analysis: Determinants- Law of Demand - Elasticity of Demand. Significance – types – measurement of elasticity of demand - Demand forecasting- factors governing demand forecasting- methods of demand forecasting –Relationship of Managerial Economics with Financial Accounting and Management.

UNIT II :THEORY OF PRODUCTION AND COST ANALYSIS

Production Function – Short-run and long- run production - Isoquants and Isocosts, MRTS, least cost combination of inputs - Cobb-Douglas production function - laws of returns - Internal and External economies of scale - **Cost Analysis**: Cost concepts - Break-Even Analysis (BEA) - Managerial significance and limitations of BEA - Determination of Break Even Point (Simple Problems)

UNIT III: INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT

Market structures: Types of Markets - Perfect and Imperfect Competition - Features, Oligopoly - Monopolistic competition. Price-Output determination - Pricing Methods and Strategies. Forms of Business Organization – Sole Proprietorship- Partnership – Joint Stock Companies – Public Sector Enterprises – New Economic Environment- Economic systems – Economic Liberalization – Privatization and Globalization

UNIT IV INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS

Financial Accounting – Concept - emerging need and importance - Double-Entry Book Keeping- Journal - Ledger – Trial Balance - Financial Statements - - Trading Account – Profit & Loss Account – Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Techniques – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

UNIT V: CAPITAL AND CAPITAL BUDGETING

Concept of Capital - Over and Under capitalization – Remedial measures - Sources of Shot term and Long term capital - Estimating Working Capital requirement – Capital budgeting – Features of Capital budgeting proposals – Methods and Evaluation of Capital budgeting – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems).

Course Outcome: The thorough understanding of Managerial Economics and Analysis of Financial Statements facilitates the Technocrats – cum – Entrepreneurs to take-up decisions effectively and efficiently in the challenging Business Environment.

TEXT BOOKS:

1. VijayaKumar.P. and Apparao. N. Managerial Economics and Financial Analysis,Cengage,2012
2. Aryasri: Managerial Economics and Financial Analysis, 4/e, TMH, 2009.

REFERENCES

1. Subhash Sharma & Vithal .M.P.Financial Accounting for Management, Macmillan,2010.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.
3. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2009.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2009.
5. Shailaja & Usha: Managerial Economics and Financial Analysis, University Press, 2012.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech. I Sem

	L	P	C
	3+1*	0	3

COMPLEX VARIABLES AND SPECIAL FUNCTIONS
(Common for ECE, EEE)

Objectives: To enable the students to understand the mathematical concepts of special functions & complex variables and their applications in science and engineering.

UNIT – I: Special Functions: Gamma and Beta Functions – their properties – Evaluation of improper integrals. Series Solutions of ordinary differential equations (Power series and Frobenius Method).

UNIT – II: Bessel functions – Properties – Recurrence relations – Orthogonality. Legendre polynomials – Properties – Rodrigue's formula – Recurrence relations – Orthogonality.

UNIT – III

Functions of a complex variable – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thompson method.

Conformal mapping: Transformation of e^z, Inz, z^2, Sin z, cos z, Bilinear transformation - Translation, rotation, magnification and inversion – Fixed point – Cross ratio – Determination of bilinear transformation.

UNIT – IV

Complex integration: Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

Complex power series: Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point – Isolated singular point – Pole of order m – Essential singularity.

UNIT – V

Residue – Evaluation of residue by formula and by Laurent series – Residue theorem.

Evaluation of integrals of the type

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$ (c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Advanced Engineering Mathematics, Peter V.O'Neil, CENGAGE publisher.

REFERENCES:

1. Mathematics III by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publications.
2. Engineering Mathematics, Volume - III, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.
3. Complex variables by Raisinghania
4. Advanced Engineering Mathematics by M.C. Potter, J.L. Goldberg, Edward F.Aboufadel, Oxford.

Outcomes: The student achieves the knowledge to analyse the problems using the methods of special functions and complex variables.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech. I Sem	**L**	**P**	**C**
	3+1*	**0**	**3**

DATA STRUCTURES

Course Objective

- To develop skills to design and analyze linear and non linear data structures.
- Develop algorithms for manipulating linked lists, stacks, queues, trees and graphs.
- Develop recursive algorithms as they apply to trees and graphs.
- To get acquaintance with frequently used data structures in Software Engineering and Programming practices.
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- To develop a base for advanced computer science study.

UNIT - I :

Introduction and Overview: System Life Cycle, Definition, Concept of Data Structures, Overview of Data Structures, Implementation of Data Structures.

Stacks: Definition, The Abstract Data Type, Array Representation, Linked Representation.

Queues: Definition, The Abstract Data Type, Array Representation, Linked Representation, Circular Queues, Applications.

Linked Lists: Single Linked Lists – Insertion and Deletion, Double Linked Lists – Insertion and Deletion.

UNIT – II

Sorting: Motivation, Quick Sort, Merge Sort, Insertion Sort, Heap Sort.

Trees: Introduction, Representation of Trees, Binary Trees, Binary Tree Traversal and Tree Iterators, Additional Binary Tree Operations, Threaded Binary Trees, Binary Search Trees, Selection Trees.

UNIT – III

Graphs: The Graph Abstract Data Type, Elementary Graph Operations.

Skip Lists and Hashing: Dictionaries, Linear List Representation, Skip List Representation, Hash Table Representation, Static and Dynamic Hashing.

UNIT – IV

Priority Queues: Definition and Applications, Single and Double Ended Priority Queues, Linear Lists, Heaps, Leftist Trees, Binomial Heaps, Fibonacci Heaps, Pairing Heaps.

UNIT – V

Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees, Red – Black Trees, Splay Trees.

Multiway Search Trees: m – way Search Trees, B – Trees, B^+ - Trees

TEXT BOOKS:

1. Fundamentals of Data Structures in C++ by Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, Universities Press, Second Edition.
2. Data Structures, Algorithms and Applications in C++ by Sartaj Sahni, Universities Press, Second Edition

REFERENCES:

1. Data Structures and Algorithms Using C++ by Ananda Rao Akepogu and Radhika Raju Palagiri
2. Classic Data Structure by D. Samanta, Eastern Economy Edition.
3. Data Structures and Algorithms Made Easy by Narasimha Karumanchi, Second Edition, Written in C/C++, CareerMonk Publications, Hyderabad
4. ADTs, Data Structures and Problem Solving with C++, Larry Nyhoff, Pearson
5. Data Structures using C++, D.S.Malik, 2nd Edition, Cengage Learning
6. Data Structures through C++, Yashavant P.Kanetkar, BPB Publication
7. Data Structures using C and C++, Yedidyah Langsam.Moshe J.Augenstein Aaron M.Tenenbaum, 2nd Edition,PHI
8. Data Structures using C & C++, Rajesh K.Shukla, Wiley-India

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech. I Sem	L	P	C
	3+1*	0	3

SIGNALS AND SYSTEMS

Course objectives:

- To study about signals and systems.
- To do analysis of signals & systems (continuous and discrete) using time domain & frequency domain methods.
- To understand the stability of systems through the concept of ROC.
- To know various transform techniques in the analysis of signals and systems.

Course Outcomes:

- For integro-differential equations, the students will have the knowledge to make use of Laplace transforms.
- For continuous time signals the students will make use of Fourier transform and Fourier series.
- For discrete time signals the students will make use of Z transforms.
- The concept of convolution is useful for analysis in the areas of linear systems and communication theory.

UNIT I

SIGNALS & SYSTEMS: Definition and classification of Signal and Systems (Continuous time and Discrete time),Elementary signals such as Dirac delta, unit step, ramp, sinusoidal and exponential and operations on signals.

Analogy between vectors and signals-orthogonality-Mean Square error- Fourier series: Trigonometric & Exponential and concept of discrete spectrum

UNIT II

CONTINUOUS TIME FOURIER TRANSFORM: Definition, Computation and properties of Fourier Transform for different types of signals. Statement and proof of sampling theorem of low pass signals

UNIT III

SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS: Linear system, impulse response, Response of a linear system, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, Relationship between bandwidth and rise time. Energy and Power Spectral Densities

UNIT IV

DISCRETE TIME FOURIER TRANSFORM: Definition, Computation and properties of Fourier Transform for different types of signals.

UNIT V

LAPLACE TRANSFORM: Definition-ROC-Properties-Inverse Laplace transforms-the S-plane and BIBO stability-Transfer functions-System Response to standard signals-Solution of differential equations with initial conditions.

The Z–TRANSFORM: Derivation and definition-ROC-Properties-Linearity, time shifting, change of scale, Z-domain differentiation, differencing, accumulation, convolution in discrete time, initial and final value theorems-Poles and Zeros in Z -plane-The inverse Z-Transform-System analysis-Transfer function-BIBO stability-System Response to standard signals-Solution of difference equations with initial conditions. .

TEXT BOOKS:

1. B.P. Lathi, “Signals, Systems & Communications”, 2009,BS Publications.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, “Signals and Systems”, PHI, 2nd Edn.
3. A. Ramakrishna Rao, “Signals and Systems”, 2008, TMH.

REFERENCES:

1. Simon Haykin and Van Veen, “Signals & Systems”, Wiley, 2nd Edition.
2. B. P. Lathi, “Linear Systems and Signals”, Second Edition, Oxford University press, 2008.
3. Michel J. Robert, “Fundamentals of Signals and Systems”, MGH International Edition, 2008.
4. C. L. Philips, J. M. Parr and Eve A. Riskin, “Signals, Systems and Transforms”, Pearson education.3rd

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech I Sem	L	P	C
	3+1*	0	3

SWITCHING THEORY AND LOGIC DESIGN

Course Objectives:

- To provide fundamental concepts used in the design of digital systems and learn the methods for the design of digital circuits.

Course Outcomes:

- To introduce basic postulates of Boolean algebra and the methods for simplifying Boolean expressions
- To illustrate the concepts and study the procedures for the analysis and design of combinational circuits and sequential circuits
- To introduce the concepts of programmable logic devices.

UNIT I

Number System & Boolean Algebra:

Digital Systems, Binary Numbers, Number base conversions, Complements of numbers, Signed binary numbers, Binary codes.

Boolean Algebra-Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, other logic operations & Logic gates.

UNIT II

Gate Level Minimization:

The map method, four variable & Five variable K-map, POS & SOP Simplification, Don't care conditions, NAND & NOR Implementation, Other two level Implementation, Ex-or Function, Tabular Method- Simplification of Boolean function using tabulation Method.

UNIT III

Combinational Logic Circuits:

Combinational circuits, Analysis & Design procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude comparator, Decoder, Encoders, Multiplexers.

UNIT IV

Sequential Logic Circuits:

Sequential Circuits, Latches, Flips-Flops - RS, JK, Master-Slave JK, D & T flip flops, Analysis of Clocked sequential circuits, State Reduction & Assignment, Design procedure, Registers & Counters – Registers, Shift Registers, Ripple Counters, Synchronous counters, asynchronous counters.

Asynchronous sequential circuits - Introduction, Analysis Procedure, Design Procedure, Reduction of State flow tables, Race-free State Assignment, Hazards.

UNIT V

Programmable Memories:

Memory organization, classification of semi conductor memories, ROM, PROM, DROM, EPROM, EEPROM, RAM, expansion of memory, CCD memories, content addressable memory, programmable logic devices, PROM at PLD, programmable logic array (PLA) programmable array logic (PAL), field programmable gate array (FPGA).

Text Books:

1. M.Morris Mano & Michel D. Ciletti, "Digital Design", 5th Edition Pearson.
2. Zvi KOhavi and Nirah K.Jha, "Switching theory and Finite Automata Theory", 3rd Edition Cambridge.

References:

1. Subratha Goshal, "Digital Electronics", Cambridge
2. Comer, "Digital & State Machine Design", Third Indian edition, OXFORD

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

	L	P	C
II B.Tech. I Sem	**3+1***	**0**	**3**

ELECTRONIC DEVICES AND CIRCUITS

Course Objectives:

To give understanding on semiconductor physics of the intrinsic, p and n materials, characteristics of the p-n junction diode, diode's application in electronic circuits, Characteristics of BJT,FET,MOSFET, characteristics of special purpose electronic devices. To familiarize students with dc biasing circuits of BJT, FET and analyzing basic transistor amplifier circuits.

Course Outcomes:

Upon completion of the course, students will:

- Analyze the operating principles of major electronic devices, its characteristics and applications.
- Design and analyze the DC bias circuitry of BJT and FET.
- Design and analyze basic transistor amplifier circuits using BJT and FET.

UNIT- I

Junction Diode Characteristics : Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Diodes: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, Varactor diode, Tunnel Diode, DIAC, TRIAC, SCR, UJT. Construction, operation and characteristics of all the diodes is required to be considered.

UNIT- II

Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter, Capacitor filter, L- section filter, Π- section filter, Multiple L- section and Multiple Π section filter ,comparison of various filter circuits in terms of ripple factors.

UNIT- III

Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT- IV

Transistor Biasing and Thermal Stabilization : Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE}, Ic, and β, Stability factors, (S, $S^{'}$, $S^{''}$), Bias compensation, Thermal runaway, Thermal stability.

FET Biasing- methods and stabilization.

UNIT- V

Small Signal Low Frequency Transistor Amplifier Models:

BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

TEXT BOOKS:

1. J. Millman, C. Halkias, "Electronic Devices and Circuits", Tata Mc-Graw Hill, Second Edition,2010.
2. David A.Bell, "Electronic Devices and Circuits", Fifth Edition, Oxford University Press, 2009.
3. Salivahanan, Kumar, Vallavaraj, "Electronic Devices and Circuits", Tata Mc-Graw Hill, Second Edition

REFERENCES:

1. Jacob Millman, C. Halkies, C.D.Parikh, "Integrated Electronics", Tata Mc-Graw Hill, 2009.
2. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits", Pearson Publications,,9thEdition,2006.
3. BV Rao, KBR Murty, K Raja Rajeswari, PCR Pantulu, "Electronic Devices and Circuits", Pearson, 2nd edition.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech. I Sem	L	P	C
	0	3	2

COMPUTER PROGRAMMING & DATA STRUCTURES LAB

Course Outcomes:

- Apply and practice logical ability to solve the problems.
- Analyzing the complexity of problems, modularize the problems into small modules and then convert them into programs
- Understand and apply the pointers and use of files for dealing with variety of problems
- Ability to develop programs to implement linear data structures such as stacks, queues, linked lists, etc.
- Ability to identify the appropriate data structure to develop real time applications
- Able to implement various kinds of searching and sorting techniques, and know when to choose which technique.

Part A: Computer Programming

1. Write a C program to find the sum of individual digits of a positive integer.
2. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to calculate the following Sum: $Sum=1-x^2/2! +x^4/4!-x^6/6! +x^8/8!-x^{10}/10!$
5. Write a C program to find the roots of a quadratic equation.
6. Write C programs that use both recursive and non-recursive functions
    1. To find the factorial of a given integer.
    2. To find the GCD (greatest common divisor) of two given integers.
    3. To solve Towers of Hanoi problem.
7. The total distance traveled by vehicle in ‘t’ seconds is given by distance = $ut+1/2at^2$ where ‘u’ and ‘a’ are the initial velocity (m/sec.) and acceleration (m/sec^2). Write C program to find the distance traveled at regular intervals of time given the values of ‘u’ and ‘a’. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of ‘u’ and ‘a’.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
    i) Addition of Two Matrices
    ii) Multiplication of Two Matrices
11. Write a C program that uses functions to perform the following operations:
    i) To insert a sub-string in to a given main string from a given position.
    ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not

13. Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.
15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$
For example: if n is 3 and x is 5, then the program computes 1+5+25+125.
Print x, n, the sum
Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.
18. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
19. Write a C program to convert a Roman numeral to its decimal equivalent.
20. Write a C program that uses functions and structures to perform the following operations:
 i) Reading a complex number
 ii) Writing a complex number
 iii) Addition of two complex numbers
 iv) Multiplication of two complex numbers
(Note: represent complex number using a structure.)
21. Write a C program which copies one file to another.
22. Write a C program to reverse the first n characters in a file.
(Note: The file name and n are specified on the command line.)
23. Write a C program to display the contents of a file.
24. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Part B: Data Structures

1. Write a C program that uses functions to perform the following operations on singly linked list.
   a. i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write C programs that implement stack (its operations) using
   a. i) Arrays ii) Pointers iii) linked lists
3. Write C programs that implement Queue (its operations) using
   a. i) Arrays ii) Pointers iii) linked lists
4. Write a C program that uses Stack operations to perform the following:
   i) Converting infix expression into postfix expression
   ii) Evaluating the postfix expression
5. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Bubble sort
   ii) Selection sort
   iii) Quick Sort
   iv) Heap Sort
   v) Merge Sort
6. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:

   a. i) Linear search   ii) Binary search

7. Write a Program to Implement the Operations of Double Linked Lists
8. Write a Program to Implement Circular Queue Operations by using Array and Linked Lists.
9. Write a Program to Implement the Binary Search Tree Operations.
10. Write a Program to Perform the Tree Traversal Techniques by using the Iterative Method
11. Write C programs for implementing the following graph traversal algorithms:

    a)Depth first traversal   b)Breadth first traversal

12. Write a Program to Implement All functions of a Dictionary by using Hashing
13. Write a Program to Implement Skip List Operations.
14. Write a Program to Implement Insertion, Deletion and Search Operations on SPLAY Trees.
15. Write a program to Implement Insertion and Deletion Operations on AVL Trees
16. Write a Program to Implement Insertion and Deletion Operations on B – Trees

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech. I Sem	L	P	C
	0	3	2

ELECTRONIC DEVICES AND CIRCUITS LABORATORY

Objectives:

- This Lab provides the students to get an electrical model for various semiconducter devices. Students can find and plot V_I characteristics of all semiconductor devices. Student learns the practical applications of the devices. They can learn and implement the concept of the feedback and frequency response of the small signal amplifier

Outcomes:

- Students able to learn electrical model for various semiconductor devices and learns the practical applications of the semiconductor devices

PART A: Electronic Workshop Practice

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

PART B: List of Experiments
(For Laboratory Examination-Minimum of Ten Experiments)

1. P-N Junction Diode Characteristics

Part A: Germanium Diode (Forward bias& Reverse bias)

Part B: Silicon Diode (Forward bias only)

2. Zener Diode Characteristics

Part A: V-I Characteristics

Part B: Zener Diode act as a Voltage Regulator

3. Rectifiers (without and with c-filter)

Part A: Half-wave Rectifier

Part B: Full-wave Rectifier

4. BJT Characteristics(CE Configuration)

Part A: Input Characteristics

Part B: Output Characteristics

5. FET Characteristics(CS Configuration)

Part A: Drain (Output) Characteristics

Part B: Transfer Characteristics

6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

PART C: Equipment required for Laboratory

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires
12. CRO Probes etc.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem	L	P	C
	3+1*	0	3

PROBABILITY THEORY & STOCHASTIC PROCESSES

Course Objectives:

- To understand the concepts of a Random Variable and operations that may be performed on a single Random variable.
- To understand the concepts of Multiple Random Variables and operations that may be performed on Multiple Random variables.
- To understand the concepts of Random Process and Temporal & Spectral characteristics of Random Processes.

Learning Outcomes:

- A student will able to determine the temporal and spectral characteristics of random signal response of a given linear system.

UNIT-I

Probability : Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bays' Theorem, Independent Events:

The Random Variable : Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Raleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties.

UNIT-II

Multiple Random Variables : Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions.

Operations on Multiple Random Variables : Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT-III

Random Processes – Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT-IV

Random Processes – Spectral Characteristics : The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

UNIT-V

Linear Systems with Random Inputs : Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties.

Text Books:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", TMH, 4th Edition, 2001.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", PHI, 4th Edition, 2002.

References:

1. R.P. Singh and S.D. Sapre, "Communication Systems Analog & Digital", TMH, 1995.
2. Henry Stark and John W.Woods, "Probability and Random Processes with Application to Signal Processing",Pearson Education, 3rd Edition.
3. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis", Oxford, 3rd Edition, 1999.
4. S.P. Eugene Xavier, "Statistical Theory of Communication", New Age Publications, 2003.
5. B.P. Lathi, "Signals, Systems & Communications", B.S. Publications, 2003.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

	L	P	C
II B.Tech II Sem	**3+1***	**0**	**3**

PULSE AND DIGITAL CIRCUITS

Objectives:-

- To study various wave shaping circuits and their applications.
- To study different circuits that produce non-sinusoidal waveforms(multivibrators) and their applications
- To study various voltage time base generators and their applications.
- To study different logic families and their comparison.

Outcomes:

- Students will be able to design different pulse circuits based on the above concepts.

UNIT I
LINEAR WAVESHAPING

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. High Pass RC network as Differentiator, Low Pass RC network as integrator, attenuators and its applications as a CRO probe, RL and RLC circuits and their response for step input, Ringing circuit. Illustrative Problems.

UNIT II
NON-LINEAR WAVE SHAPING

Diode clippers, Transistor clippers, clipping at two independent levels, Comparators, applications of voltage comparators, clamping operation, clamping circuits taking source and Diode resistances into account, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Synchronized Clamping.

UNIT III
SWITCHING CHARACTERISTICS OF DEVICES

Diode and Transistor as a switch, Characteristics, parameters and their switching times

MULTIVIBRATORS

Analysis and Design of Bi-stable, Monostable, Astable Multivibrators and Schmitt trigger circuit using BJT.

UNIT IV

TIME BASE GENERATORS

General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator, Transistor Current time base generators, Methods of linearity Improvements.

SYNCHRONIZATION AND FREQUENCY DIVISION

Pulse Synchronization of relaxation Devices, Frequency division in sweep circuit, Stability of relaxation Devices, Astable relaxation circuits, Monostable relaxation circuits, Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit, A Sinusoidal Divider using Regeneration and Modulation.

UNIT V

SAMPLING GATES

Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Four Diode Sampling Gate, Reduction of pedestal in gate circuits, Six Diode Gate, Application of Sampling Gates.

REALIZATION OF LOGIC GATES USING DIODES & TRANSISTORS

AND, OR, & NOT gates using Diodes, and Transistors, DCTL, RTL. DTL, TTL, and CMOS Logic Families, and comparison between the logic families.

Text books:

1. J.Millman, H.Taub and Mothiki S. Prakash Rao, "Millman's Pulse, Digital and Switching Waveforms",2nd Edition, 2008 TMH.
2. A. Bell, "Solid State Pulse Circuits", David 4th edition, 2002 PHI.

References:

1. A. Anand Kumar, "Pulse and Digital Circuits", PHI, 2005.
2. Ronald J. Tocci, "Fundamentals of Pulse and Digital Circuits", 3rd edition, 2008.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech IISem	**L**	**P**	**C**
	3+1*	**0**	**3**

ELECTRONIC CIRCUIT ANALYSIS & DESIGN

Course Objectives:

The aim of this course is to familiarize the student with the analysis and design of multistage amplifiers with compound connections, feedback amplifiers, oscillators, power amplifiers and tuned amplifiers. To study and analyze the frequency response of amplifier circuits.

Course Outcomes:

Upon completion of this course, student will be able to :

- Analyze the frequency response of the BJT amplifiers at low and high frequencies.
- Analyze and design multistage amplifiers with compound connections, feedback amplifiers, oscillators, power amplifiers and tuned amplifiers.

Unit -I

Feedback Amplifiers : Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of Analysis of Feedback Amplifiers.

Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and FET with the relevant analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and FET with relevant analysis, Crystal oscillators, Frequency and amplitude stability of oscillators.

Unit- II

Small Signal High Frequency Transistor Amplifier models:

BJT: Transistor at High Frequencies, Hybrid- π Common Emitter transistor model, Hybrid π conductances, Hybrid π capacitances, Validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters , CE short circuit current gain, Current gain with resistive load, Cut-off frequencies, Frequency Response and Gain Bandwidth product.

FET: Analysis of Common Source and Common Drain Amplifier circuits at High frequencies.

Unit – III

Multistage Amplifiers : Classification of amplifiers, Methods of coupling**,** Cascaded transistor amplifier and its analysis, Analysis of two stage RC coupled amplifier, High input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Analysis of multi stage amplifiers using FET, Differential amplifier using BJT.

UNIT- IV

Power Amplifiers: Class A large signal Amplifiers, Second harmonic Distortions, Higher order harmonic Distortion, Transformer Coupled Audio power amplifier, Efficiency, Push-pull amplifiers, Class B Amplifiers, Class AB operation, Efficiency of Class B Amplifier, Complementary Symmetry push pull amplifier, Class D amplifier, Class S amplifier, MOSFET power amplifier, Thermal stability and Heat sink

UNIT -V

Tuned Amplifiers : Introduction, Q-Factor, Small Signal Tuned Amplifier – Capacitance single tuned amplifier, Double Tuned Amplifiers, Effect of Cascading Single tuned amplifiers on Band width, Effect of Cascading Double tuned amplifiers on Band width, Staggered tuned amplifiers, Stability of tuned amplifiers

Text Books:

1. J. Millman and C.C. Halkias, "Integrated Electronics", Mc Graw-Hill, 1972.
2. Donald A. Neaman, "Electronic Circuit Analysis and Design", McGraw Hill.
3. Salivahanan, N.Suressh Kumar, A. Vallavaraj, "Electronic Devices and Circuits", Tata McGraw Hill, Second Edition.

References:

1. Robert T. Paynter, "Introductory Electronic Devices and Circuits", Pearson Education, 7th Edition
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory" Pearson/Prentice Hall, 9th Edition, 2006.
3. Sedra A.S. and K.C. Smith, "Micro Electronic Circuits", Oxford University Press, 5th Edition.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem	L	P	C
	3+1*	0	3

ELECTROMAGNETIC FIELD THEORY

***Course Objectives*:**
(a) Understanding and the ability to use vector algebra, and vector calculus.
(b) Proficiency in the use of vector identities.

Course Outcomes:
This course provides the foundational education in static electromagnetic fields, and time varying electromagnetic waves. Through lecture, and out-of-class assignments, students are provided learning experiences that enable them to:

1. Employ various mathematical operations and use them in calculation of electromagnetic fields.
2. Evaluate the electric field intensity due to various charge distribution.
3. Analyze and calculate EM field distribution in capacitors and inductors having different geometry.
4. Compute the parameters of EM fields in bounded and unbounded media by understanding boundary conditions.
5. Interpret complex and electromagnetic field problems using Maxwell's equations.
6. Formulate and analyze problems involving propagation of uniform plane waves in different media.
7. Able to understand, analyze transmission lines at radio frequencies by calculating the line parameters through the use of smith chart and other techniques.

UNIT I

Electrostatics: Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT II

Magnetostatics: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems.

UNIT III

Maxwell's Equations (for Time Varying Fields): Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different

Final Forms and Word Statements. Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

UNIT IV

EM Wave Characteristics – I: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

UNIT V

EM Wave Characteristics – II: Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

Text books:

1. Matthew N.O. Sadiku, “Elements of Electromagnetics”, Oxford Univ. Press, 4^{th} ed., 2008.
2. William H. Hayt Jr. and John A. Buck, “Engineering Electromagnetics”, TMH, 7th ed., 2006.
3. John D. Krauss, “Electromagnetics”, McGraw- Hill publications.
4. Electromagnetics, Schaum’s out line series, Second Edition, Tata McGraw-Hill publications, 2006.

References:

1. E.C. Jordan and K.G. Balmain, “Electromagnetic Waves and Radiating Systems”, PHI, 2^{nd} Edition, 2000.
2. Nathan Ida, “Engineering Electromagnetics”, Springer (India) Pvt. Ltd., New Delhi, 2nd ed., 2005.
3. Nannapaneni Narayana Rao, “Fundamentals of Electromagnetics for Engineering”, Pearson Edu. 2009.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

	L	P	C
II B.Tech II Sem	**3+1***	**0**	**3**

NETWORKS & TRANSMISSION LINES

Course Objectives:

- To study about principles involved in Resonance circuits
- To study about different network functions and methods of state variable analysis
- To study about working of different types of filters and attenuators
- To study in detail about transmission lines and electrical behavior

Course Outcomes:

After completion of this course the students will be able to

- Get complete knowledge regarding Resonance circuits and analyze electrical circuits by employing principles of Resonance
- Understand different network functions and methods of state variable analysis
- Understand working of different types of filters and attenuators
- Get complete knowledge regarding transmission lines and able to represent equivalent transmission line by employing its constants.

UNIT - I

Resonance: Introduction, Definition of 'quality factor **Q**' of inductor and capacitor, Series resonance, Bandwidth of the series resonant circuits, Parallel resonance (or anti-resonance), Conditions for maximum impedance, Currents in parallel resonance, Impedance variation with frequency; universal resonance curves, Bandwidth of parallel resonant circuits, General case of parallel resonance circuit, Anti-resonance at all frequencies; variable phase angle circuit, reactance curves, Impedance Transformation .

UNIT – II

Network Functions: Circuit Analysis in S-Domain- Z(S) and Y(S), Poles and zeros of network functions, Restrictions on pole and zero locations for driving point functions and transfer functions, Time-domain behavior from the pole zero plot, The Complex- Frequency Plane, Natural Response and the S-Plane.

State Variable Analysis: Introduction to state variables – state variables of circuits, state and output equations, advantages of state variable analysis, Circuit state equations, Proper and improper circuits, Equations for proper circuits, Transform solution of state equations, Illustrative problems

UNIT III

Filters: Introduction, the neper & decibel, Characteristic Impedance of symmetrical networks, Currents & voltage ratios as exponentials; the propagation constant, Hyperbolic trigonometry, Properties of symmetrical networks, Filter fundamentals; pass and stop bands, Behavior of characteristic impedance, The constant – k low pass filter, the constant – k high pass filter, The m-derived T section, The m-derived π section, Variation of characteristic impedance over the pass band, Termination with m-derived half sections, Band-pass filters, Band elimination filters, Filter design, Filter performance, Illustrative problems.

Attenuators: Symmetrical and Asymmetrical attenuators, T-type attenuator, Π-type attenuator, Lattice attenuator, Bridged-T attenuator, L-type attenuator.

UNIT IV

Transmission Lines 1:

Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness/Low-loss Characterization, Distortion, Condition for distortion-free transmission and minimum attenuation, Loading, Types of Loading – Illustrative problems.

UNIT V

Transmission Lines 2:

Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements; λ/4, λ/2, λ/8 Lines – Impedance Transformations, Significance of Zmin and Zmax , Smith Chart – Configuration and Applications, Single and Double Stub Matching – Illustrative Problems.

TEXT BOOKS:

1. John D. Ryder, “Networks, Lines, and Fields,” PHI publications, Second Edition, 2012.
2. William H.Hayt, Jr.Jack E.Kemmerly and Steven M.Durbin, “ Engineering Circuit Analysis”, Mc Graw Hill Science Engineering Seventh Edition, 2006

References:

1. M.E.Vanvalkenburg, “Network Analysis”, 3rd Edition, PHI,2003
2. Sudarshan and Shyam Mohan, “Network Theory”, TMH
3. Umesh Sinha, Satya Prakashan, “Transmission Lines and Networks”, 2001, Tech. India Publications

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech. II Sem

	L	P	C
	3+1*	0	3

ANALOG COMMUNICATION SYSTEMS

Course Objectives:

- To study the fundamental concept of the analog communication systems.
- To analyze various analog modulation and demodulation techniques.
- To know the working of various transmitters and receivers.
- To understand the influence of noise on the performance of analog communication systems, and to acquire the knowledge about information and capacity.

Course Outcomes:

This course provides the foundational education in Analog Communication systems, and applications. The students are provided the learning experience through class room teaching and solving assignment & tutorial problems. At the end of course, students should be able to:

- Acquire knowledge on the basic concepts of Analog Communication Systems.
- Analyze the analog modulated and demodulated systems.
- Verify the effect of noise on the performance of communication systems.
- Know the fundamental concepts of information and capacity.

UNIT- I

Introduction: Elements of communication systems, Information, Messages and Signals, Modulation, Modulation Methods, Modulation Benefits and Applications.

Amplitude Modulation & Demodulation: Baseband and carrier communication, Amplitude Modulation (AM), Rectifier detector, Envelope detector, Double sideband suppressed carrier (DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Frequency mixer, sideband and carrier power of AM, Generation of AM signals, Quadrature amplitude modulation (QAM), Single sideband (SSB) transmission, Time domain representation of SSB signals & their demodulation schemes (with carrier, and suppressed carrier), Generation of SSB signals, Vestigial sideband (VSB) modulator & demodulator, Carrier Acquisition- phased locked loop (PLL), Costas loop, Frequency division multiplexing (FDM), and Super-heterodyne AM receiver, Illustrative Problems.

UNIT- II

Angle Modulation & Demodulation: Concept of instantaneous frequency, Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Verification of Frequency modulation bandwidth relationship, Features of angle modulation, Generation of FM waves – Indirect method, Direct generation; Demodulation of FM, Bandpass limiter, Practical frequency demodulators, Small error analysis, Pre-emphasis, & De-emphasis filters, FM receiver, FM Capture Effect, Illustrative Problems.

UNIT- III

Noise in Communication Systems: Thermal noise, Time domain representation of narrowband noise, Filtered white noise, Quadrature representation of narrowband noise, Envelope of narrowband noise plus sine wave, Signal to noise ratio & probability of error, Noise equivalent bandwidth, Effective noise temperature, and Noise figure, Baseband systems with channel noise, Performance analysis (i.e. finding SNR expression) of AM, DSB-SC, SSB-SC, FM, PM in the presence of noise, Illustrative Problems.

UNIT- IV

Analog pulse modulation schemes: Pulse amplitude modulation – Natural sampling, flat top sampling and Pulse amplitude modulation (PAM) & demodulation, Pulse-Time Modulation – Pulse Duration and Pulse Position modulations, and demodulation schemes, PPM spectral analysis, Illustrative Problems.

Radio Receiver measurements: Sensitivity, Selectivity, and fidelity.

UNIT- V

Information & Channel Capacity: Introduction, Information content of message, Entropy, Entropy of symbols in long independent and dependent sequences, Entropy and information rate of Markoff sources, Shannon's encoding algorithm, Discrete communication channels, Rate of information over a discrete channel, Capacity of discrete memoryless channels, Discrete channels with memory, Shannon – Hartley theorem and its implications, Illustrative problems.

Text books:

1. B. P. Lathi, "Modern Digital and Analog Communication Systems," Oxford Univ. press, 3rd Edition, 2006.
2. Sham Shanmugam, "Digital and Analog Communication Systems", Wiley-India edition, 2006.
3. A. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5th Edition, 2010.

References:

1. Simon Haykin, "Communication Systems", Wiley-India edition, 3rd edition, 2010.
2. Herbert Taub & Donald L Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 3rd Edition, 2009.
3. R.E. Ziemer & W.H. Tranter, "Principles of Communication-Systems Modulation & Noise", Jaico Publishing House, 2001.
4. George Kennedy and Bernard Davis, "Electronics & Communication System", TMH, 2004.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem	**L**	**P**	**C**
	0	**3**	**2**

ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB

Note: The students are required to design the electronic circuit and they have to perform the analysis through simulator using Multisim/ Pspice/Equivalent Licensed simulation software tool. Further they are required to verify the result using necessary hardware in the hardware laboratory**.**

Objectives

- Help students make transition from analysis of electronic circuits to design of electronic circuits.
- To understand the Analysis of transistor at high frequencies.
- To understand the concept of designing of tuned amplifier.
- The student will construct and analyze voltage regulator circuits.
- To understand the circuit configuration and the principle operation of converters, including diode rectifiers, controlled AC-DC converters and DC choppers

Outcomes:

- The ability to analyze and design single and multistage amplifiers at low, mid and high frequencies.
- Designing and analyzing the transistor at high frequencies.
- Determine the efficiencies of power amplifiers.
- Determine Frequency response and design of tuned amplifiers.
- Able to Analyze all the circuits using simulation software and Hardware.

PART A: List of Experiments :(Minimum of Ten Experiments has to be performed)

1. Determination of f_T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

PART B: Equipment required for Laboratory

Software:

i. Multisim/ Pspice/Equivalent Licensed simulation software tool
ii. Computer Systems with required specifications

Hardware:

13. Regulated Power supplies
14. Analog/Digital Storage Oscilloscopes
15. Analog/Digital Function Generators
16. Digital Multimeters
17. Decade Résistance Boxes/Rheostats
18. Decade Capacitance Boxes
19. Ammeters (Analog or Digital)
20. Voltmeters (Analog or Digital)
21. Active & Passive Electronic Components
22. Bread Boards
23. Connecting Wires
24. CRO Probes etc.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem	L	P	C
	0	3	2

PULSE & DIGITAL CIRCUITS LAB

Course Objectives:

- To generate Different types of non-sinusoidal signals.
- To generate and processing of non-sinusoidal signals.
- To learn about Limiting and storage circuits and their applications.
- To learn about Different synchronization techniques, basics of different sampling gates and their uses.
- To obtain Basics of digital logic families.

Course Outcomes:

- Student understands the various design and analysis to generate various types of signals.
- Student can design various digital circuits based on the application and specifications.

Minimum Twelve experiments to be conducted:

1. Linear wave shaping- RC High Pass and Low Pass Circuits
2. Non Linear wave shaping – Clippers.
3. Non Linear wave shaping – Clampers.
4. Transistor as a switch.
5. Study of Logic Gates & Some applications.
6. Sampling Gates.
7. Astable Multivibrator.
8. Monostable Multivibrator.
9. Bistable Multivibrator.
10. Schmitt Trigger.
11. UJT Relaxation Oscillator.
12. Bootstrap sweep circuit.
13. Constant Current Sweep Generator using BJT.

Equipment required for Laboratories:

1.	RPS	-	0 – 30 V
2.	CRO	-	0 – 20 M Hz.
3.	Function Generators	-	0 – 1 M Hz
4.	Components		
5.	Multi Meters		

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech ECE II Sem

	T	P	C
	2	0	0

HUMAN VALUES AND PROFESSIONAL ETHICS

Course Outcomes: Students will be able to

- identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
- identify the multiple ethical interests at stake in a real-world situation or practice
- articulate what makes a particular course of action ethically defensible
- assess their own ethical values and the social context of problems
- identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
- demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
- integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research

Unit I: HUMAN VALUES

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty - Courage- Co Operation – Commitment – Empathy –Self Confidence Character – Spirituality.

Unit II: ENGINEERING ETHICS

Senses of ‘Engineering Ethics- Variety of moral issued – Types of inquiry – Moral dilemmas – Moral autonomy –Kohlberg’s theory- Gilligan’s theory- Consensus and controversy – Models of professional roles- Theories about right action- Self interest - Customs and religion –Uses of Ethical theories – Valuing time –Co operation – Commitment.

Unit III: **ENGINEERING AS SOCIAL EXPERIMENTATION**

Engineering As Social Experimentation – Framing the problem – Determining the facts – Codes of Ethics – Clarifying Concepts – Application issues – Common Ground - General Principles – Utilitarian thinking respect for persons.

UNIT IV: ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK

Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing risk- Safety and the Engineer- Designing for the safety- Intellectual Property rights(IPR).

UINIT V: GLOBAL ISSUES

Globalization – Cross culture issues- Environmental Ethics – Computer Ethics – Computers as the instrument of Unethical behavior – Computers as the object of Unethical acts – Autonomous Computers- Computer codes of Ethics – Weapons Development - Ethics and Research – Analyzing Ethical Problems in research – Intellectual property Rights(IPR).

Text Books

1. “Engineering Ethics includes Human Values” by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.
2. “Engineering Ethics” by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3. “Ethics in Engineering” by Mike W. Martin and Roland Schinzinger – Tata McGraw-Hill– 2003.
4. “Professional Ethics and Morals” by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications.
5. “Professional Ethics and Human Values” by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi
6. Publications.
7. “Indian Culture, Values and Professional Ethics” by PSR Murthy-BS Publication.
8. “Professional Ethics and Human Values” by Prof.D.R.Kiran-

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem

	L	P	C
	4	0	3

MANAGEMENT SCIENCE

Course Objective*: The objective of the course, is to equip the student the fundamental knowledge of management science and its application for effective management of human resource, materials and operation of an organization. It also aims to expose the students about the latest and contemporary developments in the field of management***.**

UNIT I

INTRODUCTION TO MANAGEMENT:
Management-Concept and meaning-Nature-Functions-Management as a science and art and both. Schools of management thought-Taylor's scientific theory-Henry Fayol's principles-Weber's Ideal Bureaucracy-Eltan Mayo's Human relations-Systems theory- Situational or Contingency theory-Social responsibilities of management.**Organizational structure and design**: Features of organizational structure-work specialization-Departmentation-Span of control-Centralization and Decentralization. **Organisational designs**-Line organization-Line & Staff Organization-Functional Organization-Matrix Organization-Project Organization-Committee form of organization.

UNIT II

OPERATIONS MANAGEMENT:
Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study- Statistical Quality Control**:** *C* chart, *P* chart, (simple Problems) Deming's contribution to quality. **Material Management:** Objectives-Inventory-Functions,types, inventory classification techniques-EOQ-ABC Analysis-Purchase Procedure and Stores Management. **Marketing Management:** Concept- Meaning - Nature- Functions of Marketing- Marketing Mix- Channels of distribution - Advertisement and sales promotion- Marketing Strategies based on Product Life Cycle.

UNIT III

HUMAN RESOURCES MANAGEMENT (HRM):
HRM- Definition and meaning – nature-Managerial and Operative functions-Evolution of HRM-Human Resource Planning(HRP)-Employee Recruitment-sources of recruitment-employee selection-process and tests in employee selection- Employee training and development-On- the- job and Off-the- job training methods-Performance Appraisal systems-Concept-Methods of Performance Appraisal-Placement-Employee Induction-Wage and Salary Administration-Objectives-Essentials of Wage and Salary Administration-Job Analysis-Process -Job Evaluation-Employee Grievances-techniques of handling Grievances.

UNIT IV

STRATEGIC MANAGEMENT:
Definition& meaning-Setting of Vision- Mission- Goals- Corporate Planning Process- Environmental Scanning-Steps in Strategy Formulation and Implementation-SWOT Analysis. **Project Management (PERT/CPM):**Network Analysis- Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying Critical Path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems).

UNIT V

CONTEMPORARY ISSUES IN MANAGEMENT:
The concept of MIS- Materials Requirement Planning (MRP)- Just-In-Time (JIT) System- Total Quality Management (TQM)- Six Sigma Concept- Supply Chain Management- Enterprise Resource Planning (ERP)- Performance Management- Business Process Outsourcing (BPO), Business Process Re-engineering and Bench Marking -Balanced Score Card-Knowledge Management.

The students are required to submit any one of the following- two assignments/ a mini project/submission of any two case studies in the subject.

Learning Outcome: After completion of this course, the prospective engineering technocrats will be able to understand various fundamentals of functional areas such general management, plant and materials management, marketing management, human resource management, statistical quality control techniques, strategic management and also aware of the latest and contemporary issues of management science.

TEXT BOOKS:
1. A.R Aryasri: Management Science, TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education,New Delhi, 2012.

REFERENCE BOOKS:
1. Kotler Philip & Keller Kevin Lane: Marketing Mangement , PHI,2013.
2. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2005.
3. Thomas N.Duening & John M.Ivancevich ManagementPrinciples and Guidelines,Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Memoria & S.V.Gauker, Personnel Management, Himalaya, 25/e, 2005
6. Samuel C.Certo: Modern Management, 9/e, PHI, 2005
7. Schermerhorn, Capling, Poole & Wiesner: Management, Wiley, 2002.
8. Parnell: Strategic Management, Biztantra, 2003.
9. Lawrence R Jauch, R.Gupta &William F.Glueck: Business Policy and Strategic Management, Frank Bros., 2005.
10. L.S.Srinath: PERT/CPM,Affiliated East-West Press, 2005.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem	L	P	C
	3+1*	0	3

LINEAR IC APPLICATIONS

Course Outcomes:

- Understand the basic building blocks of linear integrated circuits and its characteristics.
- Analyze the linear, non-linear and specialized applications of operational amplifiers.
- Understand the theory of ADC and DAC.
- Realize the importance of Operational Amplifier.

UNIT – I

Differential Amplifiers: Differential amplifier configurations, Balanced and unbalanced output differential amplifiers, current mirror, level Translator.

Operational amplifiers: Introduction, Block diagram, Ideal op-amp, Equivalent Circuit, Voltage Transfer curve, open loop op-amp configurations. Introduction to dual OP-AMP TL082 as a general purpose JFET-input Operational Amplifier.

UNIT-II

Introduction, feedback configurations, voltage series feedback, voltage shunt feedback and differential amplifiers, properties of Practical op-amp.

Frequency response: Introduction, compensating networks, frequency response of internally compensated op-amps and non compensated op-amps, High frequency op-amp equivalent circuit, open loop gain Vs frequency, closed loop frequency response, circuit stability, slew rate.

UNIT-III

DC and AC amplifiers, peaking amplifier, summing, scaling and averaging amplifiers, instrumentation amplifier, voltage to current converter, current to voltage converter, integrator, differentiator, active filters, First, Second and Third order Butterworth filter and its frequency response, Tow-Thomas biquad filter.

UNIT-IV

Oscillators, Phase shift and wein bridge oscillators, Square, triangular and sawtooth wave generators, Comparators, zero crossing detector, Schmitt trigger, characteristics and limitations.

Specialized applications: 555 timer IC (monostable&astable operation) & its applications, PLL, operating principles, Monolithic PLL, applications, analog multiplier and phase detection, Wide bandwidth precision analog multiplier MPY634 and its applications.

UNIT V

Analog and Digital Data Conversions, D/A converter – specifications – weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications – Flash type – Successive Approximation type – Single Slope type – Dual Slope type – A/D Converter using Voltage-to-Time Conversion – Over-sampling A/D Converters,

TEXT BOOKS:

1. D. Roy Chowdhury, “Linear Integrated Circuits”, New Age International (p) Ltd, 2nd Edition, 2003.
2. K.Lal Kishore,“Operational Amplifiers and Linear Integrated Circuits”, Pearson Education,2007.

REFERENCES:

1. Ramakanth A. Gayakwad, “Op-Amps & Linear ICs”, PHI, 4th edition, 1987.
2. R.F.Coughlin& Fredrick Driscoll, “Operational Amplifiers & Linear Integrated Circuits”, 6th Edition, PHI.
3. David A. Bell, “Operational Amplifiers & Linear ICs”, Oxford University Press, 2nd edition, 2010.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem	L	P	C
	3+1*	0	3

DIGITAL SYSTEM DESIGN

Course Outcomes:

- Capable of using Computer-aided design tools to model, simulate, verify, analyze, and synthesize complex digital logic circuits.
- Efficient designing of any Digital System using basic structure ICs .
- Able to design and prototype with standard cell technology and programmable logic.
- Apply design test for digital logic circuits, and design for testability.

UNIT-I

CMOS LOGIC: Introduction to logic families, CMOS logic, CMOS logic families;
BIPOLAR LOGIC AND INTERFACING**:** Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families, Familiarity with standard 74-series and CMOS 40- series-ICs – Specifications.

UNIT-II

HARDWARE DESCRIPTION LANGUAGES: HDL Based Digital Design, The VHDL Hardware Description Language–Program Structure, Types, Constants and Arrays, Functions and procedures, Libraries and Packages, Structural design elements, Dataflow design elements, Behavioral design elements, The Time Dimension, Simulation, Test Benches, VHDL Features for Sequential Logic Design, Synthesis

UNIT-III

COMBINATIONAL LOGIC DESIGN PRACTICES: Description of basic structures like Decoders, Encoders, Comparators, Multiplexers (74 –series MSI); Design of complex Combinational circuits using the basic structures; Designing Using combinational PLDs like PLAs, PALs ,PROMs CMOS PLDs; Adders & sub tractors, ALUs, Combinational multipliers; VHDL models for the above standard building block ICs.

UNIT-IV

SEQUENTIAL MACHINE DESIGN PRACTICES: Review of design of State machines**;** Standard building block ICs for Shift registers, parallel / serial conversion , shift register counters, Ring counters; Johnson counters, LFSR counter ; VHDL models for the above standard building block ICs.Synchronous Design example using standard ICs

UNIT –V

Design Examples (using VHDL): Barrel shifter, comparators, floating-point encoder, and dual parity encoder.

Sequential logic Design: Latches & flip flops, PLDs, counters, shift register and their VHDL models.

Text Books:

1. John F.Wakerly ,"Digital Design Principles and Practices" 4th edition, Pearson Education., 2009
2. Charles H.Roth,Jr., "Fundamentals of Logic Design" 5th edition , CENGAGE Learning 2012.

References:

1. M.Morris Mano and Michael D. Cilleti., "Digital Logic Design" 4th edition Pearson Education., 2013
2. Stephen Brown and ZvonkoVranesic, "Fundamentals of digital logic with VHDL design" 2nd edition McGraw Hill Higher Education.
3. J. Bhasker, "A VHDL PRIMER" 3rd edition Eastern Economy Edition, PHI Learning,2010.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem

	L	P	C
	3+1*	0	3

ANTENNAS & WAVE PROPAGATION

Course Outcomes:

Upon successful completion of the course, students will be able to:

- Approximate parametric equations for the calculation in the farfield region.
- Write parametric integral expressions for a given current source.
- Calculate electromagnetic fields for a given vector potential.
- Discover pattern multiplication principle for array antennas.

UNIT - I

Antenna Basics & Dipole antennas: Introduction, Basic antenna parameters- patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective height, Fields from oscillating dipole, Field Zones, Shape-Impedance considerations, Polarization – Linear, Elliptical, & Circular polarizations, Antenna temperature, Antenna impedance, Front–to-back ratio, Antenna theorems, Radiation – Basic Maxwell's equations, Retarded potential-Helmholtz Theorem, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Field Components, Radiated power, Radiation Resistance, Beam width, Natural current distributions, far fields and patterns of Thin Linear Center-fed Antennas of different lengths, Illustrative problems.

UNIT- II

VHF, UHF and Microwave Antennas - I: Loop Antennas - Introduction, Small Loop, Comparison of far fields of small loop and short dipole, Radiation Resistances and Directives of small and large loops (Qualitative Treatment), Arrays with Parasitic Elements - Yagi - Uda Arrays, Folded Dipoles & their characteristics. Helical Antennas-Helical Geometry, Helix modes, Practical Design considerations for Monofilar Helical Antenna in Axial and Normal Modes. Horn Antennas- Types, Fermat's Principle, Optimum Horns, Design considerations of Pyramidal Horns, Illustrative Problems.

UNIT - III

VHF, UHF and Microwave Antennas - II: Micro strip Antennas- Introduction, features, advantages and limitations, Rectangular patch antennas- Geometry and parameters, characteristics of Micro strip antennas, Impact of different parameters on characteristics, reflector antennas - Introduction, Flat sheet and corner reflectors, parabola reflectors- geometry, pattern characteristics, Feed Methods, Reflector Types - Related Features, Lens Antennas - Geometry of Non-metallic Dielectric Lenses, Zoning , Tolerances, Applications, Illustrative Problems.

UNIT- IV

Antenna Arrays: Point sources - Definition, Patterns, arrays of 2 Isotropic sources- Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison, BSA with Non-uniform Amplitude Distributions - General considerations and Bionomial Arrays, Illustrative problems.

Antenna Measurements: Introduction, Concepts- Reciprocity, Near and Far Fields, Coordination system, sources of errors, Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement , Gain Measurements (by comparison, Absolute and 3-Antenna Methods).

UNIT – V

Wave Propagation: Introduction, Definitions, Characterizations and general classifications, different modes of wave propagation, Ray/Mode concepts, Ground wave propagation (Qualitative treatment) - Introduction, Plane earth reflections, Space and surface waves, wave tilt, curved earth reflections, Space wave propagation - Introduction, field strength variation with distance and height, effect of earth's curvature, absorption, Super refraction, M-curves and duct propagation, scattering phenomena, tropospheric propagation, fading and path loss calculations, Sky wave propagation - Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-HOP propagation, Energy loss in Ionosphere, Summary of Wave Characteristics in different frequency ranges, Illustrative problems.

TEXT BOOKS:

1. John D. Kraus and Ronald J. Marhefka and Ahmad S.Khan, “Antennas and wave propagation,” TMH, New Delhi, 4th Ed., (special Indian Edition), 2010.
2. E.C. Jordan and K.G. Balmain, “Electromagnetic Waves and Radiating Systems,” PHI, 2nd Edn, 2000.

REFERENCES:

1. C.A. Balanis, “Antenna Theory- Analysis and Design,” John Wiley & Sons, 2nd Edn., 2001.
2. K.D. Prasad, SatyaPrakashan, “Antennas and Wave Propagation,” Tech. India Publications, New Delhi, 2001.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem	**L**	**P**	**C**
	3+1*	**0**	**3**

DIGITAL COMMUNICATION SYSTEMS

Course Outcomes:
After the completion of the course, student will be able to:

- Understand the elements of DCS & the fundamentals concepts of sampling theorem along with different coding and modulation techniques
- Understand the basic principles of baseband and passband digital modulation schemes
- Analyze probability of error performance of digital systems and are able to design digital communication systems
- Understand the basics of information theory and error correcting codes.

UNIT – I
Source Coding Systems: Introduction, sampling process, quantization, quantization noise, conditions for optimality of quantizer, encoding, Pulse-Code Modulation (PCM), Line codes, Differential encoding, Regeneration, Decoding & Filtering, Noise considerations in PCM systems, Time-Division Multiplexing (TDM), Synchronization, Delta modulation (DM), Differential PCM (DPCM), Processing gain, Adaptive DPCM (ADPCM), Comparison of the above systems.
UNIT – II
Baseband Pulse Transmission: Introduction, Matched filter, Properties of Matched filter, Matched filter for rectangular pulse, Error rate due to noise, Inter-symbol Interference (ISI), Nyquist's criterion for distortion less baseband binary transmission, ideal Nyquist channel, Raised cosine filter & its spectrum, Correlative coding – Duo binary & Modified duo binary signaling schemes, Partial response signaling, Baseband M-array PAM transmission, Eye diagrams.
UNIT – III
Signal Space Analysis: Introduction, Geometric representation of signals, Gram-Schmidt orthogonalization procedure, Conversion of the Continuous AWGN channel into a vector channel, Coherent detection of signals in noise, Correlation receiver, Equivalence of correlation and Matched filter receivers, Probability of error, Signal constellation diagram.
UNIT - IV
Passband Data Transmission: Introduction, Passband transmission model, Coherent phase-shift keying – binary phase shift keying (BPSK), Quadrature shift keying (QPSK), Binary Frequency shift keying (BFSK), Error probabilities of BPSK, QPSK, BFSK, Generation and detection of Coherent BPSK, QPSK, & BFSK, Power spectra of above mentioned modulated signals,M-array PSK, M-array quadrature amplitude modulation (M-array QAM), Non-coherent orthogonal modulation schemes -

Differential PSK, Binary FSK, Generation and detection of non-coherent BFSK, DPSK, Comparison of power bandwidth requirements for all the above schemes.

UNIT – V

Channel Coding: Error Detection & Correction - Repetition & Parity Check Codes, Interleaving, Code Vectors and Hamming Distance, Forward Error Correction (FEC) Systems, Automatic Retransmission Query (ARQ) Systems, Linear Block Codes – Matrix Representation of Block Codes, Convolutional Codes – Convolutional Encoding, Decoding Methods.

TEXT BOOKS:

1. Simon Hakin, “Communication Systems,” Wiley India Edition, 4th Edition, 2011.
2. B.P. Lathi, &Zhi Ding, “Modern Digital & Analog Communication Systems”, Oxford University Press, International 4th edition, 2010.

REFERENCES:

1. Sam Shanmugam, “Digital and Analog Communication Systems”, John Wiley, 2005.
2. A. Bruce Carlson, & Paul B. Crilly, “Communication Systems – An Introduction to Signals & Noise in Electrical Communication”, McGraw-Hill International Edition, 5th Edition, 2010
3. Bernard Sklar, “Digital Communications”, Prentice-Hall PTR, 2nd edition, 2001.
4. Herbert Taub & Donald L Schilling, “Principles of Communication Systems”, Tata McGraw-Hill, 3rd Edition, 2009.
5. J. G. Proakis, M Salehi, Gerhard Bauch, “Modern Communication Systems Using MATLAB,” CENGAGE, 3rd Edition, 2013.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem	L	P	C
	3+1*	0	3

CONTROL SYSTEMS ENGINEERING

Objective:

In this course it is aimed to introduce to the students the principles and applications of control systems in everyday life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

UNIT – I CONTROL SYSTEMS CONCEPTS

Open Loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback Characteristics, Effects of positive and negative feedback. Mathematical models – Differential equations of Translational and Rotational mechanical systems, and Electrical Systems, Block diagram reduction methods – Signal flow graph - Reduction using Mason's gain formula. Transfer Function of DC Servo motor - AC Servo motor - Synchro transmitter and Receiver

UNIT-II TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional, integral, derivative Controllers, Design of P, PD, PI, PID Controllers.

UNIT – III STABILITY ANALYSIS IN FREQUENCY DOMAIN

The concept of stability – Routh's stability criterion – Stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT – IV FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain margin-Stability Analysis.

Compensation techniques – Lag, Lead, Lead-Lag Compensators design in frequency Domain.

UNIT – V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from Schematic models, differential equations, Transfer function, block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models.

OUTCOME:

After going through this course the student gets a thorough knowledge on open loop and closed loop control systems , concept of feedback in control systems, mathematical modeling and transfer function derivations of translational and rotational systems, Transfer functions of Synchros, AC and DC servo motors, Transfer function representation through block diagram algebra and signal flow graphs, time response analysis of different ordered systems through their characteristic equation and time-domain specifications , stability analysis of control systems in S-domain through R-H criteria and root-locus techniques, frequency response analysis through bode diagrams and State space analysis with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.

TEXT BOOKS:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 5^{th} edition, 2010.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 5^{th} edition, 2007.

REFERENCE BOOKS:

1. Control Systems Engineering - by NISE 5^{th} Edition – John wiley & sons, 2010.
2. Control Systems – by – A. Nagoor Kani- First Edition RBA Publications, 2006.
3. Automatic Control Systems– by B. C. Kuo and Farid Golnaraghi – John wiley and son’s, 8th edition, 2003.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem	**L**	**P**	**C**
	0	**3**	**2**

IC APPLICATIONS LAB

Course Outcomes:

- Design basic application circuits using op-amp.
- Construct and troubleshoot circuits containing linear integrated circuits

*****All experiments are based upon 741 / TL 082/ASLK Kits.***

1. Study the characteristics of negative feedback amplifier
   a) A unity gain amplifier
   b) A non-inverting amplifier with a gain of ’A’
   c) An inverting amplifier with a gain of ‘A’
2. Design of an instrumentation amplifier
3. Study the characteristics of regenerative feedback system with extension to design an astable multivibrator using op-amps and compare the characteristics with 555 Timer
4. Study the characteristics of integrator circuit
5. Design of Analog filters – I
6. Design of Analog filters – II
7. Design of a self-tuned Filter
8. Design of a function generator
9. Design of a Voltage Controlled Oscillator using op-amps and compare the characteristics with LM566
10. Design of a Phase Locked Loop(PLL) using op-amps and compare the characteristics with LM565
11. Design of Automatic Gain Control (AGC) Automatic Volume Control (AVC)
12. Design and test a Low Dropout regulator using op-amps for a given voltage regulation characteristic
13. DC-DC Converter

References:

1. TL082: Data Sheet: http://www.ti.com/lit/ds/symlink/tl082.pdf
Application Note: http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
2. MPY634: Data Sheet: http://www.ti.com/lit/ds/symlink/mpy634.pdf
Application Note: http://www.ti.com/lit/an/sbfa006/sbfa006.pdf
3. ASLK Pro Manual: ASLK Manual

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem	L	P	C
	0	3	2

ANALOG COMMUNICATION SYSTEMS LAB

Course Outcomes:
After completion of the course the students will be able

- To experience real time behavior of different analog modulation schemes
- Technically visualize spectra of different analog modulation schemes
- Analyze practical behavior of different elements available in analog communication system such as filters, amplifiers etc.
- Measure characteristics of radio receiver and antenna measurements.

List of Experiments: (All Experiments are to be conducted)

1. Amplitude modulation and demodulation.
2. Frequency modulation and demodulation.
3. a. Characteristics of Mixer.
   b. Pre-emphasis & de-emphasis.
4. Pulse amplitude modulation & demodulation.
5. Pulse width modulation & demodulation
6. Pulse position modulation & demodulation.
7. Radio receiver measurements – sensitivity selectivity and fidelity.
8. Measurement of half power beam width (HPBW) and gain of a half wave dipole antenna.
9. Measurement of radiation pattern of a loop antenna in principal planes.

Equipment required for the Laboratory:

1. Regulated Power Supply equipments 0 – 30 V
2. CROs 0 – 20 M Hz.
3. Function Generators 0 – 3 M Hz
4. RF Signal Generators 0 – 1000 M Hz
5. Multimeters
6. Required electronic components (active and passive) for the design of experiments from 1 - 7
7. Radio Receiver Demo kits or Trainers.
8. RF power meter frequency range 0 – 1000 MHz
9. Spectrum Analyzer
10. Dipole antennas (2 Nos.) 850 MHz – 1GHz
11. Loop antenna (1 no.) 850 MHz – 1GHz

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem

	L	P	C
	3+1*	0	3

COMPUTER ORGANIZATION

Course Outcomes:

- Identify functional units, bus structure and addressing modes
- Design the hardwired and micro-programmed control units.
- Design Arithmetic Logic Unit.
- Understand pipelined execution and instruction scheduling

UNIT-I

Computer types, Functional units, basic operational concepts, Bus structures, Data types, Software: Languages and Translators, Loaders, Linkers, Operating systems.

Memory locations – addresses and encoding of information – main memory operations – Instruction formats and instruction sequences – Addressing modes and instructions – Simple input programming – pushdown stacks – subroutines.

UNIT-II

Register transfer Language, Register transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, shift Micro operations, Arithmetic Logic Shift Unit.

Stack organization, instruction formats, Addressing modes, Data transfer and manipulation, Execution of a complete instruction, Sequencing of control signals, Program Control.

UNIT-III

Control Memory, address Sequencing, Micro Program Example, Design of Control Unit.

Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating Point Arithmetic Operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations.

UNIT-IV

Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication.

Memory hierarchy, main memory, auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory management hardware.

UNIT-V

Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.

Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence.

Text Books:

1. M. Morris Mano, “Computer system Architecture”, Prentice Hall of India (PHI), Third edition.
2. William Stallings,“Computer organization and programming”, Prentice Hall of India(PHI) Seventh Edition, Pearson Education(PE) Third edition, 2006.

Reference Books:

1. Carl Hamacher, ZvonksVranesic, SafwatZaky, “Computer Organization” 5th Edition, McGraw Hill, 2002.
2. Andrew S.Tanenbaum, “Structured Computer Organization”, 4th Edition PHI/Pearson
3. John L.Hennessy and David A.Patterson, “Computer Architecture a quantitative approach”, Fourth Edition Elsevier
4. josephD.Dumas II, “Computer Architecture: Fundamentals and Principals of Computer Desigb”, BS Publication.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	L	P	C
	4+1*	0	4

MICROPROCESSORS AND MICROCONTROLLERS

Course Outcomes:

- Understand the Internal organization of some popular microprocessors/microcontrollers.
- Able to learn hardware and software interaction and integration.
- Understand concept of interfacing of peripheral devices and their applications.
- Design a microprocessors/microcontrollers-based systems.
- Recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system.

UNIT-I

Overview of 8085 Micro Processors, 8086 Over View-Internal Architecture- Register Organization, Memory Segmentation, Flag Register, Pin Configuration, Physical Memory Organization, General Bus Operation- Minimum and Maximum Mode Signals, Timing Diagrams - Interrupts Of 8086.

UNIT-II

Instruction Formats of 8086 -Addressing Modes-Instruction Set, Assembler Directives-Macros, Programs Involving Logical, Branch Instructions – Sorting and Evaluating Arithmetic Expressions - String Manipulations-Simple ALPs.

UNIT-III

Introduction, Memory and I/O interfacing, data transfer schemes, programmable peripheral interface (8255), programmable DMA controller (8257, 8237A), programmable interrupt controller (8259), programmable communication interface (8251), programmable counter/interval timer (8253 and 8254), special purpose interfacing devices, elements and circuits for interfacing.

UNIT-IV

Introduction toMicro Controllers 8051, 8096/97, Architecture, Registers, Pin Description, Connections, I/O Ports, Memory Organization, Addressing Modes, Instruction Set

UNIT-V

Assembly directives, Simple assembly software programs, Interfacing with keyboards, LEDs, 7 segment LEDs, LCDs, Interfacing with ADCs, Interfacing with DACs.

TEXT BOOKS:

1. A.K.Ray and Bhurchandi, “Advanced Microprocessors and Peripherals”, 2nd Edition, TMH Publications.
2. Ajay V. Deshmukh, “Microcontrollers, Theory and applications”, Tata McGraw-Hill Companies – 2005

REFERENCE BOOKS:

1. Douglas V.Hall, “Microprocessors and Interfacing”, 2nd Revised Edition, TMH Publications.
2. Liu & Gibson, “Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design”, 2nd ed., PHI
3. Kenneth j.Ayala, Thomson, “The 8051 Microcontrollers”, Asia Pte.Ltd
4. Krishna Kant, “Microprocessors and Microcontrollers”, PHI Publishers

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	**L**	**P**	**C**
	3+1*	**0**	**3**

DIGITAL SIGNAL PROCESSING

Course Outcomes:
At the end of the course, the student should be able to:

- Formulate engineering problems in terms of DSP tasks.
- Apply engineering problems solving strategies to DSP problems.
- Design and test DSP algorithms.
- Analyze digital and analog signals and systems.
- Encode information into signals.
- Design digital signal processing algorithms.
- Design and simulate digital filters.
- Analyze and compare different signal processing strategies.

UNIT-I
Review of discrete-time signals and systems – Time domain analysis of discrete-time signals & systems, Frequency domain analysis of discrete-time signals and systems.
Discrete Fourier Transform: Frequency-domain sampling and reconstruction of discrete-time signals, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT, Linear filtering methods based on DFT, Frequency analysis of signals using the DFT.

UNIT-II
Efficient computation of the DFT – Direct computation of DFT, Divide and conquer approach to computation of DFT, Radix-2, Radix-4, and Split radix FFT algorithms, Implementation of FFT algorithms, Applications of FFT algorithms – Efficient computation of the DFT of two real sequences, 2N point real sequences, Use of the FFT algorithm in linear filtering and correlation, A linear filtering approach to computation of the DFT- the Goertzel, and the Chirp-z transform algorithms, Quantization errors in the computation of DFT.

UNIT-III
Structures for the realization of discrete-time systems, Structures for FIR systems - Direct form, Cascade form, Frequency sampling, and Lattice structures, Structures for IIR systems – Direct form, Signal flow graphs & Transposed, Cascade form, Parallel form and Lattice structures, Conversion from Lattice structure to direct form, lattice –Ladder structure.

UNIT-IV

General considerations – Causality and its implications, Characteristics of practical Frequency Selective Filters, Design of Finite Impulse Response (FIR) filters – Symmetric and asymmetric FIR filters, Design of linear phase FIR filters using windows, Design of linear phase FIR filters by the frequency sampling method, Design of optimum equi-ripple linear phase FIR filters, Comparison of design methods for linear phase FIR filters, Design of Impulse Invariance Response (IIR) filters from analog filters – IIR filter design by approximation of derivatives, by Impulse invariance, and by bilinear transformation methods, Characteristics of commonly used analog filters, Design examples of both FIR and IIR filters, Frequency transformation in the analog and digital domains, Illustrative problems.

UNIT-V

Introduction, Decimation, and interpolation, Sampling rate conversion by a rational factor, Implementation of sampling rate conversion, Multistage implementation of sampling rate conversion, Sampling rate conversion of bandpass signals, Sampling rate conversion by arbitrary factor, Applications of multirate signal processing.

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications," Pearson Education/PHI, 4th ed., 2007.
2. Sanjit K Mitra, "Digital signal processing, A computer base approach," Tata McGraw Hill, 3rd edition, 2009.

REFERENCES:

1. A.V.Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2nd ed., Pearson Education, 2012.
2. B. P. Lathi, "Principles of Signal Processing and Linear Systems," Oxford Univ. Press, 2011.
3. Li Tan, Jean Jiang, "Digital Signal Processing, Fundamentals and Applications," Academic Press, Second Edition, 2013.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	L	P	C
	3+1*	0	3

MICROWAVE AND RADAR ENGINEERING

Course Outcomes:

- To become familiar with fundamentals of radar.
- To gain in knowledge about the different types of radar and their operation.
- Need for signal detection in radar and various radar signal detection techniques.
- Will demonstrate the ability to design a system component or process as per needs & specifications.
- Will demonstrate the ability to identify, formulate & solve engineering problems.
- Will show the ability to participate and try to succeed in competitive examination

UNIT-I

Waveguides: Introduction, Microwave spectrum and bands, applications of Microwaves, Rectangular Waveguides-Solution of Wave Equation in Rectangular Coordinates, TE/TM mode analysis, Expressions for fields, Cutoff frequencies, filter characteristics, dominant and degenerate modes, sketches of TE and TM mode fields in the cross-section, Mode characteristics - Phase and Group velocities, wavelengths and impedance relations, Illustrative Problems.

UNIT-II

Waveguide Components: Scattering Matrix - Significance, Formulation and properties, Coupling mechanisms - Probe, Loop, Aperture types, Wave guide discontinuities - waveguide Windows, tuning screws and posts, matched loads, Waveguide attenuators - Resistive card, rotary vane Attenuators, waveguide phase shifters-dielectric, rotary vane phase shifters, Wave guide multiport junctions - E plane and H plane Tees, Magic Tee, Directional couplers-2 hole,

Bothe hole types, Ferrites-composition and characteristics, Faraday rotation, Ferrite components - Gyrator, Isolator, Circulator, S Matrix calculations for 2-port junction, E plane and H plane Tees, Magic Tee, Directional coupler, circulator and Isolator, Illustrative Problems.

UNIT-III

Micro Wave Tubes: Limitations and losses of conventional tubes at microwave frequencies, Classification of Microwave tubes, O type tubes - 2 cavity klystrons-structure, Reentrant cavities, velocity modulation process and Applegate diagram, bunching process and small signal theory-Expressions for o/p power and efficiency, Reflex Klystrons-structure, Velocity Modulation, Applegate diagram, power output, efficiency, oscillating modes and o/p characteristics, Magnetrons-different types, cylindrical travelling wave magnetron-Hull cutoff and Hartree conditions, modes of resonance and PI-mode operation, Microwave semiconductor devices, classification, applications, Transfer Electronic Devices, Gunn diode - principles, RWH theory, Characteristics, Basic modes of operation - Gunn oscillation modes, LSA Mode, Illustrative Problems.

UNIT - IV

Nature of Radar and Radar equation – Simple form of Radar equation – Radar block diagram and operation, Radar frequencies, Applications of Radar.

Minimum Detectable signal – Receiver noise, Probability – Density functions, signal – to – noise ratio, Radar cross section of targets, cross-section fluctuations system losses.

UNIT–V

Radar systems: CW radar, frequency-modulates CW radar, multiple - Frequency CW radar. MTI radar – Delay line cancellers, Pulse repetition frequencies, Range-gated Doppler filters tracking radar – Range and angle tracking sequential lobing and conical scanning.

Text Books:

1. Herbert J. Reich, J. G. Skalnik, P. F. Ordung and H. L. Krauss, "Microwave principles," CBS publishers and distributors, New Delhi, 2004.
2. M.I.Skolnik,"Introduction to radar systems", 2nd edition, TMH 1980.

References:

1. Samuel Y. Liao, "Microwave devices and circuits," Pearson, 3rd Edition, 2003.
2. R. E. Collin, "Foundations for microwave engineering," IEEE press, John Wiley, 2nd Edition, 2002.
3. Om. P. Gandhi, "Microwave Engineering and Applications," Pergamon, 1981.
4. David M. Pozer, "Microwave Engineering," Wiley India Pvt. Ltd., 3rd Edition, 2010.
5. G.M.Miller, "Modern electronic communication", Prentice Hall,6th Edition, 1999.
6. Kennedy & Davis, "Electronic communication systems",McGraw Hill, 4th Edition, 1993.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	L	P	C
	3+1*	0	3

VLSI DESIGN

Course Outcomes:

- Complete Knowledge about Fabrication process of ICs
- Able to design VLSIcircuits as per specifications given.
- Capable of optimizing the design of Arithmetic / logic building Blocks at all levels of Design/Fabrication.
- Can implement circuit through various design styles (semi- Custom, Full Custom)

UNIT-I

Introduction: Basic steps of IC fabrication, PMOS, NMOS, CMOS &BiCMOS , SOI process technologies , MOS transistors - MOS transistor switches – Basic gate using switches, working polar transistor Resistors and Capacitors.

Basic Electrical Properties of MOS and BiCMOS Circuits: Working of MOS transistors – threshold voltage; MOS design equations: $\mathbf{I_{ds}}$–$\mathbf{V_{ds}}$ relationships, Threshold Voltage, Body effect, Channel length modulation , $\mathbf{g_m}$, $\mathbf{g_{ds}}$, figure of merit $\boldsymbol{\omega_0}$; Pass transistor, NMOS Inverter, CMOS Inverter analysis and design, Various pull ups loads, Bi-CMOS Inverters.

UNIT-II

Basic Circuit Concepts: Capacitance, resistance estimations- Sheet Resistance $R_{s,}$ MOSDivice Capacitances, routing Capacitance, Analytic Inverter Delays, Driving large Capacitive Loads, Fan-in and fan-out.

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2µm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT-III

Gate level Design: Logic gates and other complex gates, Switch logic, Alternate gate circuits.

Physical Design: Floor-Planning, Placement, routing, Power delay estimation, Clock and Power routing

UNIT-IV

Subsystem Design: Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Counters, High Density Memory Elements.

VLSI Design styles: Full-custom, Standard Cells, Gate-arrays, FPGAs, CPLDs and Design Approach for Full-custom and Semi-custom devices.

UNIT-V

VHDL Synthesis: VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools.

Test and Testability: Fault-modeling and simulation, test generation, design for testability, Built-in-self-test.

TEXT BOOKS:

1. Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, “Essentials of VLSI circuits and systems”, PHI, 2013 Edition.
2. K.Lal Kishore and V.S.V. Prabhakar, “VLSI Design”, IK Publishers

REFERENCES:

1. Weste and Eshraghian, “Principles of CMOS VLSI Design”, Pearson Education, 1999.
2. Wayne Wolf, “Modern VLSI Design”, Pearson Education, 3rd Edition, 1997.
3. John P. Uyemura, “Chip Design for Submicron VLSI: CMOS layout and Simulation”, Thomson Learning.
4. John P. Uyemura, “Introduction to VLSI Circuits and Systems”, John wiley, 2003.
5. John M. Rabaey, “Digital Integrated Circuits”, PHI, EEE, 1997.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	**L**	**P**	**C**
	0	**3**	**2**

DIGITAL COMMUNICATIONS SYSTEMS LAB

Course Outcomes:

- After completion of the course the students will be able to experience real time behavior of different digital modulation schemes and technically visualize spectra of different digital modulation schemes

Minimum of Ten experiments to be conducted (Five from each Part-A&B)

HARDWARE EXPERIMENTS (PART – A)

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Differential phase shift keying.
7. QPSK modulation and demodulation.

SOFTWARE EXPERIMENTS (PART-B)

Modeling of Digital Communications using MATLAB

1. Sampling Theorem – verification.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Frequency shift keying.
5. Phase shift keying.
6. Differential phase shift keying.
7. QPSK modulation and demodulation.

Equipment required for Laboratories:

1. RPS - 0 – 30 V
2. CROs - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. RF Generators (3 Nos.) - 0 – 1000 M Hz.
5. Multimeters
6. Lab Experimental kit for Pulse Code Modulation (Experiment No.3 of part – A)
7. Required Electronic Components (Active and Passive) which include required ICs
8. Arbitrary Wave form generators/ PNS generators – 2 Nos. (to generate digital data at required data rates)
9. Licensed MATLAB software for 30 users with required tool boxes.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	L	P	C
	0	3	2

MICROPROCESSORS AND MICROCONTROLLERS LAB

Course Outcome:

- Execution of different programs for 8086 in Assembly Level Language using MASM Assembler .
- Interfacing various I/O Devices like stepper motor, key board, ADC and DAC to 8086.
- Execution of different program s in 8051. Etc they will learn assembly language

Cycle 1: Using 8086 Processor Kits and/or Assembler (5 Weeks)

- Assembly Language Programs to 8086 to Perform
  1. Arithmetic, Logical, String Operations on 16 Bit and 32 Bit Data.
  2. Bit level Logical Operations, Rotate, Shift, Swap and Branch Operations.

Cycle 2: Using 8051 Microcontroller Kit (6 weeks)

- Introduction to Keil IDE

  1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
  2. Time delay Generation Using Timers of 8051.
  3. Serial Communication from / to 8051 to / from I/o devices.
  4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 Using Timer0 8051 in 8bit Auto reload Mode and Connect a 1HZ Pulse to INT1 pin and Display on Port0.Assume Crystal Frequency as 11.0592MHZ

Cycle 3: Interfacing I/O Devices to 8051(5 Weeks)

1. 7 Segment Display to 8051.
2. Matrix Keypad to 8051.
3. Sequence Generator Using Serial Interface in 8051.
4. 8bit ADC Interface to 8051.
5. Triangular Wave Generator through DAC interfaces to 8051.

BOOKS:

1. A K Ray, "Advanced Microprocessors And Peripherals", Tata McGraw-Hill Education, 2006
2. Dr. K. Uma Rao, "The 8051 ***Microcontrollers***: Architecture, Programming & Applications".

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	**L**	**P**	**C**
	0	**3**	**2**

DIGITAL SIGNAL PROCESSING LAB

Course Outcomes:

- Able to design real time DSP systems and real world applications.
- Able to implement DSP algorithms using both fixed and floating point processors.

List of Experiments: (Minimum of 5 experiments are to be conducted from each part)
Software Experiments (PART – A)

1. Generation of random signal and plot the same as a waveform showing all the specifications.
2. Finding Power and (or) Energy of a given signal.
3. Convolution and Correlation (auto and cross correlation) of discrete sequences without using built in functions for convolution and correlation operations.
4. DTFT of a given signal
5. N – point FFT algorithm
6. Design of FIR filter using windowing technique and verify the frequency response of the filter.
7. Design of IIR filter using any of the available methods and verify the frequency response of the filter.
8. Design of analog filters.

Using DSP Processor kits (Floating point) and Code Composure Studio (CCS) (PART – B)

1. Generation of random signal and plot the same as a waveform showing all the specifications.
2. Finding Power and (or) Energy of a given signal.
3. Convolution and Correlation (auto and cross correlation) of discrete sequences without using built in functions for convolution and correlation operations.
4. DTFT of a given signal
5. N – point FFT algorithm
6. Design of FIR filter using windowing technique and verify the frequency response of the filter.
7. Design of IIR filter using any of the available methods and verify the frequency response of the filter.
8. Design of analog filters.

Equipment/Software Required:

1. Licensed MATLAB software with required tool boxes for 30 users.
2. DSP floating Processor Kits with Code Composure Studio (8 nos.)
3. Function generators
4. CROs
5. Regulated Power Supplies.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem

	L	P	C
	0	3	0

ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

1. Introduction:

In the past engineering education has focused only on imparting "hard" or technical skills. With the entry of multinational companies in India there is a revolutionary change in the employment opportunities and recruitment process as well. Globalization demands universities to produce engineers who are equipped with effective interpersonal skills to meet global demands.

In this scenario the **Advanced English Language Communication skills lab** introduced at the 3rd B. Tech. level plays a key role to learn the foreign language in a happy atmosphere and in a successful way. Breaking through the traditional method of teaching, this course motivates student's learning attitude by providing an interactive learning environment.

This course is developed on the methodology of LSRW skills along with soft skills. This course focuses on the practical aspects of listening, speaking, reading and writing that enable the students to expose to various activities like group discussions, Oral Presentations, Mock interview sessions etc., Personality development, etiquettes and to provide corporate knowledge to help the students in facing interviews in a formal organizational set up.

2. Objectives:

This lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

- To expose the students to a variety of self instructional, learner-friendly modes of language learning.
- To enable the students to learn better pronunciation and accent through listening and reading exercises.
- To train students to use language appropriately for interviews, group discussion and public speaking.
- To initiate them to greater use of the computer in resume preparation, format-making etc.
- To help the students to cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer based competitive exams such as GRE, TOFEL, and GMAT etc.
- To enable the students to acquire good communication skills as well as soft skills to meet global demands.

3 **Syllabus:**

The following course content is prescribed for the Advanced Communication Skills Lab:

Unit I:

Reading &Listening Comprehension: Skimming –scanning- Extensive and Intensive reading. Reading for making inferences. Active VS passive listening. Listening and Note taking, Listening for making inferences.

Unit II:

Writing Skills: Formal and informal writing- Resume Writing-E-Correspondence.

.

Unit III:

Technical Presentations (Oral) : Planning-Preparation-Presentation . Art of Persuasion- Audience analysis- Handling questions.

.

Unit IV:

Interview Skills: Types of Interviews - pre-interview planning- answering strategies. Analysis of One to one –interviews – group interviews - Mock interviews.

Unit V:

Soft Skills: Inter Personal Skills- Goal setting – Etiquettes and good manners – Team Working – Work Ethics--Time management – Problem Solving.

.

Minimum Requirements

The English Language Lab shall have two parts:

The Computer Aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.
The Communication Skills Lab with movable chairs and audio-visual aids with a PA System, a TV, a digital stereo-audio and video system, a Camcorder, etc

System Requirement (Hardware Component):
Computer network with LAN with a minimum of 60 multimedia systems with the following specifications:

P-IV Processor
Speed-2.8 GHZ
RAM_512 MB minimum
Hard Disk-80 GB
Headphones

Prescribed Software:

1. **K-Van Advanced Communication Skills**
2. **Walden Infotech Advanced Communication Skills.**

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. **Technical Writing and Professional Communication, Huckin and Olsen** Tata Mc Graw-Hil 2009.
2. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.

3. **Cambridge English for Job-Hunting** by Colm Downes, Cambridge University Press, 2008
4. **Resume's and Interviews** by M.Ashraf Rizvi, Tata Mc Graw-Hill, 2008
5.. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
6. **Managing Soft Skills** by K R Lakshminarayan and T.Muruguvel, Sci-Tech Publications, 2010
7. **The ACE of Soft Skills** by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010
8. **Soft Skills** by Dr. K. Alex, S.Chand
9. **Study Skills for Professional Students in Higher Education** by Dr. M. Adithan, S.Chand.
10. **Personality Development and Soft Skills by Barun** K. Mitra, Oxford Higher Education.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem	L	P	C
	3+1*	0	3

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Course Outcomes:

After the completion of the course the students will be able to

- Understand basic principles involved in the meters for measuring voltage, current, resistance, frequency and so on.
- Employ CRO for measuring voltage, current, resistance, frequency and so on.
- Understand principles of measurements associated with different bridges.
- Get complete knowledge regarding working of advanced instruments such as logic analyzers and spectrum analyzers.

UNIT-I

Performance characteristics of Instruments: Static characteristics, Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC ammeters, DC voltmeters-multirange, range extension/solid state and differential voltmeters, AC voltmeters – multirange, range extension. Thermocouple type RF ammeter, ohm meters, series type, shunt type, multimeter for voltage, current and resistance measurements.

UNIT-II

Oscilloscopes: Standard specifications of CRO,CRT features, derivation of deflection sensitivity, vertical and horizontal amplifiers, horizontal and vertical deflection systems, sweep trigger pulse, delay line, sync selector circuits, probes for CRO – active, passive, and attenuator type, triggered sweep CRO, and Delayed sweep, dual trace/beam CRO, Measurement of amplitude, frequency and phase (Lissajous method).Principles of sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Digital frequency counters, time & Period measurements.

UNIT-III

Signal generators-fixed and variable, AF oscillators, function generators, pulse, random noise, sweep, and arbitrary waveform generators, their standards, specifications and principles of working (Block diagram approach).Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers.

UNIT-IV

Review of DC Bridges: Wheatstone bridge, Wein Bridge, errors and precautions in using bridges, AC bridges: Measurement of inductance-Maxwell’s bridge, Anderson Bridge. Measurement of capacitance- Schearing Bridge. Kelvin Bridge, Q-meter, EMI and EMC, Interference and noise reduction techniques.

UNIT-V

Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples, and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

TEXT BOOKS:

1. A.D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 5th Edition, 2002.
2. H.S.Kalsi, "Electronic instrumentation", second edition, Tata McGraw Hill, 2004.
3. K. Lal Kishore, "Electronic Measurements & Instrumentations", Pearson Education, 2009.

REFERENCES:

1. H.S.Kalsi, "Electronic instrumentation", second edition, Tata McGraw Hill, 2004.
2. Ernest O Doebelin and Dhanesh N Manik, "Measurement Systems Application and Design", TMH, 5th Edition, 2009.
3. Oliver and Cage, "Electronic Measurement and Instrumentation", TMH.
4. Robert A.Witte, "Electronic Test Instruments, Analog and Digital Measurements", Pearson Education, 2nd Ed., 2004.
5. David A. Bell, "Electronic Instrumentation & Measurements", PHI, 2nd Edition, 2003.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem	L	P	C
	3+1*	0	3

OPTICAL FIBRE COMMUNICATION

Course Outcomes:

- Analyze the performance of both digital and analog optical fiber systems
- Calculate the system bandwidth, noise, probability of error and maximum usable bit rate of a digital fiber system
- Calculate the system link loss, distortion and dynamic range of an RF photonic link
- To perform characteristics of fiber sources and detectors, design as well as conduct experiment in soft ware and hardware , and analyze the results to provide valid conclusions.
- To learn the various optical source materials, LED structure, quantum efficiency, laser diodes.

UNIT-I

Introduction to Optical Fibers: Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes –Single Mode Fibers-Graded Index fiber structure.

UNIT-II

Signal Degradation Optical Fibers: Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides - Information Capacity determination –Group Delay- Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT-III

Fiber Optical Sources and Coupling : Direct and indirect Band gap materials-LED structures –Light source materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition –Rate equations –External Quantum efficiency –Resonant frequencies –Temperature effects, Introduction to Quantum laser, source-to-fiber Power Launching, Lensing schemes, Fiber –to- Fiber joints, Fiber splicing.

UNIT-IV

Fiber Optical Receivers : PIN and APD diodes –Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise –Comparison of Photo detectors –Fundamental Receiver Operation –preamplifiers, Error Sources –Receiver Configuration –Probability of Error – Quantum Limit.

UNIT-V

System Design and Applications : Design of Analog Systems: system specification, power budget, bandwidth budget

Design of Digital Systems: system specification, rise time budget, power budget, Receiver sensitivity.

Text Books:

1. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International, Singapore, 3rd ed., 2000.
2. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.

References:

1. Max Ming-Kang Liu, "Principles and Applications of Optical Communications", TMH, 2010.
2. S.C.Gupta, "Text book on optical fiber communication and its applications", PHI, 2005.
3. Satish Kumar, "Fundamentals of Optical Fiber communications", PHI, 2009.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem	L	P	C
	3+1*	0	3

EMBEDDED SYSTEMS

Course Outcomes:

- Able to understand the fundamental concepts of embedded systems.
- Able to learn the architecture of Advanced ARM microcontrollers.
- Able to learn the architecture of Advanced MSP430 microcontrollers.
- Able to learn various programming techniques and interfacing using ARM and MSP430.

UNIT I

Embedded system overview, applications, features and architecture considerations - ROM, RAM, timers, data and address bus, I/O interfacing concepts, memory mapped I/O. CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture. Low power RISC MSP430 – block diagram, features and architecture, Instruction set, instruction formats, and various addressing modes of 16-bit microcontroller e.g. MSP430, Variants of the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x and their targeted applications, Sample embedded system on MSP430 microcontroller.

UNIT-II

MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. I/O ports pull up/down registers concepts, Interrupts and interrupt programming. Watchdog timer. System clocks. Low Power aspects of MSP430: low power modes, Active vs Standby current consumption, FRAM vs Flash for low power & reliability.

UNIT-III

Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

Case Study: MSP430 based embedded system application using ADC & PWM demonstrating peripheral intelligence. “Remote Controller of Air Conditioner Using MSP430”.

UNIT-IV

Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices.

Case Study: MSP430 based embedded system application using the interface protocols for communication with external devices: “A Low-Power Battery less Wireless Temperature and Humidity Sensor with Passive Low Frequency RFID”

UNIT-V
IoT overview and architecture, Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications, Building IoT applications using CC3100 user API for connecting sensors.
Case Study: MSP430 based Embedded Networking Application: "Implementing Wi-Fi Connectivity in a Smart Electric Meter"

Text Books:
1. MSP430 microcontroller basics 1st Edition by John H. Davies (Author), Newnes Publication ISBN-13: 978-0750682763
2. Gettingstarted with the MSP430 Launchpad by Adrian Fernandez, Dung Dang, Newness publication ISBN-13: 978-0124115880
3. Embedded Systems 2E Raj Kamal, Tata McGraw-Hill Education, 2011 ISBN-0070667640, 9780070667648

References:
1. http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode
2.http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra-Low_Power_MCU_Training
3.CC3100/CC3200 SimpleLink™ Wi-Fi® Internet-on-a-Chip User Guide Texas Instruments Literature Number: SWRU368A April 2014–Revised August 2015

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem	L	P	C
	3+1*	0	3

DIGITAL IMAGE PROCESSING

Course Outcomes:

- Able to apply the Image processing concept for various fields of engineering and real lifeto process as per needs &specifications.
- Get the skills to Heuristically develop new techniques to process images of any context
- Can experiment, analyze & interpret imagedata /processing data .

UNIT–I

Introduction to Digital Image processing – Example fields of its usage- Image sensing and Acquisition – image Modeling - Sampling , Quantization and Digital Image representation - Basic relationships between pixels, - Mathematical tools/ operations applied on images - imaging geometry.

UNIT–II

2D Orthogonal and Unitary Transforms and their properties - Fast Algorithms - Discrete Fourier Transform - Discrete Cosine Transforms- Walsh- Hadamard Transforms- Hoteling Transforms , Comparison of properties of the above.

UNIT–III

Background enhancement by point processing Histogram processing, Spatial filtering, Enhancement in frequency Domain, Image smoothing, Image sharpening, Colour image Enhancement

UNIT–IV

Degradation model, Algebraic approach to restoration – Inverse filtering – Least Mean Square filters, Constrained Least square restoration. Blind Deconvolution

Image segmentation:Edge detection -,Edge linking , Threshold based segmentation methods – Region based Approaches - Template matching –use of motion in segmentation

UNIT–V

Redundancies in Images - Compression models, Information theoretic perspective- Fundamental coding theorem. Huffman Coding, Arithmetic coding, Bit plane coding, Run length coding, Transform coding, Image Formats and compression standards.

Text Books:

1. R.C .Gonzalez & R.E. Woods, “Digital Image Processing”, Addison Wesley/Pearson education, 3rd Edition, 2010.
2. A .K. Jain, “Fundamentals of Digital Image processing”, PHI.

References:

1. Rafael C. Gonzalez, Richard E woods and Steven L.Eddins, “Digital Image processing using MATLAB”, Tata McGraw Hill, 2010.
2. S jayaraman, S Esakkirajan, T Veerakumar, “Digital Image processing”,Tata McGraw Hill
3. William K. Pratt, “Digital Image Processing”, John Wilely, 3rd Edition, 2004.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem	**L**	**P**	**C**
	3+1*	**0**	**3**

CONCEPTS OF COMMUNICATION SYSTEMS

Course Outcome:

After the completion of the course the students will be able to

- Understand principles involved in different types of communication systems.
- Know the importance of modulation and demodulation in communications.
- Gets clear knowledge regarding functioning of advanced communication systems like Cellular Communications, Optical Communications, Data Communications.

UNIT I

Introduction to Communications systems: Communications – General Block Diagram-Information, Transmitter, Receiver, Noise – External Noise, Internal Noise, Simple Noise Calculations, Noise Figure, Noise Temperature, Modulation- Description, Need for Modulation, Amplitude Modulation-AM theory- Frequency spectrum of AM wave, Representation of AM. FM theory- Description of system, Representation of FM, Frequency spectrum of FM wave, Brief description of other Modulation schemes – DSB, SSB, PM.

UNIT II

RF TRANSMITTERS & RECEIVERS

Transmitters: AM Transmitters, SSB Transmitters, FM Transmitters

Receivers: Tuned Radio Frequency (TRF) Receiver, Super Heterodyne Receiver, AM Receivers – RF Selection and Characteristics, Frequency Changing and Tracking, Intermediate Frequencies and IF Amplifiers, Detection and Automatic Gain Control (AGC), FM Receivers – Common circuits in comparison with AM receivers, Amplitude limiting, Basic FM Demodulators.

UNIT III

Pulse Analog Modulation Techniques: Sampling Theorem, Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM).Digital Modulation schemes: Pulse Code Modulation (PCM), Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Quadrature Phase Shift Keying (QPSK) - Modulations and Demodulations.

Multiplexing: Frequency Division Multiplexing (FDM) &Time Division Multiplexing (TDM).

UNIT IV

Optical Communication Systems – Block Diagram, Optical Fiber Types, Light Propagation, Optical Fiber Configurations, Optical Fiber Classifications, Losses in Fiber cables, Optical Sources, Detectors.

Data Communications – Introduction to data Communications, Data Communication Network Architecture, Protocols, Standards, Data Communication Circuits – DTE, DCE, LCU, UART, USRT, Data communication Codes, Error Detection & Correction, Serial Interface Standard – RS-232.

UNIT V

Cellular Telephone Concepts - Evolution of Cellular Telephone, Fundamental concepts of cellular telephone, Frequency reuse, interface, cell splitting and sectoring, Roaming and Hand off's, Cellular Telephone call processing, Multiple Access Techniques – FDMA, TDMA, CDMA, Cellular Telephone Systems - 1st Generation, 2nd Generation – GSM, GSM System Architecture, GSM Standards, 3rd Generation Communication System – WCDMA, cdma – 2000.

Text Books:

1. Kennedy and Davis, "Electronic &Communication Systems", TMH, 4th edition, 2004.
2. Wayne Tomasi, "Advanced Electronic Communication Systems", 6th Edition, PHI, 2010.

Reference Books:

1. B.P Lathi, "Modern Digital and Analog Communication Systems", 3rd edition Oxford, 2000.
2. T. S. Rappaport, "Wireless Communications – Principles and Practice," PHI, 2001.
3. B. A.Forouzan, "Data Communication and Computer Networking", 3rd ed., TMH, 2008.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem	L	P	C
	3+1*	0	3

NEURAL NETWORKS & FUZZY LOGIC

Course Outcome:

After completion of the course the students will be able to

- Get an overview of different types of neural network models.
- Understand the functioning of single; multi layer feed forward neural networks, associative memories and their rules and algorithms.
- Understand about fundamentals of fuzzy logic, their rules and applications.

UNIT I

Introduction to Neural Networks: Biological neuron, McCulloh-pitts neuron model, Neuron Modelling for Artificial Neural Systems, Models of Artificial Neural Networks-feedforward and feedback networks, Neural Processing, Learning as approximation, Supervised and unsupervised learning, Neural Network Learning rules- Hebbian, Perceptron, Delta, Widrow-Hoff, Correlation, Winner-Take-All learning rules.

UNIT II

Single-Layer Neural Networks: Classification Model, Features and Decision Regions, Discriminant Functions, Linear Machine and Minimum Distance Classification, Training and Classification using Discrete Perceptron, Single-Layer Continuous Perceptron Networks, Multicategory Single-Layer Perceptron Networks, Hopfield Network – Discrete-time, Gradient type.

Multi-Layer Neural Networks: Linearly Nonseparable Pattern Classification, Delta Learning Rule for Multiperceptron Layer, Generalized Delta Learning Rule, Feed forward Recall and Error Back-propagation training, Learning Factors.

UNIT III

Associative Memories: Basic concepts, Linear Associator, Recurrent Autoassociate Memory, Performance Analysis of Recurrent Autoassociate Memory, Bidirectional Associate Memory(BAM): Memory Architecture, Association Encoding and Decoding, Stability Considerations, Memory Example and Performance Evaluation, Improved coding of memories, Multidirectional Associative Memory, Associative Memory of Spatio-Temporal Patterns.

UNIT IV

Fuzzy Set– Introduction: Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

UNIT V

Fuzzy Logic - Fuzzy Membership, Rules: Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

Text Books:

1. JacekM.Zurada,” Introdution to Artificial Neural Systems”,West Publishing Company
2. Timothy J.Ross, “ Euzzy Logic with Engineering Applications”, Wiley Indian 3rd Edition

Reference Books:

1. George J.Klir/Bo Yuan, “Fuzzy Sets and Fuzzy Logic : Theory and apllications”, Prentice-Hall Edition
2. S.N.Sivanandam, S.Sumathi, S.N.Deepa, “Introduction to Neural Networks using MATLAB 6.0”, TMH, 2006.
3. S.N.Sivanandam, S.Sumathi, S.N.Deepa, “Introduction to Fuzzy Logic using MATLAB 6.0”, TMH, 2006
4. Simon Haykins, “Neural Networks”, Pearson Education.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem	L	P	C
	3+1*	0	3

INDUSTRIAL ELECTRONICS

Course Outcome:

After completion of the course the students will be able to

- Get an overview of semi-conductor devices (such as PN junction diode & Transistor) and their switching characteristics.
- Understand the characteristics of AC to DC converters.
- Understand about the practical applications Electronics in industries.

UNIT I

Scope of industrial Electronics, Semiconductors, Merits of semiconductors, crystalline structure, Intrinsic semiconductors, Extrinsic semiconductors, current flow in semiconductor, Open-circuited p-n junction, Diode resistance, Zener diode, Photoconductors and junction photo diodes, Photo voltaic effect, Light emitting diodes (LED)

UNIT II

Introduction, The junction transistor, Conventions for polarities of voltages and currents, Open circuited transistor, Transistor biased in the active region, Current components in transistors, Currents in a transistor, Emitter efficiency, Transport factor and transistor-α, Dynamic emitter resistance, Transistor as an amplifier, Transistor construction, Letter symbols for semiconductor Devices, Characteristic curves of junction transistor in common configuration, static characteristic curves of PNP junction transistor in common emitter configuration, The transistor in common collector Configuration.

UNIT III

AC to DC converters- Introduction, Classification of Rectifiers, Half wave Rectifiers, Full wave Rectifiers, Comparison of Half wave and full wave rectifiers, Bridge Rectifiers, Bridge Rectifier meter, Voltage multiplying Rectifier circuits, Capacitor filter, LC Filter, Metal Rectifiers, Regulated Power Supplies, Classification of Voltage Regulators, Short period Accuracy of Regulators, Long period .Accuracy of Voltage Regulator, Principle of automatic voltage Regulator, Simple D.C. Voltage stabilizer using Zener diode, D.C. Voltage Regulators, Series Voltage Regulators, Complete series voltage regulator circuit, Simple series voltage regulator.

UNIT IV

Resistance welding controls: Introduction, Resistance welding process, Basic Circuit for A.C. resistance welding, Types of Resistance welding, Electronic welding control used in Resistance welding, Energy storage welding. **Induction heating:** Principle of induction heating, Theory of Induction heating merits of induction heating, Application of induction heating, High frequency power source of induction heating. **Dielectric heating**: Principle of dielectric heating, theory of dielectric heating, dielectric properties of typical materials, electrodes used in dielectric heating, method of coupling of electrodes to the R.F. generator, Thermal losses in Dielectric heating, Applications.

UNIT V :

Ultrasonics: Introduction, Generation of Ultrasonic waves, Application of Ultrasonic waves, Ultrasonic stroboscope, ultrasonic as means of communication, ultrasonic flaw detection, Optical image on non-homogeneities, ultrasonic study of structure of matter, Dispersive study of structure of matter, Dispersive and colloidal effect of Ultrasonic, Coagulating action of Ultrasonic, separation of mixtures by ultrasoni8c waves, cutting and machining of hard materials by ultrasonic vibrations, Degassing of liquids by ultrasonic waves, Physico-chemical effects of ultrasonics, chemical effects of ultrasonics, Thermal effects of Ultrasonics, soldering and welding by ultrasonics, Ultrasonic Drying

Text Books:

1. G. K. Mithal, "Industrial Electronics", Khanna Publishers, Delhi, 2000.
2. J.Gnanavadivel, R.Dhanasekaran, P.Maruthupandi, "Industrial Electronics", Anuradha Publications, 2011.

Reference Books:

1. F. D. Petruzulla, "Industrial Electronics", McGraw Hill, Singapore, 1996.
2. M. H. Rashid, "power Electronics Circuits, Devices and Application", PHI, 3rd edition, 2004.
3. G. M. Chute and R. D. Chute, "Electronics in Industry", McGraw Hill Ltd, Tokyo, 1995.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem	L	P	C
	3+1*	0	3

TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS

Course Outcomes:

- Will be able to have ideas on basic concepts of switching system.
- Will be able to have on different data communication n/w.
- Will be able to have ideas on different services in digital n/w & DSL technologies.

UNIT I

Introduction: Evolution of Telecommunications, Simple Telephone Communication, Basics of Switching System, Manual Switching System, Major Telecommunication Networks.

Crossbar Switching: Principals of Common Control, Touch tone Dial telephone, Principles of Crossbar Switching, Crossbar Switch Configurations, Cross-point Technology, and Crossbar Exchange Organization.

Electronic Space Division switching: Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Two-Stage Networks, Three Stage Networks, n-Stage Networks.

UNIT II

Time Division Switching: Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching, Three-Stage Combination Switching, n-Stage Combination Switching.

Traffic Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching System, Incoming Traffic and service time Characterization, Blocking Models and Loss Estimates, Delay Systems.

UNIT III

Telephone Networks: Subscriber loop Systems, Switching Hierarchy and Routing, Transmission Plan, Transmission systems, Numbering Plan, Charging Plan, Signaling Techniques, In-channel Signaling, Common Channel Signaling, Cellular mobile Telephony.

UNIT IV

Data Networks: Data Transmission in PSTNs, Switching Techniques for Data Transmission, Data Communication Architecture, Link-to-Link layers, End-to-End Layers, Satellite Based Data Networks, Local Area Networks, Metropolitan Networks, Fiber Optic Networks, Data Networks Standards, Protocol Stacks, Internet Working.

UNIT V

Integrated Services Digital Network: Motivation for ISDN, New Services, Network and Protocol Architecture, Transmission Channels, User-Network interfaces, Signaling, Numbering and Addressing, Service Characterization, Interworking, ISDN Standards, Expert Systems in ISDN, Broadband ISDN, Voice Data Integration.

Text Books:

1. ThiagarajanViswanathan, "*Telecommunication Switching Systems and Networks*," PHI Learning Private Limited, New Delhi, 2009.
2. J.E.Flood, "*Telecommunications Switching, Traffic and Networks,*" Pearson Education.

References:

1. John C.Bellamy, "*Digital Telephony,*" Third Edition; Wiley Publications.
2. Wayne Tomasi, "Electronic Communications Systems," Fifth Edition; Pearson Education.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem	L	P	C
	3+1*	0	3

OPERATING SYSTEMS

UNIT I

Computer System and Operating System Overview: Overview of Computer System hardware – Instruction execution – I/O function – Interrupts – Memory hierarchy – I.O Communication techniques. Operating System Objectives and functions – Evaluation of operating System – Example Systems.**Process Description** – Process Control –Process States- Process and Threads - Examples of Process description and Control.

UNIT- II

Concurrency: Principles of Concurrency – Mutual Exclusion – Software and hardware approaches – semaphores – Monitors – Message Passing – Readers Writers Problem. **Principles of deadlock** – deadlock prevention, detection and avoidance dining philosopher's problem – example Systems.

UNIT –III

Memory Management: Memory Management requirements – loading programmes in to main memory – virtual memory – hardware and Control structures – OS Software – Examples of Memory Management.

UNIT – IV

Uniprocessor Scheduling: Types of Scheduling – Scheduling algorithms – I/O management and Disc Scheduling – I/O devices – organization – of I/O function – OS design issues – I/O buffering – Disk I/O – disk scheduling Policies – examples System.

UNIT – V

File Management and Security: Overview of file management – file organization and access – File Directories – File sharing – record blocking – secondary Storage Management – example system.**Security:** Security threats – Protection – intruders – Viruses – trusted System.

Text Books:

1. Operating Systems' – Internal and Design Principles - Stallings, Fifth Edition–2005, Pearson education/PHI
2. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley

References:

1. Operating System A Design Approach-Crowley, TMH.
2. Modern Operating Systems, Andrew S Tanenbaum 2nd edition Pearson/PHI

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem	L	P	C
	3+1*	0	3

ARTIFICIAL NEURAL NETWORKS

Course Outcomes:

- To survey of attractive applications of artificial neural networks.
- To practical approach for using artificial neural networks in various technical, organizational and economic applications.

UNIT I

Introduction: What is a Neural Network, Human Brain, Models of a Neuron,Neural Network Viewed as Directed Graph, Feedback, Network Architectures, knowledge representation, Artificial Intelligence and neural networks , Learning Process- Introduction, Error-correction learning, memory-Based learning, Hebbian learning, Competitive learning, Boltzmann learning, Credit Assignment Problem, Learning with Teacher, Learning Tasks

UNIT II

Single Layer Perceptron: Introduction, least mean square algorithm, learning curves, learning rate annealing techniques, Perceptron-convergence theorem, Relation between perceptron and Bayes Classifier for a Gaussian environment,

Multi Layer Perceptron: Introduction, Some preliminaries, Back-Propagation Algorithm, XOR Problem, heuristics, output Representation and decision rule,

UNIT III

Radial-Basis Function Networks- Introduction, Cover's Theorem, Interpolation Problem, Supervised Learning, Generalized Radial-Basis Function Networks**,** XOR Problem, Approximation Properties of RBF Networks, Comparison of RBF Networks and Multilayer Perceptron's, Learning Strategies

UNIT IV

Principal Component Analysis: Introduction, Some Intuitive Priciples of Self-Organization, Hebbian-Based Maximum Eigen filter, Hebbian-Based PCA, Adaptive Principal Component Analysis using Lateral Inhibition, Classes of PCA Algorithms, Batch and Adaptive Methods of computation, Kernel-Based PCA.

Self-Organizing Maps: Introduction, Basic Feature-Mapping Models, Self-Organizing Map, Summary of SOM Algorithm, Properties of Feature Map, Learning Vector Quantization.

UNIT V:

Associative Memories: Basic concepts, Linear Associator, Recurrent Autoassociate Memory, Performance Analysis of Recurrent Autoassociate Memory, Bidirectional Associate Memory(BAM): Memory Architecture, Association Encoding and Decoding, Stability Considerations, Memory Example and Performance Evaluation, Improved coding of memories, Multidirectional Associative Memory, Associative Memory of Spatio-Temporal Patterns.

Textbooks:

3. Simon H. Haykin, "Neural Networks: A Comprehensive Foundation, Pearson Education", 2nd edition 2004.
4. JacekM.Zurada, " Introdution to Artificial Neural Systems", West Publishing Company

Reference Books:

1. S.N.Sivanandam, S.Sumathi, S.N.Deepa, "Introduction to Neural Networks using MATLAB 6.0", TMH, 2006.
2. "Neural Networks, Fuzzy logic, Genetic Algorithms" PHI pablication

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem	L	P	C
	0	3	2

VLSI & EMBEDDED SYSTEMS LABORATORY

Note: The students are required to perform any **Six** Experiments from each Part of the following.

Part-A: VLSI Lab

Course Objective:

- *To design and draw the internal structure of the various digital integrated circuits*
- *To develop VHDL/Verilog HDL source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.*
- *To verify the logical operations of the digital ICs (Hardware) in the laboratory.*

Course Outcome:

After completion of the course the students will be able to

- *Design and draw the internal structure of the various digital integrated circuits*
- *Develop VHDL/Verilog HDL source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.*
- *Verify the logical operations of the digital IC"s (Hardware) in the laboratory*

Note: For the following list of experiments students are required to do the following.

- ✓ **Target Device Specifications**
- ✓ **Simulation**
- ✓ **Synthesize the design**
- ✓ **Generate RTL Schematic.**
- ✓ **Generate Technology Map.**
- ✓ **Generate Synthesis report.**
- ✓ **Design Summary.**

List of Experiments:
Note: Use VHDL/ Verilog HDL

1. Realization of Logic Gates.
2. 3- to - 8Decoder- 74138.
3. 8 x 1 Multiplexer-74151 and 2 x 4 De-multiplexer-74155.
4. 4-Bit Comparator-7485.
5. D Flip-Flop-7474.
6. Decade counter-7490.
7. Shift registers-7495.
8. ALU Design.

Part-B: Embedded C Experiments using MSP430:

Course Objective:

- *To develop an algorithm, the flow diagram, source code and perform the compilation*
- *To generate the required binary file which can be dumped into the controller and obtain the respective output control on the connected peripheral.*
- *To verify the logic with the necessary hardware.*

Course Outcome:

After completion of the course the students will be able to

- *Develop an algorithm, the flow diagram, source code and perform the compilation.*
- *Generate the required binary file which can be dumped into the controller and obtain the respective output control on the connected peripheral.*
- *Verify the logic with the necessary hardware.*

1. Learn and understand how to configure MSP-EXP430G2 Launchpad digital I/O pins. Write a C program for configuration of GPIO ports for MSP430 (blinking LEDs, pushbuttons interface).

Exercises:

a) Modify the delay with which the LED blinks.
b) Modify the code to make the green LED blink.
c) Modify the code to make the green and red LEDs blink:
   i. Together
   ii. Alternately
d) Alter the code to turn the LED ON when the button is pressed and OFF when it is released.
e). Alter the code to make the green LED stay ON for around 1 second every time the button is pressed.
f). Alter the code to turn the red LED ON when the button is pressed and the green LED ON when the button is released.

2. **Usage of Low Power Modes:**

Configure the MSP-EXP430G2 Launchpad for Low Power Mode (LPM3) and measure current consumption both in active and low power modes. Use MSPEXP430FR5969 as hardware platform and measure active mode and standby mode current.

Exercises:

a) How many Low power modes are supported by the MSP430G2553 platform?
b) Measure the Active and Standby Current consumption in LPM3 mode for the same application using MSP430F5529 Launchpad

3. Learn and understand GPIO based Interrupt programming. Write a C program and associated GPIO ISR using interrupt programming technique.

Exercises:

a) Write the code to enable a Timer interrupt for the pin P1.1.
b) Write the code to turn on interrupts globally

4. Learn and understand how to configure the PWM and ADC modules of the MSP-EXP430G2 Launchpad to control the DC motor using external analog input.

Exercises:

a) Observe the PWM waveform on a particular pin using CRO.
b) What is the maximum resolution of PWM circuitry in MSP430G2 Launchpad and how it can be achieved using program?
c) Create a PWM signal of 75% duty cycle on particular PWM pin.
d) Create Switch case code from the example code to run the DC Motor in 3 set of speeds.

5. Understand the ULP Advisor capabilities and usage of ULP Advisor to create optimized, power-efficient applications on the MSP-EXP430G2 Launchpad.

Exercises:

a) How does the ULP Advisor software help in designing power-optimized code?
b) Which ULP rule violation helps us to detect a loop counting violation?

6. Understand and Configure 2 MSP430F5529 Launchpads in master-slave communication mode for SPI protocol.

Exercises:

a) Which port pins of MSP430 can be configured for SPI communication?
b) What is the data transfer rate supported by MSP430 for SPI communication?

7. A basic Wi-Fi application: Configure CC3100 Booster Pack connected to MSP430F5529 Launchpad as a Wireless Local Area Network (WLAN) Station to send Email over SMTP.

Exercises:

a) Identify the code that helps in establishing connection over SMTP. Modify the code to trigger E-mail application based upon external analog input.
b) How to configure the AP WLAN parameters and network parameters (IP addresses and DHCP parameters) using CC3100 API.

8. Understand Energy Trace Technology analysis tool that measures and displays the application's energy profile. Compute and measure the total energy of MSP-EXP430G2 Launchpad running an application and estimate the lifetime of an AA battery if the Launchpad is powered using standalone AA battery.

Exercises:

Compute the energy measurement and the estimated lifetime of a battery in various low power modes.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

	L	P	C
IV B.Tech I Sem	**0**	**3**	**2**

MICROWAVE & OPTICAL COMMUNICATIONS LAB

Course Outcomes:

- Capable of Applying microwave Concepts/ Microwave components and test them .
- Able to design and analyse an optical fiber communications link

Microwave Lab (PART – A) --- Any Seven (7) Experiments

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance Measurement.
7. Frequency and Wavelength measurements using slotted section.
8. Impedance Matching and Tuning
9. Scattering parameters of Magic Tee.
10. Radiation Pattern Measurement of horn Antennas (at least two antennas).

Optical Fiber Lab (PART – B) --- Any five (5) Experiments

1. Characterization of LED.
2. Characterization of Laser Diode.
3. Intensity modulation of Laser output through an optical fiber.
4. Measurement of Data rate for Digital Optical link.
5. Measurement of Numerical Aperture of the given fiber.
6. Measurement of losses for Analog Optical link.

Equipment required for Laboratories:

1.	Regulated Klystron Power Supply	6 nos.
2.	VSWR Meter	6 nos.
3.	Milli/Micro Ammeters	10 nos.
4.	Multi meters	10 nos.
5.	CROs	8 nos.
6.	GUNN Power Supply, Pin Moderator	4 nos.
7.	Relevant Microwave components	--
8.	Fiber Optic Analog Trainer based LED	3 nos.
9.	Fiber Optic Analog Trainer based laser	2nos.
10.	Fiber Optic Digital Trainer	1 no.
11.	Fiber cables -	(Plastic, Glass)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem	L	P	C
	3+1*	0	3

MOBILE AND SATELLITE COMMUNICATIONS

Course Outcomes:

- Understand the Concepts of Basic Cellular Systems.
- Identify the Techno-Political aspects of wireless and mobile communications.
- Understand the information theoretical aspects of wireless channels.
- Understand the principals of Co-operative communications and describe their advantages.
- Students can determine the location of Satellite.
- Students can design Satellite Uplink and Downlink.
- Students can design earth station transmitter, receiver and antenna systems.

UNIT I

Introduction: Evolution of Mobile Radio Communications, Mobile Radio Systems around the world, Paging Systems, Cordless Telephone Systems, Cellular Telephone Systems, How a Cellular Telephone Call is Made, Trends in Cellular Radio and Personal Communications, Frequency Reuse, Channel Assignment Strategies, Prioritizing Handoff, practical Handoff Considerations**.**

Interference and system Capacity: Co-channel Interferences and System Capacity, Channel Planning for wireless Systems, Adjacent Channel Interference, Power Control for Reducing Interference, Trunknig and Grade of Service,Cell Splitting, Sectoring, Repeaters for Range Extension, A Microcell Zone Concept.

Radio Wave Propagation: Free Space Propagation Model, Relating Power to Electric Field, Ground Reflection(Two-Ray) Model, Diffraction, Scattering: Radar Cross Section Model.

UNIT II

Outdoor & Indoor Propagation Models: Okumura Model, Hata Model, Partition Losses (Same Floor), Log-distance Path Loss Model. Small-Scale Multipath Propagation: Factors Influencing Small-Scale Fading, Doppler Shift.

Impulse Response Model of a Multipath Channel: Relationship between Bandwidth and Received Power, Parameters of Mobile Multipath Channels: Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

Types of Small Scale Fading: Fading Effects due to Multipath Time Delay Spread: Flat Fading, Frequency Selective Fading; Fading Effects Due to Doppler Spread: Fast Fading, Slow Fading. **Statistical Models for Multipath Fading Channels:** Clarke’s Model for Flat Fading: Spectral Shape Due to Doppler Spread in Clarke’s Model; Simulation of Clarke and Gans Fading Model, Level Crossing and Fading Statistics.

UNIT III

Digital Modulation: Overview, Factors that influence the choice of Digital Modulation, Bandwidth and Power Spectral Density of Digital Signals, Raised Cosine Filter, Gaussian Pulse- Shaping Filter, QPSK Transmission and Detection Techniques, Minimum Shift Keying(MSK), Gaussian Minimum Shift Keying(GMSK), M-ary Quadrature Amplitude Modulation(QAM), and brief introduction to OFDM.

Equalization and Diversity Techniques: Fundamental of Equalization, Training A Generic Adaptive Equalizer, Linear Equalizers, Selection Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, time Diversity, RAKE Receiver.

Multiple Access Techniques for Wireless Communications: Introduction to Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA).

UNIT IV

Overview of Satellite Systems: Introduction, Frequency Allocations for Satellite Services, INTELSAT, Polar Orbiting Satellites, Cospas-Sarsat. **Orbits and launching Methods:** Introduction, Kepler's First Law, Kepler's Second Law, Kepler's Third Law, Definitions of Terms for Earth-Orbiting Satellites, Orbital Elements, Apogee and Perigee Heights,

UNIT V

Orbit Perturbations: Effects of a non-spherical earth, Atmospheric drag. **Inclined Orbits:** Calendars, Universal Time, Julian dates, Sidereal Time, The Orbital Plane, The geocentric-equatorial coordinate system, Earth station referred to the IJK frame, The topocentric-horizon coordinate system, The sub-satellite point, Predicting satellite Position. Local Mean Solar Time and Sun-Synchronous Orbits, Standard Time.

The Geostationary Orbit: Introduction, Antenna Look Angles, The Polar Mount Antenna, Limits of Visibility, Near Geostationary Orbits, Earth Eclipse of Satellite, Sun Transit Outage, Launching Orbits.

Text Books:

1. T. S. Rappaport, "Wireless Communications-Principles and Practice," Prentice Hall of India/Pearson Education India, Second Edition, 2002.
2. Dennis Roddy, "Satellite Communications," Tata McGraw-Hill Education Private Limited, NewDelhi, Fourth Edition, 2010.

References:

1. WCY Lee, "Mobile Communication Engineering," Tata McGraw Hill, India, 2008.
2. T.Pratt and W.Boston, "Satellite Communications," John Wiley & Sons, 2004.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem	**L**	**P**	**C**
	3+1*	**0**	**3**

COMPUTER NETWORKS

Course Outcomes:

- After the completion of the course the student will be able to
- Identify the issues and challenges in the architecture of a computer network.
- Understand the ISO/OSI seven layers in a network.
- Realize protocols at different layers of a network hierarchy.
- Recognize security issues in a network.

UNIT I

Introduction – network architecture - protocol implementation issues - Quantitative performance metrics - network design. Reference models- The OSI Reference Model- The TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models. Physical Layer: Different types of transmission media, errors in transmission: attenuation, noise. Repeaters.Encoding (NRZ, NRZI, Manchester, 4B/5B, etc.).

UNIT II

MAC Layer: Aloha, CSMA, CSMA/CD, CSMA/CA protocols. Examples: Ethernet, including Gigabit Ethernet and WiFi (802.11). Data Link Layer: Error detection (Parity, CRC), Sliding Window, Stop and Wait protocols. LAN: Design, specifications of popular technologies, switching. A student should be able to design LAN of a campus or a building.

UNIT III

Network layer: Internet Protocol, IPv6, ARP, DHCP, ICMP, Routing algorithms: Distance vector, Link state, Metrics, Inter-domain routing. Subnetting, Classless addressing, Network Address Translation.

UNIT IV

Transport layer: UDP, TCP. Connection establishemnt and termination, sliding window revisited, flow and congestion control, timers, retransmission, TCP extensions, etc.

Session, Presentation, and Application Layers. Examples: DNS, TELNET, FTP, SMTP, HTTP, WWW, VoIP .

UNIT V

Network Security: Conepts of symmetric and asymmetric key cryptography.Sharing of symmetric keys - Diffie Hellman.Public Key Infrastructure.Public Key Authentication Protocols.Symmetric Key Authentication Protocols. Pretty Good Privacy (PGP), IPSec, Firewalls.

Text Books:

1. Behrouz a. Forouzan, "Data Communications and Networking", 2 nd Edition, Tata McGraw-Hill, New Delhi, 2003 .
2. Andrew S. Tanenbaum, "Computer Networks", 4 th Edition, Prentice-Hall of India, New Delhi, 2000

Reference:

1. William Stallings, "Data and Computer Communication", 6 th Edition, Prentice Hall of India, New Delhi, 1999.
2. Douglas E Comer, "Computer Networks and Internet", Pearson Education Asia, 2000

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem

	L	P	C
	3+1*	0	3

WIRELESS SENSOR NETWORKS

UNIT I

Introduction Wireless sensor networks: The vision, Networked wireless sensor devices Applications of wireless sensor networks, Key design challenges

UNIT II

Network deployment Structured versus randomized deployment, Network topology, Connectivity in geometric random graphs, Connectivity using power control, Coverage metrics, Mobile deployment

UNIT III

Localization and Time synchronization Key issues, Localization approaches, Coarse-grained node localization using minimal information, Fine-grained node localization using detailed information, Network- wide localization, Theoretical analysis of localization techniques, Key issues of time synchronization, Traditional approaches, Fine-grained clock synchronization, Coarsegrained data synchronization

UNIT IV

Wireless characteristics and Medium-access Wireless link quality, Radio energy considerations, The SINR capture model for interference, Traditional MAC protocols, Energy efficiency in MAC protocols, Asynchronous sleep techniques, Sleep-scheduled techniques, and Contention-free protocols.

UNIT V

Sleep-based topology control and Energy-efficient routing Constructing topologies for connectivity, Constructing topologies for coverage, Set Kcover algorithms, Cross-layer issues, Metric-based approaches, Routing with diversity, Multi-path routing, Lifetime-maximizing energy-aware routing techniques, Geographic routing, Routing to mobile sinks

Textbooks:

1. BhaskarKrishnamachari, “Networking Wireless Sensors”, Cambridge University Press
2. KazemSohraby, Daniel Minoli, TaiebZnati, “Wireless Sensor Networks: Technology, Protocols, and Applications”, John Wiley & Sons

References:

1. Dr.Xerenium, Shen, Dr. Yi Pan , “Fundamentals of Wireless Sensor Networks, Theory and Practice”, Wiley Series on wireless Communication and Mobile Computing, 1st Edition, 2010.
2. Raghavendra C.S, Krishna Sivalingam M., Taiebznati, “Wireless Sensor Networks”, Springer Science, 2004.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem	L	P	C
	3+1*	0	3

ADVANCED DATA STRUCTURES

Course objectives:

- To develop skills to design and analyse linear and nonlinear data structures.
- Develop algorithms for manipulating linked lists, stacks, queues, trees and graphs.
- Develop recursive algorithms as they apply to trees and graphs.
- To get acquaintance with frequently used data structures in Software Engineering and Programming practices.
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- To develop a base for advanced computer science study.

UNIT I

Data Structures – Introduction to Data Structures, abstract data types, The list ADT, Stack ADT, Queue ADT, Implementation Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack application-infix to postfix conversion, postfix expression evaluation, recursion implementation, Queues-operations, array and linked representations

UNIT II

Hash table representation, hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing, and comparison of hashing and skip lists.

UNIT III

Priority Queues – Definition, ADT, Realizing a Priority Queue using Heaps, Definition, insertion, Deletion. External Sorting- Model for external sorting, Multiway merge, Polyphase merge.

UNIT IV

Search Trees- Binary Search Trees, Definition, ADT, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching. Introduction to Red –Black and Splay Trees.

UNIT V

Search trees :B-Trees, B-Tree of order m, height of a B-Tree, insertion, deletion and searching, Comparison of Search Trees. **Pattern matching and Tries :**Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries

Text Books:

1. S.Sahni, “Data structures, Algorithms and Applications in C++”, University Press (India) Pvt.Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.
2. Michael T.Goodrich, R.Tamassia and Mount, “Data structures and Algorithms in C++”, Wiley student edition, John Wiley and Sons.

References:

1. Mark Allen Weiss, “Data structures and Algorithm Analysis in C++”, Pearson Education Ltd., Second Edition.
2. Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson
3. Langsam, Augenstein and Tanenbaum “Data structures using C and C++”, PHI.
4. W.Savitch, “Problem solving with C++ The OOP”, Fourth edition, Pearson education.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem	L	P	C
	3+1*	0	3

EMBEDDED C

Course Outcomes: At the end of the course, the student will be:

- Aware of Embedded System programming basics.
- Understand programming of Embedded System Processor interface.
- Aware of creating an Embedded Operating System.
- Understand the importance of C Language in Embedded System programming.

UNIT - I

Introduction to embedded system, processor suitable for embedded system, selection of programming language, operating system, development of embedded software.

Introduction to microcontroller family, external interface of the Standard 8051, Reset requirements,, Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts Serial interface Power consumption.

UNIT - II

Introduction to adding structure to your code, Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H), Example: Restructuring the 'Hello Embedded World' example, Example: Restructuring the goat-counting example, Further examples

Introduction to Reading switches, Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats.

UNIT - III

Meeting real-time constraints**,** Introduction, Creating 'hardware delays' using Timer 0 and Timer 1, Example: Generating a precise 50 ms delay, configuring the simulator, Building the target, Running the simulation, Dissecting the program, Aside: Building the hardware.

Introduction to creating an embedded operating system, The basis of a simple embedded OS, Introducing sEOS, Using Timer 0 or Timer 1, Is this approach portable?, Alternative system architectures, Important design considerations when using sEOS, Example: Milk pasteurization.

UNIT - IV

Introduction to multi-state systems and function sequences, Implementing a Multi-State (Timed) system, Example: Traffic light sequencing, Example: Animatronic dinosaur, Implementing a Multi-State (Input/Timed) system, Example: Controller for a washing machine.

UNIT – V

Case study: Intruder alarm system, Introduction, The software architecture, Key software components used in this example, Running the program, The software.

TEXT BOOKS

1. Michael J. Pont, "Embedded C", Addison – Wesley, Pearson Education, 2002.
2. David. E.Simon, "An Embedded Software Primer", Pearson Education, 2001.
3. Kai Qian, David Den Haring, Li Cao (auth.),"Embedded Software Development with C", Springer US, 2009.

REFERENCES

1. Frank Vahid and Tony Gwargie, "Embedded System Design", John Wiley & sons, 2002.
2. Steve Heath, "Embedded System Design", Elsevier, Second Edition, 2004.
3. KVKK Prasad, "Embedded / Real Time Systems" Dreamtech Press, 2005.
4. Jonathan W. Valvano, Brooks / Cole, "Embedded Microcomputer Systems", Thompson Learning.
5. Daniel W. Lewis, "Fundamentals of Embedded Software where C and Assembly meet", PHI, 2002.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem	L	P	C
	3+1*	0	3

SPREAD SPECTRUM TECHNIQUES

Course Outcomes:
At the end of the course the students should be able to:

- Understand the general concepts of spread spectrum techniques.
- Generate spread spectrum signals through hardware and computer simulations.
- Know various applications of spread spectrum techniques and working operation of CDMA systems of 2G and 3G standards.

UNIT – I
Fundamentals of Spread Spectrum: General concepts, Direct sequence (DS), Bi-phase and quadri-phase modulations, Pseudo noise (PN) signal characteristics, Direct Sequence receiver, Frequency Hopping – transmitter, receiver, Time Hopping, Comparison of modulation methods.

UNIT – II
Analysis of Direct-Sequence & Avoidance type Spread Spectrum Systems: Properties of PN sequences, Properties of m-sequences, Partial Correlation, PN signals from PN sequences, Partial correlation of PN signals, Generation of PN signal, Despreading the PN signal, Interference rejection, Output Signal – to – Noise ratio, Antijam characteristics, Interception, Energy and Bandwidth efficiency. The frequency hopped signal, Interference rejection in a Frequency – Hopping receiver, The Time-Hopped Signal.

UNIT – III
Generation and Detection of Spread Spectrum Signals: Shift register sequence generators, Discrete-Frequency Synthesis, Saw device PN generators, Charge coupled devices, Coherent Direct – sequence receivers, Other methods of carrier tracking, Delay lock loop analysis, Tau-Dither loop, Coherent carrier tracking, Non-coherent frequency hop receiver, Acquisition of Spread Spectrum Signals, Acquisition by cell-by-cell searching, Reduction of Acquisition time, Acquisition with matched filter, Matched filters for PN sequences, Matched filters for Frequency Hopped signals, Matched filters with acquisition aiding waveforms.

UNIT – IV
Application of Spread Spectrum to Communications: General characteristics of Spread spectrum, Multiple access considerations – number of active users (equal powers), number of active users (unequal powers), bandwidth limited channels, power limited channels, Energy and bandwidth efficiency in multiple access, Selective calling and identification, Antijam considerations, Jamming direct-sequence systems, Jamming Frequency – Hopping Systems, Intercept considerations.

UNIT – V

CDMA Digital Cellular Systems:Introduction, Cellular radio concept, CDMA Digital cellular systems, Specific examples of CDMA digital cellular systems based on 2G, and 3G standards and their technical specifications.

TEXT BOOKS:

1. George. R. Cooper and Clare D. McGillem, “Modren Communications and Spread Spectrum”, McGraw – Hill Book Company, 1986.
2. Roger L. Peterson, Rodger E. Ziemer& David E. Borth, “Introduction to Spread Spectrum Communications”, McGraw Hill, 2011.

REFERENCES:

1. Dr. KamiloFeher, “Wireless Digital Communications – Modulation & Spread Spectrum Applications”, PHI, 1999.
2. T. S. Rappaport, “Wireless Communications – Principles and Practice,” PHI, 2001.
3. Simon Haykin, “ Communication Systems” 4th edition
4. Andrea Goldsmith “Wireles Communications”, Cambridge University Press, 2005

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem	L	P	C
	3+1*	0	3

DATABASE MANAGEMENT SYSTEMS

Course Outcomes

- Students can design the simple database, and can use the SQL instructions in developing the database applications.
- Can apply the ER concepts to design the databases.
- Advanced concepts like triggers, assertions and constraints can be applied effectively in designing the business applications

UNIT I :

Data base System Applications, data base System VS file System – View of Data – Data Abstraction – Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base System Structure – Storage Manager – the Query Processor. History of Data base Systems. Data base design and ER diagrams – Beyond ER Design Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Concept Design with the ER Model – Conceptual Design for Large enterprises.

UNIT II:

Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical data base Design – Introduction to Views – Destroying /altering Tables and Views. Form of Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries Set – Comparison Operators – Aggregative Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL Triggers and Active Data bases, Oracle, SQL Server,DB2.

UNIT III:

Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.Schema refinement – Problems Caused by redundancy – Decompositions – Problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form, FIFTH Normal Form.

UNIT IV:

Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability- Lock –Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity.Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent

Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems- Remote Backup systems.

UNIT V:

Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – Indexes and Performance Tuning- Intuitions for tree Indexes – Indexed Sequential Access Methods (ISAM) – B+ Trees: A Dynamic Index Structure.

Text Books:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, V edition.

References:

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, ElmasriNavrate Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education
4. Oracle for Professionals,The X Team,S.Shah and V.Shah,SPD.
5. Database Systems Using Oracle:A Simplified guide to SQL and PL/SQL,Shah,PHI.
6. Fundamentals of Database Management Systems,M.L.Gillenson,Wiley Student Edition.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem	L	P	C
	3+1*	0	3

CPLD AND FPGA ARCHITECURES AND APPLICATIONS

Course Outcomes:

After completion of this course the students will be able to

- Understand functioning of different types of Programmable Logic Devices.
- Gets clear idea regarding functioning, organization and specialized components associated with FPGAs.
- Complete knowledge pertaining to different FPGA Architectures and some design applications.

UNIT – I

Review of Logic Design, Implementation with NAND – NOR gates, designing with multiplexers, implementation of logic functions with look-up tables, minimization of combinational functions based on a) Circuit size, gates and literals i.e. space & power b) number of levels of logic i.e. time or circuit depth.

The Quine-McCluskey Algorithm, Multi level logic minimization, covering, factored forms, technology mapping, review of finite state machines, one hot encoding

UNIT – II

Programmable Logic: Introduction, programmable logic devices (PLDs), SPLDs, CPLDs, fundamentals of PLD circuits, PLD symbology, PLD architectures: Progrmmable Read Only Memories (PROMs), Programmable Array Logic (PAL), ALTERA CPLDs

UNIT – III

FPGAs: Introduction, Programming Technologies: SRAM, Antifuse, EPROM and EEPROM Xilinx FPGAs, Actel, Altera, Concurrent Logic FPGAs. Crosspoint Solutions FPGA, translation to XNF format, Partition, Place and route, Technology mapping for FPGAs: Logic Synthesis, logic Optimization, Lookup Table Technology Mapping, Mapping into Xilinx 3000 CLBs, Multiplexer Technology, Mapping.

UNIT – IV

Logic Block Architecture: Logic Block functionality Versus area-efficiency, Impact of Logic Block Functionality in FPGA performance, Routing for FPGAs: Segmented Channel Routing, Routing for Symmetrical FPGAs, CGE detailed router Algorithm. Flexibility of FPGA routing architectures: Logic Block, Connection Block, Trade offs in Flexibilities of the S and C blocks, A theoretical model for FPGA routing.

UNIT – V

Platform FPGA architectures, Multi-FPGA Systems: Xilinx Virtex II Pro Platform FPGA, Altera Stratix Platform FPGA, Serial I/O, Memories, CPUs and Embedded Multipliers, Multi FPGA systems: Interconnecting Multiple FPGAs, partitioning, Novel architectures.

TEXT BOOKS:

1. Stephen Brown Zvonko Vranesic – Fundamentals of Digital Logic with VHDL design, McGraw Hill – 2000 (Unit I & II).
2. Stephen D. Brown,Robert J Francis, Jonathan Rose, Ivonko G. Vranesic, “Field Programmable Gate Arrays”, Springer International Edition, First Indian Print 2007(UnitIII & IV)
3. Wayne Wolf,“FPGA-based System Design”,Pearson Education First Impression,2009(Unit V)

REFERENCES:

1. Park K. Chan / Samiha Mourad, “Digital Design using Field Programmable Gate Arrays”, Pearson, 1994 (Unit-I)
2. Ronald J Tocci, Neal S. Widmer, Gregory L. Moss, “Digital Systems: Principles & Applications”, 10th Edition, Pearson, 2009 (Unit-II)
3. Stephen M. Trimberger, “Field Programmable Gate Array Technology” Springer International Edition”, First Indian Reprint 2007.
4. Michel John Sebastian Smith “Application – Specific Integrated Circuits”, Pearson Education, First Indian reprint 2000.

JNTUACOLLEGEOFENGINEERING(Autonomous),ANANTHAPURAMU

DEPARTMENTOFELECTRONICS&COMMUNICATIONENGINEERING

COURSE STRUCTURE AND SYLLABIFORB.Tech.PROGRAM

With Effectfrom2015 - 16

MissionandVisionoftheInstitution

VISION

- Committedtoexpandingthehorizonandinspiringyoungmindstowardsacademicexcellence .
- Aims at scaling new heights through advanced research and innovative technologies tokeeppacewiththechangingneedsofindustryandsociety atlarge.

MISSION

- Toidentifyandimplementproven,preventionoriented,forwardlookingsolutionstocritical scientificandtechnological problems.
- To maketechnology a principal instrument of economic development of the country andto improve the quality of life of the people through technological education, innovation,research, trainingandconsultancy.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VISION

- To produce globally competitive and socially sensitized engineering graduates and tobringoutqualityresearchinthefrontierareasofElectronics&CommunicationEngineering.

MISSION

- ToprovidequalityandcontemporaryeducationinthedomainofElectronics&CommunicationEngineeringthroughperiodicallyupdatedcurriculum,bestofbreedlaboratory facilities, collaborative ventures with the industries and effective teachinglearningprocess.
- To provide essential knowledge research and innovative technologies in Electronics &Communication Engineering and to inculcate innovative skills, research aptitude, team-work, ethical practices in students so as to meet expectations of the industry as well associety.

PROGRAM OUTCOMES (POs):

The Program outcomes are the knowledge skills and attitudes which the students haveatthetimeofgraduation.Theseoutcomes aregenericandarecommontoallengineering programs. These program outcomes are identified by National Board ofAccreditation.

PO1	Apply the knowledge of mathematics science engineering fundamentals and an mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems engineering problems.
PO2	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	Apply reasoning informed by Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development and need for sustainable development.
PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Function effectively as an individual and as a member or leader in diverse teams and individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Demonstrate knowledge and understanding of the engineering and knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Recognize the need for and have the Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAMSPECIFICOUTCOMES (PSOs):

PSO1	Competenceindesignand analysisof analogand digital systemusing hardwareandsoftwaretools.
PSO2	Understand andanalyzepresentandpastgenerationsofwirelesscommunicationtechnologies.

PROGRAMEDUCATIONALOBJECTIVES (PEOs)

PEO1	Toimpartknowledgetostudentsonfundamentalsofengineeringsciences,mathematicsandmulti - disciplinaryengineeringcoursesthatwouldhelpthemtounderstandthedesignanddevelopmentalconceptsofElectronics& CommunicationEngineering.
PEO2	Toprovideanin-depthknowledgeanddemonstrationsrelatedtothecoreareaof electronics and communication engineering, starting from the basics to thelevelofanalysis,synthesisanddesignofcircuitsandsystems,inadditiontothe exposureonlatestadvancementsinthefield.
PEO3	To provide the required technical skills necessary for solving real life problems,inspiring towards perceiving post graduate programs and encourage towardsR&DoftheadvancedareasofElectronics&CommunicationEngineering.
PEO4	Toprovidestudentswithanacademicenvironmentawareofexcellence,leadership, ethical attitude, communication and management skills, team work,socialresponsibility,physicalstaminaandthecontinuouslife-longlearningneededforasuccessfulprofessionalcareerasengineers,scientists,technocrats, administratorsandentrepreneurs.

MAPPINGOFPROGRAMEDUCATIONALOBJECTIVESWITH PROGRAM OUTCOMES

PEO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PEO1	3	1	1	1	1	1	1	1	1	1	3	2	1	1
PEO2	2	3	3	1	1	1	1	1	3	1	1	1	3	3
PEO3	1	2	1	3	3	1	2	1	3	1	3	3	3	3
PEO4	1	1	1	1	1	3	3	3	2	3	2	3	1	1

MAPPINGOFMISSIONSTATEMENTSWITHPROGRAMEDUCATIONALOBJECTIVES

MissionStatement	PEO1	PEO2	PEO3	PEO4
Toprovidequalityandcontemporaryeducationinthedomain ofElectronics&CommunicationEngineeringthroughperiodicallyupdatedcurriculum,bestofbreedlaboratory facilities, collaborative ventures with the industries and effective teachinglearningprocess.	1	1	1	2
To provide essential knowledge research and innovative technologies in Electronics &Communication Engineering and to inculcate innovative skills, research aptitude, team-work, ethical practices in students so as to meet expectations of the industry as well associety.	1	2	3	1

Note:M1,M2aredistinctelementsofMissionstatement.Entercorrelationlevels1,2or 3as definedbelow:

1:Slight (Low) 2: Moderate (Medium) 3: Substantial (High), If there is no correlation, "-"

COURSE COMPONENTS

	Share of course component	Total number of contact hours	Total number of credits (222)
	R15	R15	R15
Basic Science	14.41	34	32
Engineering Science	10.81	26	24
Humanities and Social Science	6.30	20	14
Open Elective	1.80	4	4
Department Elective	9.00	20	20
Department Core	52.25	130	116
Project & Seminar	5.40	24	12

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: ANANTHAPURAMU

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

COURSE STRUCTURE

B.Tech. Regular Four Year Degree Course (w.e.f2015-16 admitted batch)

I B.Tech. I Semester

Code	Subject	L	P	C
15A55101	English	4	-	4
15A51101	Mathematics -I	4	-	4
15A52101	Applied Physics	4	-	4
15A01101	Environmental Studies	4	-	4
15A03102	Engineering Graphics	4	-	4
15A52102	Applied Physics Lab	-	3	2
15A35101	Engineering Workshop & IT Workshop	-	3	2
15A55102	English Language Communication Skills Lab	-	3	2
	Total	**20**	**9**	**26**

I B.Tech.II Semester

Code	Subject	L	P	C
15A51201	Mathematics –II	4	-	4
15A53201	Applied Chemistry	4	-	4
15A51202	Mathematical Methods	4	-	4
15A04201	Circuit Theory	4	-	4
15A04202	Computer Programming	4	-	4
15A02202	Electrical Technology	4	-	4
15A53202	Applied Chemistry Lab	-	3	2
15A02203	Electrical Technology Lab	-	3	2
	Total	**24**	**6**	**28**

II B.Tech. I Semester

Code	Subject	T	P	C
15A54301	Managerial Economics and Financial Accountancy	4	0	4
15A51302	Complex Variables & Special Functions	4	0	4
15A04301	Data Structures	4	0	4
15A04302	Electronic Devices & Circuits	4	0	4
15A04303	Probability Theory and Stochastic Processes	4	0	4
15A04304	Signals and Systems	4	0	4
15A04305	Electronic Devices & Circuits Lab	0	3	2
15A04306	Computer Programming & Data Structures Lab	0	3	2
	Total	**24**	**6**	**28**

II B.Tech. II Semester

Code	Subject	T	P	C
15A04401	Switching Theory and Logic Design	4	0	4
15A04402	Electromagnetic Field Theory	4	0	4
15A04403	Electronic Circuit Analysis & Design	4	0	4
15A04404	Networks and Transmission Lines	4	0	4
15A04405	Analog Communication Systems	4	0	4
15A02406	Control Systems Engineering	4	0	4
15A54402	Human Values & Professional Ethics(Audit)	2	0	0
15A04406	Electronic Circuit Analysis & Design Lab	0	3	2
15A04407	Basic Simulation Lab	0	3	2
	Total	**26**	**6**	**28**

IIIB.Tech. I Semester

Code	Subject	T	P	C
15A54501	Management Science	4	-	4
15A04501	Computer Architecture &Organization	4	-	4
15A04502	Linear IC Applications	4	-	4
15A04503	Digital System Design	4	-	4
15A04504	Antennas and Wave Propagation	4	-	4
15A04505	Digital Communication Systems	4	-	4
15A04506	Linear IC & Digital System Design Lab	-	3	2
15A04507	Analog Communication Systems Lab	-	3	2
	Total	**24**	**6**	**28**

III B.Tech. II Semester

Code	Subject	T	P	C
15A04601	Electronic Measurements and Instrumentation	4	-	4
15A04602	Microprocessors and Microcontrollers	4	-	4
15A04603	Digital Signal Processing	4	-	4
15A04604	Microwave Engineering	4	-	4
15A04605	VLSI Design	4	-	4
15A04606	**Open Elective** a. Digital Electronics b. Principles of Electronic Communication Systems c. Electronic Measuring Instruments	4	-	4
15A04607	Digital Communication Systems Lab	-	3	2
15A04608	Microprocessors and Microcontrollers Lab	-	3	2
15A55601	Advanced English CommunicationSkills Lab **(Audit Course)**	-	3	-
	Total	**24**	**9**	**28**

IV B.Tech. I Semester

Code	Subject	T	P	C
15A04701	Computer Networks	4	-	4
15A04702	Optical Communications	4	-	4
15A04703	Embedded Systems	4	-	4
15A04704	Digital Image Processing	4	-	4
15A04705	Cellular and Mobile Communications	4	-	4
15A04706	**Elective – I (MOOC)**	4	-	4
15A04707	Digital Signal Processing Lab	-	3	2
15A04708	Microwave & Optical Communications Lab	-	3	2
15A04709	Project Work – A	2	-	-
	Total	**26**	**6**	**28**

IV B.Tech. II Semester

Code	Subject	T	P	C
 15A04801a 15A04801b 15A04801c	**Elective-II** a. Satellite Communications b. Advanced Computer Architecture c. RF Circuit Design	4	-	4
 15A04802a 15A04802b 15A04802c	**Elective-III** a. Speech Processing b. Scripting Languages c. CPLD & FPGA Architectures	4	-	4
 15A04803a 15A04803b 15A04803c	**Elective-IV** a. Radar Engineering b. Adhoc Wireless Sensor Networks c. Advanced Digital Signal Processing	4	-	4
 15A04804a 15A04804b 15A04804c	**Elective-V** a. Coding Theory and Techniques b. Artificial Neural Networks c. Internet of Things	4	-	4
15A04805	Seminar	-	4	2
15A04806	Project Work - B	-	20	10
	Total	**16**	**24**	**28**

T- Theory P – Practical/Drawing C – Credits

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech I Sem	**T**	**P**	**C**
	4	**0**	**4**

(15A55101) ENGLISH
(Common to All Branches)

Course Outcomes:
CO1: Develop facility in responding to a variety of situations and contexts calling for purposeful shifts in voice, tone, level of formality, design, medium, and/or structure.
CO2: Become effective in the use of different modes of written communication in a professional environment.
CO3: Develop capacity to apply different reading methods to evaluate a mass of data on the net and
to glean the necessary information.
CO4: Learn and use key rhetorical concepts through analyzing and composing a variety of texts.
CO5: Well trained in LSRW skills and develop communicative competence.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3											2	
CO2	2												2	
CO3		3	3							3	3			3
CO4		3	3			2					3			3
CO5		3	3			2			2	3	3			3

UNIT –I
Chapter entitled *Humour*from "Using English"
Chapter entitled '*HomiJehangirBhabha'* from "New Horizons"
L- Listening -Techniques - Importance of phonetics
L- Meet & Greet and Leave taking, Introducing Oneself and Others (Formal and Informal situations)
R- -Reading Strategies -Skimming and Scanning
W- Writing strategies- sentence structures
G-Parts of Speech –Noun-number, pronoun-personal pronoun, verb- analysis
V-Affixes-prefix and suffix, root words, derivatives

UNIT –II
Chapter entitled *Inspiration* from "Using English"
Chapter entitled 'My Struggle for an Education' from "New Horizons"
L- Listening to details
S- Apologizing, Interrupting, Requesting and Making polite conversations
R-note making strategies
W- Paragraph-types- topic sentences, unity, coherence, length, linking devices
G-Auxiliary verbs and question tags
V- synonyms-antonyms, homonyms, homophones, homographs, words often confused

UNIT –III
Chapter entitled *Sustainable Development* from "Using English"
Chapter entitled 'The Autobiography of Abraham Lincoln' from "New Horizons"
L- Listening to themes and note taking
S- Giving instructions and Directions, making suggestions, accepting ideas, fixing a time and Advising
R- Reading for details -1
W- Resume and cover letter
G- Tenses – Present tense, Past tense and Future tense
V-Word formation and One-Word Substitutes

UNIT –IV
Chapter entitled *Relationships* from "Using English"
Chapter entitled ' T*he Happy Prince* from "New Horizons"
L- Listening to news
S- Narrating stories, Expressing ideas and opinions and telephone skills
R- Reading for specific details and Information
W- Technical Report writing-strategies, formats-types-technical report writing
G- Voice and Subject – Verb Agreement
V- Idioms and prepositional Phrases

UNIT –V
Chapter entitled Science and Humanism from "Using English"
Chapter entitled 'If' from "New Horizons"
L- Listening to speeches
S- Making Presentations and Group Discussions
R- Reading for Information
W- E-mail drafting
G- Conditional clauses and conjunctions
V- Collocations and Technical Vocabulary and using words appropriately

Text Books:
1. **Using English (for detailed study)** published by Orient Black Swan, 2013
2. **New Horizons** published by Pearson, 2013

SUGGESTED READING:

1. Raymond Murphy's English Grammar with CD, Murphy, Cambridge University Press, 2012.
2. English Conversation Practice –Grant Taylor, Tata McGraw Hill,2009.
3. Communication Skills, Sanjay Kumar &Pushpalatha Oxford University Press, 2012.
4. A Course in Communication Skills- KiranmaiDutt& co. Foundation Books, 2012.
5. Current English grammar and usage-S M Guptha, PHI, 2013.
6. Modern English Grammar-Krishna SWAMI .McMillan, 2009.
7. Powerful Vocabulary Builder- AnjanaAgarwal New Age International Publishers, 2011.
8. Writing with a Purpose, Tickoo and Sasi Kumar, OUP, 2011
9. Strengthen Your Writing, Orient Blackswan

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech I Sem	**T**	**P**	**C**
	4	**0**	**4**

(15A51101) MATHEMATICS – I
(Common to All Branches)

Course Outcomes:

CO1: The students become familiar with the application of differential and integral

CO2: Able to analyze the calculus, ordinary differential equations and vector calculus to engineering problems.

CO3: The students attain the abilities to use mathematical knowledge

CO4: able to analyze, formulate and solve problems in engineering applications.

CO5: Use relevant mathematical techniques, applications for evaluating various types of particular integrals in differential equations, stationary values for multi variable functions, multiple integrals in change of variables, Integrations of vector functions.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1				1			2	1			3	1
CO2	1	3				1			2	2			1	3
C03	1	3	2			1			2	2			1	3
C04	1	1	1	3		1			2	1			1	1
C05	1	1	1	1		1			2	1			1	1

UNIT – I

Exact, linear and Bernoulli equations, Applications to first order equations.
Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, sin ax, cos ax, polynomials in x, e^{ax} V(x), xV(x), method of variation of parameters, linear equations with variable coefficients: Euler-Cauchy Equations, Legendre's linear equation. Applications of linear differential equations- Mechanical and Electrical oscillatory circuits and Deflection of Beams.

UNIT – II

Taylor's and Maclaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrange's method of undetermined Multipliers with three variables only. Radius of curvature, center of curvature, Involutes, evolutes and envelopes..

UNIT – III

Curve tracing – Cartesian, polar and parametric curves. Length of curves, surface area of solid of revolution (single integrals)

UNIT – IV

Multiple integral – Double and triple integrals – Change of Variables – Change of order of integration. Applications to areas and volumes in Cartesian and polar coordinates using double and triple integral.

UNIT – V

Vector Calculus: Gradient – Divergence – Curl and their properties; Vector integration – Line integral - Potential function – Area – Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss's Divergence Theorem (Without proof). Application of Green's, Stoke's and Gauss's Theorems.

TEXT BOOKS:

1. Engineering Mathematics-I, E. Rukmangadachari& E. Keshava Reddy, Pearson Publisher.
2. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.

REFERENCES:

1. Engineering Mathematics Volume-I, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publication.
2. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.
3. Higher Engineering Mathematics, by B.V.Ramana, McGraw Hill publishers.
4. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech I Sem **T P C**
4 0 4

(15A2101) APPLIED PHYSICS
(Common to EEE, ECE & CSE)

Course Outcomes:

- **CO1**:The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fiber optics.
- **CO2:**The important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction are focused along with the understanding of quantum mechanical picture of subatomic world.
- **CO3**:The discrepancies between the classical estimates and laboratory observations of electron transportation phenomena are successfully explained by free electron theory and band theory. The physical properties exhibited by materials would be lifted through the understanding of properties of semiconductors.
- **CO4**:The dielectric and magnetic response of materials are focused.
- **CO5**:The importance of superconducting materials, nanomaterials and smart materials along with their engineering applications are well elucidated.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		2		2	2		2		1		2	
CO2	3	2		2		2	2		2		1		2	
CO3	3	3		2		2	2		2		1		2	
CO4	3	2		2		2	2		2		1		2	
CO5	3	2		2		2	2		2		1		2	

UNIT I:PHYSICAL OPTICS, LASERS AND FIBRE OPTICS

***Physical Optics**:* Introduction to interference – Colours in thin films – Newton's Rings – Michelson interferometer – Fraunhofer diffraction due to single slit, double slit – Diffraction grating.

***Lasers**:* Introduction – Characteristics of laser – Spontaneous and stimulated emission of radiation – Einstein's coefficients – Population inversion – Pumping mechanisms – Ruby laser – He - Ne laser – Applications of lasers.

Fiber optics: Introduction–Principle of optical fiber –Numerical aperture and acceptance angle – Types of optical fibers –Optical fiber communication system – Attenuation and losses in optical fibers – Applications of optical fibers.

UNIT II:CRYSTALLOGRAPHY AND QUANTUM MECHANICS

Crystallography*:* Introduction – Space lattice –Unit cell – Lattice parameters –Bravias lattice – Crystal systems – Packing fractions of SC, BCC and FCC – Miller indices – Interplanar spacing in cubic crystals – X-ray diffraction – Bragg's law –Laue method.

QuantumMechanics*:* Introduction to matter waves – de'Broglie hypothesis – Schrodinger's time independent wave equation – Significance of wave function – Particle in a one dimensional infinite potential well.

UNIT III: FREE ELECTRON THEORY AND SEMICONDUCTORS

Freeelectrontheory: Classical free electron theory – Sources of electrical resistance – Equation for electrical conductivity – Quantum free electron theory – Fermi-Dirac distribution – Kronig-Penny model (qualitative) – Origin of bands in solids – Classification of solids into conductors, semiconductors and insulators.

Semiconductorphysics*:* Introduction – Intrinsic and extrinsic semiconductors – Drift & diffusion currents – Einstein's equation – Continuity equation – Hall Effect.

UNIT IV: **DIELECTRICS AND MAGNETIC MATERIALS**

Dielectrics*:* Introduction – Dielectric Polarization – Types of Polarization – Lorentz field – Clausius-Mosotti equation – Dielectric strength, loss and breakdown.

Magneticmaterials*:* Introduction – Basic definitions – Origin of magnetic moment – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials – Hysteresis – Soft and hard magnetic materials – Applications of magnetic materials.

UNIT V: **ADVANCED MATERIALS**

Superconductors*:* Introduction – Properties of superconductors – Meissner effect– Type I and type II superconductors – ac and dc Josephson effects – BCS theory (qualitative) – High T_c superconductors – Applications of superconductors.

Nanomaterials: Introduction – Significance of nanoscale – Surface area and quantum confinement – Physical properties: optical, thermal, mechanical and magnetic – Carbon nanotubes & its properties – Applications of nanomateials.

SmartMaterials: Shape Memory Alloys: Definition – Two phases – One way and two way memory effect – Pseudo elasticity – Applications of shape memory alloys.

TEXT BOOKS:

1. Engineering physics – M.N. Avadhanulu and P.G. KrshiSagar, Chand and Co.
2. Engineering physics – S. ManiNaidu, Pearson Education

REFERENCES:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Introduction to modern optics – Grant R Fowles
3. A text book on Optics – Brijlal&Subramanyam
4. Semiconductor physics and devices- Basic principle – Donald A, Neamen, McGraw Hill
5. Introduction to Nanotechnology – C P Poole and F J Owens, Wiley

6. Shape Memory Alloys-Modeling and Engg. Applications – C Lagoudas, Springer
7. Engineering Physics – V. Rajendran, K.Thyagarajan Tata MacGraw Hill Publishers
8. Engineering Physics – S.O.Pillai, New Age Publications
9. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press
10. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
11. Engineering Physics – M. Arumugam, Anuradha Publications

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech I Sem **T P C**
4 0 4

(15A01101) ENVIRONMENTAL STUDIES
(Common to all Branches)

Course Outcomes

CO1: Critical Thinking: demonstrate critical thinking skills in relation to environmental affairs.

CO2: Communication: demonstrate knowledge and application of communication skills and the ability to write effectively in a variety of contexts.

CO3: Interdisciplinary Synthesis: demonstrate an ability to integrate the many disciplines and fields that intersect with environmental concerns.

CO4:Ecological Literacy: demonstrate an awareness, knowledge, and appreciation of the intrinsic values of ecological processes and communities

CO5: Sustainability: demonstrate an integrative approach to environmental issues with a focus on sustainability.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				2			3		1				
CO2	1				2			3		1				
CO3	1				2			3		1				
CO4	1				1			3		1				
CO5	1				2			3		1				

UNIT – I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: – Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – II

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological sucession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION: Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-soports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered
and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of:

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT: Causes**,** effects and control measures of urban and industrial wates – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Proggramme. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds – river, hill slopes, etc.,

TEXT BOOKS:

1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.
3. Environmental Studies by Benny Joseph, TMH Publishers

REFERENCES:

1. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company.
2. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
3. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
4. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
5. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech I Sem **T P C**
4 0 4

(15A03102)Engineering Graphics
(CIVIL, EEE, ECE, CSE & CHEMICAL)

Course Outcomes:
CO1: To draw and understand the practical importance of geometrical constructions
CO2: To understand the representation of the regular planes and solids in first angle of projections
CO3: Student will be familiar with the BIS conventions and dimensions
CO4: Student will be familiar with the positions of points and straight lines under different cases
CO5: Student can draw the development for regular solids, familiarize with the 2D and 3D projections of various figure

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		1							1				
CO2	1		1							1				
CO3	1		1							1				
CO4	1		1							1				
CO5	1		1							1				

UNIT-I
Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance Drawing Instruments and their Use – BIS Conventions in drawing and Lettering.
Curves used in practice:
a) Conic sections including the Rectangular Hyperbola
b) Cycloid, Epicycloid and Hypocycloid –Normals and Tangents
c) Involute of a circle –Normals and Tangents

Principles of orthographic projection, I and III angle projections –Conventions – Projections of points.

UNIT –II
Projection of lines inclined to both planes –traces, Projection of plane figures inclined to both planes.

UNIT –III
Projection of simple solids inclined to both planes.

UNIT –IV

Sections and Developments: Sections and Sectional views of Regular solids –Prism, Cylinder, Pyramid, Cone – True shapes.

UNIT –V

Isometric projections: Principles of pictorial representations-Isometric projection-Isometric scale-Isometric views- conventions- Isometric views of plane figures, solids-Isometric projection of objects with non isometric lines-Isometric projection of spherical parts.

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhat, Charotar Publishers
2. Engineering Drawing, K.L. Narayana& P. Kannaih, Scitech Publishers, Chennai.

REFERENCES:

1. Engineering Drawing, Johle, Tata McGraw-Hill Publishers.
2. Engineering Drawing, Shah and Rana,2/e, Pearson Education
3. Engineering Drawing and Graphics, Venugopal/New age Publishers
4. Engineering Graphics, John&john.

Suggestions:

Student is expected to buy a book mentioned under 'Text books' for better understanding.
Student should prepare rough sketches for all the problems given at the end of each chapter to improve his / her imaginations.
Student should also practice Auto CAD or any other drawing software to help understanding better.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech I Sem **T P C**
0 3 2

(15A52102) APPLIED PHYSICS LABORATORY

Course Outcomes:

- **CO1**:The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fiber optics.
- **CO2:**The important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction are focused along with the understanding of quantum mechanical picture of subatomic world.
- **CO3**:The discrepancies between the classical estimates and laboratory observations of electron transportation phenomena are successfully explained by free electron theory and band theory. The physical properties exhibited by materials would be lifted through the understanding of properties of semiconductors.
- **CO4**:The dielectric and magnetic response of materials are focused.
- **CO5**:The importance of superconducting materials, nanomaterials and smart materials along with their engineering applications are well elucidated.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		2		2	2		2		1		2		
CO2	3	2		2		2	2		2		1		2		
CO3	3	3		2		2	2		2		1		2		
CO4	3	2		2		2	2		2		1		2		
CO5	3	2		2		2	2		2		1		2		

Any EIGHT of the following experiments have to be performed during the SEMESTER

1. Determination of wavelengths of various colours of mercury spectrum using diffraction grating in normal incidence method.
2. Determination of dispersive power of the prism
3. Determination of thickness of thin object by wedge method.
4. Determination of radius of curvature of lens by Newton's rings.
5. Laser: Diffraction due to single slit
6. Laser: Diffraction due to double slit
7. Laser: Determination of wavelength using diffraction grating
8. Determination of Numerical aperture of an optical fiber.
9. Meldes experiment: Determination of the frequency of tuning fork

10. Sonometer: Verification of the three laws of stretched strings
11. Energy gap of a material using p-n junction diode
12. Electrical conductivity by four probe method
13. Hall effect: Determination of mobility of charge carriers in semiconductor
14. B-H curve
15. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
16. Determination of dielectric constant and Curie temperature of a ferroelectric material.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech I Sem **T P C**
0 3 2

(15A35101) Engineering Workshop &IT Workshop
(Common to all branches)

Course Outcomes:

CO1: Student will be aware of the safety aspects in using the tools

CO2: Student will be able to use the tools for the preparation of models in respective trades of engineering workshop.

CO3: Precautions in making the models will be known by the student.

CO4: Student will be aware of the usage of the power tools for various purposes.

CO5: Knowledge about the measuring instruments will be achieved.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				3				1							
CO2								1							
CO3								1							
CO4								1							
CO5								1							

Part – A: Engineering Workshop Lab

1. TRADES FOR EXERCISES:

At least 2 exercises In each:

1. Carpentry
2. Fitting
3. House-wiring
4. Black Smithy
5. Tin smithy
6. Power Tools Demonstration

TEXT BOOK:

1. Work shop Manual / P.Kannaiah/ K.L.Narayana/ Scitech Publishers.

Objective: The objective of this subject is to provide the basic concepts about different manufacturing processes and use of various workshop tools the exposer to the Power tools used in the inclusion

Codes / Tables : Nil

Question Paper pattern: Test in any two out of 6 trades.

PART – B: IT Workshop

Course Outcomes:

- Disassemble and Assemble a Personal Computer and prepare the computer ready to use
- Prepare the Documents using Word processors
- Prepare Slide presentations using the presentation tool
- Interconnect two or more computers for information sharing
- Access the Internet and Browse it to obtain the required information
- Install single or dual operating systems on computer.
- Prepare spread sheets for calculations using excel.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					2					1					
CO2			1		2					1					
CO3			1		2					1					
CO4			1		2					1					
CO5			1		2					1					

Preparing your Computer

Task 1: Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2: Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

Task 3: Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4: **Operating system features**: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

Networking and Internet

Task 5:Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc should be done by the student. The entire process has to be documented.

Task 6:Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create

e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc.
If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, search process using different natural languages, and creating e-mail account.
Task 7: Antivirus: Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.
Productivity tools
Task 8: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.
Task 9: Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement.Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.
Task 10: Presentations: creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

REFERENCES:
1. Introduction to Computers, Peter Norton, McGraw Hill
2. MOS study guide for word, Excel, Powerpoint& Outlook Exams", Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI

5.Trouble shooting, Maintaining& Repairing PCs", Bigelows, TMH

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech I Sem **T P C**
0 3 2

(15A55102) English Language Communication Skills (ELCS) Lab
(Common to all branches)

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Course Objectives:

- To train students to use language effectively in everyday conversations, to participate in group discussions, to help them face interviews, and sharpen public speaking skills
- To expose the students to a varied blend of self-instructional learner-friendly modes of language learning through computer-aided multi-media instruction.
- To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To help the second language learners to acquire fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

Course Outcomes:
CO1: Becoming active participants in the learning process and acquiring proficiency in spoken English of the students.
CO2: Speaking with clarity and confidence thereby enhancing employability skills of the students.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1							2			2				
CO2							2			2				

UNIT- I
Phonetics – Introduction to Sounds of Speech – Vowels – Consonants – Phonetic Transcription & Orthographic Transcription
UNIT – II
Syllabification – Word Stress – Rules of word stress – Intonation – Falling tone and Rising tone
UNIT – III
Situational Dialogues – Role-play – Expressions in various situations – Self Introduction – Introducing others – Greetings – Apologies – Requests – Social and Professional etiquettes – Telephone Etiquettes

UNIT – IV
JAM – Describing object/person/place/situation – Giving directions
UNIT – V
Debates and Group Discussions
MINIMUM REQUIREMENT FOR ELCS LAB:
The English Language Lab shall have two parts:

1. Computer Assisted Language Learning (CALL) Lab:
   The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
2. The Communication Skills Lab with movable chairs and audio-visual aids with a P.A. system, Projector, a digital stereo-audio & video system and camcorder etc.

System Requirement (Hardware component):
Computer network with LAN with minimum 60 multimedia systems with the following specifications:

i) P – IV Processor
   a) Speed – 2.8 GHZ
   b) RAM – 512 MB Minimum
   c) Hard Disk – 80 GB
ii) Headphones of High quality

SUGGESTED SOFTWARE:

1. Walden Infotech English Language Communication Skills.
2. Clarity Pronunciation Power – Part I (Sky Pronunciation)
3. Clarity Pronunciation Power – part II
4. K-Van Advanced Communication Skills
5. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
6. *DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.*
7. Lingua TOEFL CBT Insider, by Dreamtech
8. English Pronunciation in Use (Elementary, Intermediate, Advanced) CUP
9. Cambridge Advanced Learners' English Dictionary with CD.

REFERENCES:

1. **A Textbook of English Phonetics for Indian Students** 2nd Ed T. Balasubramanian. (Macmillian), 2012.
2. **A Course in Phonetics and Spoken English**, DhamijaSethi, Prentice-Hall of India Pvt.Ltd
3. **Speaking English Effectively**, 2nd Edition Krishna Mohan & NP Singh, 2011. (Mcmillan).
4. **A Hand book for English Laboratories**, E.Sureshkumar, P.Sreehari, Foundation Books,2011
5. **English Pronunciation in Use. Intermediate & Advanced**, Hancock, M. 2009. CUP
6. **Basics of Communication in English**, Soundararaj, Francis. 2012.. *New Delhi: Macmillan*
7. **Spoken English** (CIEFL) in 3 volumes with 6 cassettes, OUP.
8. **English Pronouncing Dictionary**, Daniel Jones Current Edition with CD.Cambridge, 17th edition, 2011.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II Sem	T	P	C
	4	0	4

(15A51201) MATHEMATICS - II
(Common to All Branches)

Course Outcomes:

COURSE OBJECTIVES:

CEO 1: To impart basic knowledge on Fourier series, Fourier transforms, Laplace Transforms, z-transforms and partial differential equations.

CEO 2: To develop skills in analyzing the problems, designing mathematical models,
Fourier series, Fourier transforms, Laplace transforms, z-transforms and partial differential equations for the problems in engineering.

COURSE OUTCOMES: After completion of the course a successful student is able to

CO 1: Acquire basic knowledge in Fourier series and Fourier transforms, Fourier integrals, Laplace transforms and their applications, z- transforms and their applications, Solving partial differential equations, Heat transfer and wave motion

CO 2: Able to Develop the problem solving skills in Properties of Fourier series for a given function, Partial differential equations through different evaluation methods, Difference equations through z – transforms, Engineering systems and processes involving wave forms and heat transfer

CO 3: Develop skills in designing mathematical models, derivations for Problems involving heat transfer and wave forms, Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z-transforms and difference equations

CO 4: Develop analytical skills in solving the complex problems involving Fourier series and Fourier transforms, Laplace transforms, Z-transforms and difference equations, Heat transfer and wave motion

CO 5: Use relevant transformation techniques, applications for Obtaining Fourier transforms for different types of functions, Laplace transforms, Z- transforms, Partial differential equations

Course Outcome	Program Outcomes													
	PO 1	PO 2	P O3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	P S O 1	P S O 2
CO1	3	1	-	-	-	1	-	-	2	1	-	-		
CO2	1	3	-	-	-	1	-	-	2	2	-	-		
CO3	1	3	2	-	-	1	-	-	2	2	-	-		
CO4	1	1	1	3	-	1	-	-	2	1	-	-		
CO5	1	1	1	1	-	1	-	-	2	1	-	-		

UNIT – I

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac’s delta function – Convolution theorem – Laplace transform of Periodic function.

Differentiation and integration of transform – Application of Laplace transforms to ordinary differential equations of first and second order.

UNIT – II

Fourier Series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic continuation – Half-range Fourier sine and cosine expansions- Parseval's formula- Complex form of Fourier series.

UNIT – III

Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

UNIT – IV

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one dimensional wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.s

UNIT – V

z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.

REFERENCES:

1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.
2. Higher Engineering Mathematics, by B.V.Ramana, McGraw Hill publishers.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II Sem	T	P	C
	4	0	4

(15A53201) APPLIED CHEMISTRY
(Common to EEE,ECE,CSE)

COURSE OBJECTIVES	
1	The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
2	The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
3	The lucid explanation of the topics will help students understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
4	The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example

COURSE OUTCOMES	
CO1	The students would understand about the concepts of chemistry in respect of Electrochemical cells, fuel cells, mechanism of corrosion and factors to influence, polymers with their applications, engineering materials and water chemistry.
CO2	Understand industrially based polymers, various engineering materials.
CO3	Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. The Students select and apply suitable treatments domestically and industrially.
CO4	They can able to know the chemical properties of engineering materials like ceramics, cement, glass, refractories, rocket propellants, lubricants.
CO5	Understanding the water treatment to reduce the impurities, corrosion of boiler, internal and external treatment of water.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		2		2	2		2		1		2	
CO2	3	2		2		2	2		2		1		2	
CO3	3	3		2		2	2		2		1		2	
CO4	3	2		2		2	2		2		1		2	
CO5	3	2		2		2	2		2		1		2	

UNIT – 1 ELECTROCHEMISTRY

i).Review of electrochemical cells, Numerical calculations, Batteries: Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries),Fuels cells: (Hydrogen-Oxygen and Methanol-Oxygen)

ii).Electrochemical sensors: Potentiometric Sensors and voltammetric sensors. Examples: analysis of Glucose and urea

iii).Corrosion:Definition, types of corrosion, Electrochemical Theory of corrosion, Factors affecting the corrosion.Prevention: Anodic and catholic protection and electro and electroless plating. (10h)

UNIT – II POLYMERS

i)Introduction to polymers, Polymerisation process, mechanism: cationic, anionic, free radical and coordination covalent.

Elastomers (rubbers)

Natural Rubber; Compounding of Rubber

Synthetic Rubber: Preparation, properties and engineering applications of Buna-S, buna-N, Polyurethene, Polysulfide (Thiokol) rubbers

Plastomers: Thermosetting and Thermoplatics, Preparation, properties and Engineering applications, PVC, Bakelite, nylons.

ii)Conducting polymers: Mechanism, synthesis and applications of polyacetyline, polyaniline.

iii)Liquid Crystals: Introduction, classification and applications

iii)Inorganic Polymers: Basic Introduction, Silicones, Polyphospazins (-(R)2-P=N-) applications. (12h)

UNIT – III FUEL TECHNOLOGY

i).Classifications of Fuels – Characteristics of Fuels- Calorific Value – Units, Numerical Problems.

Solid Fuels–Coal, Coke : Manufacture of Metallurgical Coke by Otto Hoffmann's by product ovenprocesses.

ii).Liquid Fuels:

Petroleum: Refining of Petroleum, Gasoline: Octane Number, Synthetic Petrol: Bergius Processes, Fischer Troph's synthesis

Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

iii). Gaseous Fuels:Origin, Production and uses of Natural gas, Producer gas, Water gas, Coal gas and Biogas.

iv). Nuclear Fuels: Controlled and uncontrolled reactions. Breeder reactor and Power reactors. (12h)

UNIT – IV CHEMISTRY OF ENGINEERING MATERIALS

i).Electrical Insulators or Dielectric materials: Definition and classification, Characteristics of electrical insulators. Applications of electrical insulating materials (Gaseous, liquid and solid insulators)

iii).Semiconducting and Super Conducting materials-Principles and some examples

iii).Magnetic materials – Principles and some examples (9h)

UNIT – V NANOCHEMISTRY & COMPOSITE MATERIALS

i). Nanochemistry Introduction, nanotechnology applications, nanomaterials, nanoparticles, nanostructure, supramolecular systems, future perspective.

ii). Composite Materials: Classification of Composites materials, Constituents of Composite materials. Disperse Phase composite materials Ex. a) Glass fibre reinforced polymer composite
and b) Carbon fibre reinforced polymer composite materials. Advantages and applications of Composites.

TEXT BOOKS:

1. Engineering Chemistry by KNJayaveera, GVSubba Reddy and C. Ramachandraiah, McGraw Hill Higher Education, Foruth Edition, New Delhi
2. A Text book of Engineering Chemistry by SS Dhara, S. Chand Publications, New Delhi

REFERENCES:

1. A Text Book of Enigneering Chemistry, Jain and Jain, DhanapathiRai Publications, New Delhi
2. Engineering Chemistry by K.B.ChandraSekhar, UN.Das and Sujatha Mishra, SCITECH Pubblications India Pvt Limited.
3. Concepts of Engineering Chemistry- AshimaSrivastavaf and N.N. Janhavi
4. Text Book of Engineering Chemistry – C. Parameswara Murthy, C.V.Agarwal and Andra Naidu
5. Chemistry of Engineering Materials, C.V.Agarwal, C.Parameswaramurthy and Andranaidu
5. Text Book of Engineering Chemistry, Shashichawla, Dhanapathirai Publications.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II Sem

T	P	C
4	0	4

(15A51202) MATHEMATICAL METHODS
(Common to ECE,CSE)

COURSE OBJECTIVES:

CEO 1:To impart basic knowledge on ranks of matrices, systems of linear equations,numerical methods to solve algebraic and transcendental equations,differential equations, numerical differentiation and integration.

CEO 2:To develop skills in analyzing various numerical techniques, designing mathematical models, numerical techniques for engineering problems and
fitting of curves to experimentaldata.

COURSE OUTCOMES: After completion of the course a successful student is able to

CO 1 :Acquire basic knowledge in Finding the rank of matrices and analyzing them, Solving algebraic and transcendental equations by various numerical methods, Fitting of various types of curves to the experimental data, Estimating the missing data through interpolation methods, Identification of errors in the experimental data, Finding the values of derivatives and integrals through various numerical methods, differential equations numerically when analytical methods fail to hold.

CO 2 : Able to Develop the problem solving skills in Interpolating a given data, Properties of interpolating polynomials and derive conclusions, Properties of curves of best fit to the given data, Algebraic and transcendental equations through their solutions, Properties of functions through numerical differentiation and integration, Properties of numerical solutions of differential equations

CO 3 : Develop skills in designing mathematical models, derivations for Fitting geometrical curves to the given data, Solving differential equations, Constructing polynomials to the given data and drawing inferences.

CO 4 : Develop numerical skills in solving the complex problems involving Systems of linear equations, Fitting of polynomials and different types of equations to the experimental data, Derivatives and integrals, Ordinary differential equations

CO 5 : Use relevant numerical techniques, applications for Diagonalising the matrices of quadratic forms, Interpolation of data and fitting interpolation polynomials, Fitting of different types of curves to experimental data, Obtaining derivatives of required order for given experimental data

Course Outcome	Program Outcomes												Program Specific Outcomes				
	PO 1	PO 2	P O3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	-	-	-	1	-	-	2	1	-	-					
CO2	1	3	-	-	-	1	-	-	2	2	-	-					
CO3	1	3	2	-	-	1	-	-	2	2	-	-					
CO4	1	1	1	3	-	1	-	-	2	1	-	-					
CO5	1	1	1	1	-	1	-	-	2	1	-	-					

UNIT – I

Elementary row transformations-Rank – Echelon form, normal form – Consistency of System of Linear equations.Lineartransformations.Hermitian, Skew-Hermitian and Unitary matrices and their properties. Eigen Values, Eigen vectors for both real and complex matrices. Cayley – Hamilton Theorem and its applications – Diagonalization of matrix.Calculation of powers of matrix and inverse of a matrix. Quadratic forms – Reduction of quadratic form to canonical form and their nature.

UNIT – II

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation: Crout'striangularisation method, Gauss - Seidal iteration method.

UNIT – III

Interpolation: Newton's forward and backward interpolation formulae–Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

UNIT – IV

Curve fitting: Fitting of a straight line – Second degree curve – Exponentional curve-Power curve by method of least squares. Numerical Differentiation for Newton's interpolation formula. Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

UNIT – V

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods. Numerical solutions of Laplace equation using finite difference approximation.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher.

REFERENCES:

1. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.
2. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.
3. Higher Engineering Mathematics, by B.V.Ramana, McGraw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
COLLEGE OF ENGINEERING: ANANTAPUR

I B.Tech II-Sem **T P C**
4 0 4

(15A04201) CIRCUIT THEORY

Course Objectives:

- To study about basic laws that govern flow of current, different sources of voltage and currents
- To study about different network theorems
- To study about principles of coupling
- To study about different parameters associated with two port networks

Course Outcomes:

After completion of the course the students will be able to

CO1: Understand the concepts of nodal and mesh analysis, network topology, network theorems & DC, AC circuits using KVL & KCL.

CO2: Apply the knowledge of different circuit analysis techniques, network theorems & both DC, AC circuits to solve problems related to the topics.

CO3: Analyze DC transient circuits involving RL, RC & RLC circuits, magnetically coupled circuits, symmetrical & asymmetrical networks to know the behaviour of the responses in the circuits/networks.

CO4: Derive the expressions for the responses (voltage or current) in under damped, critical damped & over damped RLC circuits. Also derive characteristic impedance, propagation constant, image & iterative impedances related to symmetrical & asymmetrical networks.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	1	1			1	1	2	1	1	2	1
CO2	2	3	1	2	1	1		2	1	2	2	1	2	1
CO3	2	3	1	2	1	1		2	1	2	1	1	3	1
CO4	2	3	1	1	1	1		2	1	2	2	1	3	1

UNIT - I

Circuit Analysis Techniques: Voltage and Current Laws, Loop and Nodal methods of analysis of Networks with dependent and independent voltage and current sources, Duality & Dual networks.

Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, f-circuit matrix and f-cutset matrix, Tie set and Cutset Matrices for planar networks.

UNIT – II

Magnetically Coupled Circuits: Self inductance, Mutual inductance, Dot rule, Coefficient of coupling, Analysis of multi-winding coupled (series and parallel) circuits, Energy Considerations, The Linear Transformer, The Ideal Transformer.

A.C Circuit Power Analysis: Instantaneous Power, Average Power, Effective Values of Current and Voltage, Apparent Power and Power Factor, Complex Power.

UNIT – III

Network Theorems: Linearity and Superposition, Reciprocity, Thevenin's& Norton's, Maximum Power Transfer, Milliman, Miller, Tellegan'sTheorems.Source Transformation.

UNIT - IV

Transient Analysis: Basic RL and RC Circuits- The Source free RL Circuit, The Source free RC Circuit, Properties of Exponential Response, Natural response and forced response, Characteristics of Sinusoids, Forced Response of Sinusoidal Functions, The Complex forcing Function, The Phasor, Phasor relationships for R,L, and C, Impedance, Admittance Transient
response of RC, RL and RLC circuits to excitation by DC and exponential sources, Complete response of RC, RL and RLC circuits to sinusoidal excitation.

UNIT - V

Two Port Networks: Relationship of two port variables, Short circuit Admittance parameters, Open circuit Impedance parameters, Transmission Parameters, Hybrid Parameters, Relationship between parameter sets, Interconnection of two port networks, Lattice networks.

Symmetrical and Asymmetrical networks:
Symmetrical Network - Concept and significance of characteristic impedance, propagation constant, attenuation constant (with expression in terms of Zo, Zoc for T network, Pi-network).
Asymmetrical Network - Concept and significance of iterative impedance, image impedance, image transfer constant and insertion loss.

TEXT BOOKS:

1. Hayt, Kemmerly and Durbin, "Engineering Circuit Analysis", 6th edition, Tata McGraw-Hill
2. M.E.VanValkenburg, "Network Analysis," McGraw Hill, 3rd Edition.

REFERENCES:

1. John D. Ryder, "Networks, Lines, and Fields," PHI publications, Second Edition, 2012.
2. D Roy Choudary, "Network and Systems" New Age International,
3. A. Sudhakar&ShyanmugamS.Palli "Circuits & Network Analysis & Synthesis", 2nd Edition, Tata McGraw Hill, 1994
4. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II Sem **T P C**
4 0 4

(15A04202) COMPUTER PROGRAMMING

Course Outcomes:
At the end of the course students will be able to
CO1: Solve the given problem using the syntactical structures of C language
CO2: Develop, execute and document computerized solution for various problems using the features of C language
CO3: To read and write C program that uses pointers, structures and files

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2		1	1		2	2	1	1	1	2
CO2	2	3	3	1	1	2			1	1	1	1	1	2
CO3	3	3	2	1		2		1	2	1	1	1	1	2

UNIT-I Introductory Concepts: Introduction to computers, Computer characteristics, modes of operation, Types of programming languages, Introduction to C, some simple C programs, Desirable program characteristics.
C Fundamentals: C character Set, Identifiers and keywords, data types, constants, variables and arrays, Declarations, expressions, statements, Symbolic constants.

UNIT-II Operators and expressions: Arithmetic operators, unary operator, Relational and logical operators, assignment operators, conditional operators, Library Functions.
Data Input and Output: Preliminaries, singe character input, singe character output, Entering input data, writing output data, the gets and puts function.
Preparing and Running a Complete C Program: Planning a program, Writing a C program, entering the program into the compiler, compiling and executing the program, error diagnosis, debugging techniques.

UNIT-III Control Statements: Preliminaries, Branching, Looping, Nested control statements, switch statement, break statement, The continue statement, The goto statement, The comma operator.
Arrays: Defining an array, processing an array, passing arrays to functions, Multidimensional arrays, Arrays and strings.

UNIT-IV Functions: Defining a function, accessing a function, function prototypes, passing arguments to a function, recursion.
Pointers: Fundamentals, Pointer declarations, Passing pointers to the functions, pointers and one dimensional array, dynamic memory allocation, Operations on pointers, arrays of pointers.

UNIT–V Structures: Structures, array of structures, pointers to structures, unions and difference between structure and union.
Files: File handling functions for input and output.

TEXT BOOKS:

1. Byron Gottfried, "Programming with C", Schaum's Outlines, McGraw Hill 3rd Edition,2011.
2. E.Balagurusamy, "Programming in ANSI C", 4thed, Mcgraw-Hill.

REFERENCES:

1. YashwantKanetkar, "Let us C": BPB.
2. Kerninghan B.W. & Ritchie D. M., "The C Programming Language": PHI
3. C programming and Data Structures, Ashok M Kamthane, Pearson Education.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II-Sem	T	P	C
	4	0	4

(15A02202) ELECTRICAL TECHNOLOGY

Course Outcomes:

- After going through this course the student gets a thorough knowledge on DC Motors & Generators, Transformers and Induction motors with which he/she can able to apply the above conceptual things to real-world problems and applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					2		3		1			1		

UNIT- I DC GENERATORS
D.C. Generators – Principle of Operation – Constructional Features – E. M.F Equation– Numerical Problems – Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of E.M.F - Critical Field Resistance and Critical Speed - Load Characteristics of Shunt, Series and Compound Generators- Applications

UNIT – II D.C. MOTORS
D.C Motors – Principle of Operation – Back E.M.F.–Torque Equation – Characteristics and Application of Shunt, Series and Compound Motors-Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods. Three Point Starter-Losses – Constant & Variable Losses – Calculation of Efficiency - Swinburne's Test.

UNIT-III SINGLE PHASE TRANSFORMERS
Single Phase Transformers- Constructional Details- Emf Equation - Operation on No Load and on Load - Phasor Diagrams-Equivalent Circuit - Losses and Efficiency-Regulation-OC and SC Tests - Predetermination of Efficiency and Regulation.

UNIT-IV 3-PHASE INDUCTION MOTORS
Polyphase Induction Motors-Construction Details of Cage and Wound Rotor Machines- - Principle of Operation – Slip- Rotor Emf and Rotor Frequency - Torque Equation-Torque Slip Characteristics.

UNIT – V SYNCHRONOUS MACHINES
Principle And Constructional Features of Salient Pole and Round Rotor Machines – E.M.F Equation- Voltage Regulation by Synchronous Impedance Method- Theory of Operation of Synchronous Motor.

TEXT BOOKS:

1. Electric Machines –by I.J.Nagrath&D.P.Kothari,TataMcGraw Hill, 7th Edition.2005
2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press.

REFERENCES:

1. Fundamentals of Electric Machines by B. R. Gupta, Vandanasinghal, 3rd Edition, New age international Publishers.
2. Electromachanics – III by S. Kamakashiah, overseas publishers Pvt Ltd.
3. Principles of Electrical Engineering by V.K Mehta, S.Chand Publications.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II-Sem

T	P	C
0	3	2

(15A53202)APPLIED CHEMISTRY LAB

COURSE OBJECTIVES	
1	Will learn practical understanding of the redox reaction
2	Will able to understand the function of fuel cells, batteries and extend the knowledge to the processes of corrosion and its prevention
3	Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineer these to suit diverse applications
4	Will also learn the hygiene aspects of water would be in a position to design methods to produce potable water using modern technology

COURSE OUTCOMES	
CO1	Would be confident in handling energy storage systems and would be able combat chemical corrosion
CO2	Would have acquired the practical skill to handle the analytical methods with confidence.
CO3	Would feel comfortable to think of design materials with the requisite properties
CO4	Would be in a position to technically address the water related problems.
CO5	Determine viscosity , PH, acidity,corrosion of water

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		2		2	2		2		1		2	
CO2	3	2		2		2	2		2		1		2	
CO3	3	3		2		2	2		2		1		2	
CO4	3	2		2		2	2		2		1		2	

LIST OF EXPERIMENTS

1. Determination of total hardness of water by EDTA method.
2.Determination of Copper by EDTA method.
3. Estimation of Dissolved Oxygen by Winkler's method
4. Determination of Copper by Iodometry
5. Estimation of iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
6. Determination of Alkalinity of Water

7. Determination of acidity of Water
8. Preparation of Phenol-Formaldehyde (Bakelite)
9. Determination of Viscosity of oils using Redwood Viscometer I
10. Determination of Viscosity of oils using Redwood Viscometer II
11. Conductometric titration of strong acid Vs strong base (Neutralization titration).
12. Conductometric titration of Barium Chloride vs Sodium Sulphate (Precipitation Titration)
13. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
14. Estimation of Chloride ion using potassium Chromite indicator (Mohrs method)

(Any 10 experiments from the above list)

TEXT BOOKS:

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – J. Mendham et al, PearsonEducation.
2. Chemistry Practical – Lab Manual by Chandra Sekhar, GV Subba Reddy and Jayaveera.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

I B.Tech II-Sem

T	P	C
0	3	2

(15A02203) ELECTRICAL TECHNOLOGY LAB

Course Outcomes:

- After going through this course the student gets a thorough knowledge on DC Motors & Generators, Transformers and Induction motors with which he/she can able to apply the above conceptual things to real-world problems and applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					2		3		1			1		

PART-A

1. Verification of KVL and KCL.
2. Serial and Parallel Resonance – Timing, Resonant Frequency, Bandwidth and Q-Factor Determination for RLC Network.
3. Time Response of First Order RC/RL Network for Periodic Non-Sinusoidal Inputs – Time Constant and Steady State Error Determination.
4. Two Port Network Parameters – Z-Y Parameters, Chain Matrix and Analytical Verification.
5. Two Port Network Parameters – ABCD and H-Parameters.
6. Verification of Superposition and Reciprocity Theorems.
7. Verification of Maximum Power Transfer Theorem. Verification on DC, Verification on AC with Resistive and Reactive Loads.
8. Experimental Determination of Thevenin's and Norton's Equivalent Circuits and Verification by Direct Test.
9. Constant – K Low Pass Filter and High Pass Filter

PART-B

1. Magnetization Characteristics of D.C.Shunt Generator. Determination of Critical Field Resistance.
2. Swinburne's Test on DC Shunt Machine (Predetermination of Efficiency of a Given DC Shunt Machine Working as Motor and Generator).
3. Brake Test on DC Shunt Motor. Determination of Performance Characteristics.
4. OC & SC Tests on Single-Phase Transformer (Predetermination of Efficiency and Regulation at Given Power Factors and Determination of Equivalent Circuit).
5. Load Test on Single Phase Transformer.

Note: Any 12 of the above Experiments are to be conducted

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech I Sem **T P C**
4 0 4

(15A54301) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to ECE,EEE,CSE)

Course Objectives:

The objective of this course is to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to impart analytical skills in helping them take sound financial decisions for achieving higher organizational productivity.

Course Outcomes:

After completion of this course, the student will able to understand various aspects of Managerial Economics and analysis of financial statements and inputs therein will help them to make sound and effective decisions under different economic environment and market situations.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					3	2		1						

Unit I: INTRODUCTION TO MANAGERIAL ECONOMICS

Managerial Economics – Definition- Nature- Scope - Contemporary importance of Managerial Economics - Demand Analysis: Concept of Demand-Demand Function - Law of Demand - Elasticity of Demand- Significance - Types of Elasticity - Measurement of elasticity of demand - Demand Forecasting- factors governing demand forecasting- methods of demand forecasting -Relationship of Managerial Economics with Financial Accounting and Management.

UNIT II: THEORY OF PRODUCTION AND COST ANALYSIS

Production Function- Least cost combination- Short-run and Long- run production function- Isoquants and Isocosts, MRTS - Cobb-Douglas production function - Laws of returns - Internal and External economies of scale - **Cost Analysis**: Cost concepts and cost behavior- Break-Even Analysis (BEA) -Determination of Break Even Point (Simple Problems)-Managerial significance and limitations of Break- Even Point.

UNIT III: INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT

Market structures: Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition- Monopoly-Monopolistic Competition-Oligopoly-Price-Output Determination - Pricing Methods and Strategies-Forms of Business Organizations- Sole Proprietorship- Partnership – Joint Stock Companies - Public Sector Enterprises – New Economic Environment- Economic Liberalization – Privatization - Globalization.

UNIT IV: CAPITAL AND CAPITAL BUDGETING

Concept of Capital - Over and Undercapitalization – Remedial Measures - Sources of Shot term and Long term Capital - Estimating Working Capital Requirements – Capital

Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

UNIT V: INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS

Financial Accounting – Concept - Emerging need and Importance - Double-Entry Book Keeping- Journal - Ledger – Trial Balance - Financial Statements - Trading Account – Profit & Loss Account – Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

The students are required to submit any one of the following- two assignments/ a mini project/submission of any two case studies in the subject.

TEXT BOOKS:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Ahuja H.L Managerial economics. S.Chand, 3/e, 2013
3.

REFERENCES

1. Aryasri: Managerial Economics and Financial Analysis, 4/e, TMH, 2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech I-Sem	T	P	C
	4	0	4

(15A51302) COMPLEX VARIABLES AND SPECIAL FUNCTIONS

COURSE OBJECTIVES:

CEO 1: To impart basic knowledge on Beta and Gamma functions, Bessel function, Analytic functions, complex integration and power series, residue theorem, Mappings of functions of complex variables.
CEO 2: To develop skills in analyzing problems, designing mathematical models, Skills in Beta and Gamma functions, analytic functions, integral formulae, Residue theorem, conformal mappings for engineering problems.

COURSE OUTCOMES: After the completion of the course, a successful student is able to

CO 1: Acquire knowledge in Beta and Gamma functions, Expressing complex functions in power series, Differentiation and integration of complex functions, Conformal mappings and bilinear transformations, Expressing complex functions in terms of graphs and power series

CO 2: Able to Develop the problem solving skills I The properties exhibited by complex functions in Argand plane, Properties of real integrals through complex variable techniques, The properties of improper integrals through residue theory, Conformal transformations of complex valued functions for inferences, The properties of complex functions by expressing them in power series and graphs

CO 3: Develop skills in designing mathematical models , derivations involving Integrals of complex variable functions, Improper integrals using beta and gamma functions, Residue theory of complex functions, Power series expansions of complex variable functions, Transformations of complex variable functions, Fluid flow patterns and flux functions.

CO 4: Develop analytical skills in providing solutions for complex problems involving Fluid, Electrical and Magnetic Potential functions, Integration of complex functions, Improper real integrals

CO 5 : Use relevant Complex variable techniques, applications for Residues and integrals of complex functions, Improper real integrals through complex functions, Techniques of Beta and Gamma functions to improper integrals

Course Outcome	Program Outcomes													
	PO 1	PO 2	P O3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	P S O 1	P S O 2
CO1	3	1	-	-	-	1	-	-	2	1	-	-		
CO2	1	3	-	-	-	1	-	-	2	2	-	-		
CO3	1	3	2	-	-	1	-	-	2	2	-	-		
CO4	1	1	1	3	-	1	-	-	2	1	-	-		
CO5	1	1	1	1	-	1	-	-	2	1	-	-		

UNIT – I: Special Functions: Gamma and Beta Functions – their properties – Evaluation of improper integrals. Series Solutions of ordinary differential equations (Power series and Frobenius Method).

UNIT – II: Bessel functions – Properties – Recurrence relations – Orthogonality. Legendre polynomials – Properties – Rodrigue's formula – Recurrence relations – Orthogonality.

UNIT – III

Functions of a complex variable – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates.Harmonic and conjugate harmonic functions – Milne – Thomson method.
Conformal mapping: Transformation of e^z, Inz, z^2, Sin z, cos z, Bilinear transformation - Translation, rotation, magnification and inversion – Fixed point – Cross ratio – Determination of bilinear transformation.

UNIT – IV

Complex integration: Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.
Complex power series: Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point – Isolated singular point – Pole of order m – Essential singularity.

UNIT – V

Residue – Evaluation of residue by formula and by Laurent's series – Residue theorem.
Evaluation of integrals of the type
(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$ (c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - III, E. Rukmangadachari& E. Keshava Reddy, Pearson Publisher

REFERENCES:

1. Mathematics III by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publications.
2. Advanced Engineering Mathematics, Peter V.O'Neil, CENGAGE publisher.
3. Advanced Engineering Mathematics by M.C. Potter, J.L. Goldberg, Edward F.Aboufadel, Oxford.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech I Sem	**T**	**P**	**C**
	4	**0**	**4**

(15A04301) DATA STRUCTURES

Course Outcomes:

CO1: Able to understand the concepts of data structure, data type and array data structure.
CO2: Able to implement linked list data structure to solve various problems.
CO3: Able to understand and apply various data structure such as stacks, queues, trees and graphs to solve various computing problems using C-programming language.
CO4: Able to implement and know when to apply standard algorithms for searching and sorting.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	2			1	1	2	1	1	2	1
CO2	2	2	3	2	2	1	1	2	1	2	2	1	2	1
CO3	2	2	3	2	2	1	1	2	1	2	1	1	3	1
CO4	2	2	3	1	2	1	1	2	1	2	2	1	3	1

UNIT – I Introduction: Elementary data organization, Data Structure definition, Data type vs. data structure, Categories of data structures, Data structure operations, Applications of data structures, Algorithms complexity and time-space tradeoff, Big-O notation. Strings: Introduction, strings, String operations, Pattern matching algorithms.

UNIT – II Arrays: Introduction, Linear arrays, Representation of linear array in memory, Traversal, Insertions, Deletion in an array, Multidimensional arrays, Parallel arrays, Sparse matrix. Linked List: Introduction, Array vs. linked list, Representation of linked lists in memory, Traversal, Insertion, Deletion, Searching in a linked list, Header linked list, Circular linked list, Two-way linked list, Garbage collection, Applications of linked lists. Algorithm of insertion/ deletion in SLL.

UNIT – III Stack: primitive operation on stack, algorithms for push and pop. Representation of Stack as Linked List and array, Stacks applications: polish notation, recursion. Introduction to queues, Primitive Operations on the Queues, Circular queue, Priority queue, Representation of Queues as Linked List and array, Applications of queue.Algorithm on insertion and deletion in simple queue and circular queue.

UNIT – IV Trees - Basic Terminology, representation, Binary Trees, Tree Representations using Array & Linked List, Basic operation on Binary tree, Traversal of binary trees:- In order, Preorder & post order, Applications of Binary tree. Algorithm of tree traversal with and without recursion. Introduction to graphs, Definition, Terminology, Directed, Undirected & Weighted graph, Representation of graphs.

UNIT – V

Sorting and Searching: Selection sort, Bubble sort, Insertion sort, Merge sort, Quick sort, Heap sort, Radix sort, External sorting methods. Introduction of Sorting, Insertion-Bubble sort, selection sort, Merging, Merge sort, Quick sort, Radix sort, Searching: linear search, Binary search.

TEXT BOOKS:

1. Seymour Lipschutz, “Data Structures”, McGraw- Hill Publishing Company Limited, Schaum’s Outlines, Revised First Edition.
2. YedidyanLangsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, “Data Structures Using C”, Pearson Education., New Delhi.

REFERENCES:

1. E. Balagurusamy, “Data Structures using C” McGraw Hill Education India Pvt. Ltd., 2013.
2. ReemaThareja, “ Data Structures using C”, Oxford University press, 2nd edition 2014.
3. Ashok M Kamthane “C programming and Data Structures” , Pearson Education.
4. Data Structures using C, ISRD Group 2nd edition, McGraw Hill Education India Pvt. Ltd.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech I Sem	**T**	**P**	**C**
	4	**0**	**4**

(15A04302) ELECTRONIC DEVICES AND CIRCUITS
(Common to ECE,CSE)

Course Outcomes:

Upon completion of the course, students will:

CO1: Analyze the operating principles of major electronic devices, its characteristics and applications.

CO2: Recognize the different internal structure of PN junction including different types.

CO3: Design and analyze the DC bias circuitry of BJT and FET.

CO4: Design and analyze basic transistor amplifier circuits using BJT and FET.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1		1	-	-	-	1	2	-	-	2	2
CO2	1	3	3		2	-	-	-	1	2	-	-	1	1
CO3	1	2	3	1	3	-	-	-	1	3	-	-	2	3
CO4	1	2	3	1	3	-	-	-	1	3	-	-	3	3

UNIT- I

Junction Diode Characteristics: Open circuited p-njunction, Biased p-n junction,p-n junction diode, current components in PN junction Diode, diode equation,V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Diodes: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, Varactor diode, Tunnel Diode, DIAC, TRIAC, SCR, UJT. Construction, operation and characteristics of all the diodes is required to be considered.

UNIT- II

Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter, Capacitor filter, L- section filter, Π-section filter, Multiple L- section and Multiple Π section filter ,comparison of various filter circuits in terms of ripple factors.

UNIT- III

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collectorconfigurations,Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

FET: FETtypes, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT- IV

Transistor Biasing and Thermal Stabilization: Need for biasing,operating point, load line analysis, BJT biasing- methods,basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE},Ic, and β, Stability factors, (S, S', S''), Bias compensation, Thermal runaway, Thermal stability.

FET Biasing- methods and stabilization.

UNIT- V

BJT: Two port network, Transistor hybrid model, determination of h-parameters,conversion of h-parameters,generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

TEXT BOOKS:

1. J. Millman, C. Halkias, “Electronic Devices and Circuits”, TataMc-Graw Hill, Second Edition,2010.
2. David A.Bell, “Electronic Devices and Circuits”, Fifth Edition, Oxford University Press, 2009.
3. Salivahanan, Kumar, Vallavaraj, “Electronic Devices and Circuits”, Tata Mc-Graw Hill, Second Edition

REFERENCES:

1. Jacob Millman, C. Halkies, C.D.Parikh, “Integrated Electronics”, Tata Mc-Graw Hill, 2009.
2. R.L. Boylestad and Louis Nashelsky,“Electronic Devices and Circuits”,Pearson Publications,,9thEdition,2006.
3. BV Rao, KBR Murty, K Raja Rajeswari, PCR Pantulu, “Electronic Devices and Circuits”, Pearson, 2nd edition.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech I Sem **T P C**
4 0 4

(15A04303) PROBABILITY THEORY & STOCHASTIC PROCESSES

Course Outcomes:

CO1: Able to determine the temporal and spectral characteristics of random signal response of a given linear system.
CO2: learn How to deal with multiple random variables? Conditional probability and conditional expectation, joint distribution and independence, mean square estimation.
CO3: Understand the characterization of random processes and their properties..
CO4: Able to do Analysis of random process and application to the signal processing in the communication system
CO5: Formulate and solve the engineering problems involving random processes.
CO6: Analysis of random process and applications to the signal processing in communication system

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2		2		1			1	1		1	3
CO2	3	2	2	1	2		1	1	1	2	1		1	3
CO3	3	2	2	1	2	1			2	1	2	1	2	2
CO4	3	1	2	1	2	1	1	1	2	1	2	1	2	2
CO5	3	1	2	1	2	1	1	1	2	2	3		2	3
CO6	3	1	2	1	2	1	2	1	2	2	3	1	2	3

UNIT-I

Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bays' Theorem, Independent Events:
Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Raleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties.

UNIT-II

Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions.

Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two
Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT-III
The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT-IV
The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

UNIT-V
Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties.

TEXT BOOKS:

1. Peyton Z. Peebles, “Probability, Random Variables & Random Signal Principles”, TMH, 4th Edition, 2001.
2. Athanasios Papoulis and S. UnnikrishnaPillai, “Probability, Random Variables and Stochastic Processes”, PHI, 4th Edition, 2002.

REFERENCES:

1. R.P. Singh and S.D. Sapre, “Communication Systems Analog & Digital”, TMH, 1995.
2. Henry Stark and John W.Woods, “Probability and Random Processes with Application
   to Signal Processing”,Pearson Education, 3rd Edition.
3. George R. Cooper, Clave D. MC Gillem, “Probability Methods of Signal and System Analysis”, Oxford, 3rd Edition, 1999.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech I Sem	T	P	C
	4	0	4

(15A04304) SIGNALS AND SYSTEMS

Course Objectives:

- To study about signals and systems.
- To do analysis of signals & systems (continuous and discrete) using time domain & frequency domain methods.
- To understand the stability of systems through the concept of ROC.
- To know various transform techniques in the analysis of signals and systems.

Course Outcomes:
CO1: For integro-differential equations, the students will have the knowledge to make use of Laplace transforms.
CO2: For continuous time signals the students will make use of Fourier transform and Fourier series.
CO3: For discrete time signals the students will make use of Z transforms.
CO4: The concept of convolution is useful for analysis in the areas of linear systems and communication theory.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	3	2	1		1	1		1	1	1
CO2	2	3	3	1	3	2	1	1	2	2	1	2	1	1
CO3	2	3	3	2	3	2	1	1	2	2	1	1	1	1
CO4	3	3	2	2	3	2	1		3	1	1	1	1	1

UNIT I
SIGNALS & SYSTEMS: Definition and classification ofSignal and Systems (Continuous time and Discrete time),Elementary signals such as Dirac delta, unit step, ramp, sinusoidal and exponential and operations on signals.
Analogy between vectors and signals-orthogonality-Mean Square error-Fourier series: Trigonometric & Exponential and concept of discrete spectrum

UNIT II
CONTINUOUS TIME FOURIER TRANSFORM: Definition, Computation and propertiesofFourierTransform for different types of signals. Statement and proof of sampling theorem of low pass signals

UNIT III
SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS: Linear system, impulse response, Response of a linear system, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear

systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, Relationship between bandwidth and rise time. Energy and Power Spectral Densities

UNIT IV

DISCRETE TIME FOURIER TRANSFORM: Definition, Computation and propertiesofFourierTransform for different types of signals.

UNIT V

LAPLACE TRANSFORM: Definition-ROC-Properties-Inverse Laplace transforms-the S-plane and BIBO stability-Transfer functions-System Response to standard signals-Solution of differential equations with initial conditions.

The Z–TRANSFORM: Derivation and definition-ROC-Properties-Linearity, time shifting, change of scale, Z-domain differentiation, differencing, accumulation, convolution in discrete time, initial and final value theorems-Poles and Zeros in Z -plane-The inverse Z-Transform-System analysis-Transfer function-BIBO stability-System Response to standard signals-Solution of difference equations with initial conditions.

TEXT BOOKS:

1. B.P. Lathi, “Signals, Systems & Communications”, 2009,BS Publications.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, “Signals and Systems”, PHI, 2nd Edn.
3. A. Ramakrishna Rao, “Signals and Systems”, 2008, TMH.

REFERENCES:

1. Simon Haykin and Van Veen, “Signals & Systems”, Wiley, 2nd Edition.
2. B. P. Lathi, “Linear Systems and Signals”, Second Edition, Oxford University press, 2008.
3. Michel J. Robert, “Fundamentals of Signals and Systems”, MGH International Edition, 2008.
4. C. L. Philips, J. M. Parr and Eve A. Riskin, “Signals, Systems and Transforms”, Pearson education.3rd

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech I Sem **T P C**
0 3 2

(15A04305) ELECTRONIC DEVICES AND CIRCUITS LABORATORY

Course Outcomes:

- able to learn electrical model for various semiconductor devices and learns the practical applications of the semiconductor devices.
- Apply the knowledge various instruments while operating them during the expt.
- Analyze the given circuit and verify the same by conducting the expt.
- Design simple circuits like rectifiers and amplifier circuits for the given specifications.
- Compare the theoretical and practical results and draw the conclusions of the expt.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	1	2	1	1	1	2	1	2	2	3	1
CO2	2	1	2	1	2	1	1	1	2	1	2	1	3	2
C03	1	3	2	2	2		1	1	2	2	2	1	3	2
C04	1	1	3	2	2			1	2	2	2	1	3	2
C05	1	2	2	2	2			1	2	2	2	1	3	2

PART A: Electronic Workshop Practice

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

PART B: List of Experiments
(For Laboratory Examination-Minimum of Ten Experiments)

1. P-N Junction Diode Characteristics
   Part A: Germanium Diode (Forward bias&Reverse bias)
   Part B: Silicon Diode (Forward bias only)
2. Zener Diode Characteristics
   Part A: V-I Characteristics
   Part B: Zener Diode act as a Voltage Regulator
3. Rectifiers (without and with c-filter)
   Part A: Half-wave Rectifier
   Part B: Full-wave Rectifier
4. BJT Characteristics(CE Configuration)

Part A: Input Characteristics
Part B: Output Characteristics

5. FET Characteristics(CS Configuration)

Part A: Drain (Output) Characteristics
Part B: Transfer Characteristics

6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

PART C: Equipment required for Laboratory

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires
12. CRO Probes etc.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech I Sem

T	P	C
0	3	2

(15A04306) COMPUTER PROGRAMMING & DATA STRUCTURES LAB

Course Outcomes:

CO1: Apply and practice logical ability to solve the problems.

CO2: Analyzing the complexity of problems, modularize the problems into small modules and then convert them into programs

CO3: Understand and apply the pointers and use of files for dealing with variety of problems

CO4: Ability to develop programs to implement linear data structures such as stacks, queues, linked lists, etc.

CO5: Ability to identify the appropriate data structure to develop real time applications

CO6: Able to implement various kinds of searching and sorting techniques, and know when to choose which technique.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	1	3			1	2	2	1	2	1	1
CO2	1	3	2	2	3	1		1	2	2	1	2	1	1
CO3	2	3	2	2	3	1		1	2	2	2	2	2	2
CO4	2	2	2	2	3	1		1	2	2	2	2	3	3
CO5	2	3	2	2	3	1	2	2	3	2	2	2	3	3
CO6	2	3	2	2	3	1	2	2	3	2	2	2	3	3

Part A: Computer Programming

1. Write a C program to find the sum of individual digits of a positive integer.
2. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to calculate the following Sum: Sum=$1-x^2/2! +x^4/4!-x^6/6! +x^8/8!-x^{10}/10!$
5. Write a C program to find the roots of a quadratic equation.
6. Write C programs that use both recursive and non-recursive functions
    1. To find the factorial of a given integer.
    2. To find the GCD (greatest common divisor) of two given integers.
    3. To solve Towers of Hanoi problem.
7. The total distance traveled by vehicle in 't' seconds is given by distance = $ut+1/2at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration

(m/sec^2). Write C program to find the distance traveled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
    i) Addition of Two Matrices
    ii) Multiplication of Two Matrices
11. Write a C program that uses functions to perform the following operations:
    i) To insert a sub-string in to a given main string from a given position.
    ii) To delete n Characters from a given position in a given string.

12. Write a C program to determine if the given string is a palindrome or not

13. Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.

14. Write a C program to count the lines, words and characters in a given text.

15. Write a C program to generate Pascal's triangle.

16. Write a C program to construct a pyramid of numbers.

17. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$
For example: if n is 3 and x is 5, then the program computes 1+5+25+125.
Print x, n, the sum
Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

18. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

19. Write a C program to convert a Roman numeral to its decimal equivalent.

20. Write a C program that uses functions and structures to perform the following operations:
    i) Reading a complex number
    ii) Writing a complex number
    iii) Addition of two complex numbers
    iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

21. Write a C program which copies one file to another.

22. Write a C program to reverse the first n characters in a file.
(Note: The file name and n are specified on the command line.)

23. Write a C program to display the contents of a file.

24. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Part B: Data Structures

1. Write a C program that uses functions to perform the following operations on singly linked list.

   a. i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write C programs that implement stack (its operations) using
   a. i) Arrays ii) Pointers iii) linked lists
3. Write C programs that implement Queue (its operations) using
   a. i) Arrays ii) Pointers iii) linked lists
4. Write a C program that uses Stack operations to perform the following:
   - i) Converting infix expression into postfix expression
   - ii) Evaluating the postfix expression
5. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
   - i) Bubble sort
   - ii) Selection sort
   - iii) Quick Sort
   - iv) Heap Sort
   - v) Merge Sort
6. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
   a. i) Linear search ii) Binary search
7. Write a Program to Implement the Operations of Double Linked Lists
8. Write a Program to Implement Circular Queue Operations by using Array and Linked Lists.
9. Write a Program to Implement the Binary Search Tree Operations.
10. Write a Program to Perform the Tree Traversal Techniques by using the Iterative Method
11. Write C programs for implementing the following graph traversal algorithms:
    a)Depth first traversal b)Breadth first traversal
12. Write a Program to Implement All functions of a Dictionary by using Hashing
13. Write a Program to Implement Skip List Operations.
14. Write a Program to Implement Insertion, Deletion and Search Operations on SPLAY Trees.
15. Write a program to Implement Insertion and Deletion Operations on AVL Trees
16. Write a Program to Implement Insertion and Deletion Operations on B – Trees

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem	**T**	**P**	**C**
	4	**0**	**4**

(15A04401) SWITCHING THEORY AND LOGIC DESIGN

Course Outcomes:

- Understand numerical and character representations in digital logic including ASCII and error detecting and correcting codes.
- Design combinational and sequential logic circuits
- Optimize combinational and sequential logic circuits.
- Analyze a memory cell and apply for organizing larger memories

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1			1	3	2	1	1	3	2
CO2	2	2	2	2	3	1	2	1	3	3	2	2	3	2
CO3	3	3	2	2	3	2	2	1	2	3	2	2	3	2
CO4	3	3	3	2	2	2	2	1	3	2	1	2	3	3

UNIT I

Digital Systems, Binary Numbers, Number base conversions, Complements of numbers, Signed binary numbers, Binary codes.

Boolean Algebra-Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, other logic operations & Logic gates.

UNIT II

The map method, four variable & Five variable K-map, POS & SOP Simplification, Don't care conditions, NAND & NOR Implementation, Other two level Implementation, Ex-or Function, Tabular Method- Simplification of Boolean function using tabulation Method.

UNIT III

Combinational circuits, Analysis & Design procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude comparator, Decoder, Encoders, Multiplexers.

UNIT IV

Sequential Circuits, Latches, Flips-Flops - RS, JK, Master-Slave JK, D& T flip flops, Analysis of Clocked sequential circuits, State Reduction & Assignment, Design procedure, Registers & Counters – Registers, Shift Registers, Ripple Counters, Synchronous counters, asynchronous counters, Asynchronous sequential circuits - Introduction, Analysis Procedure, Design Procedure, Reduction of State flow tables, Race-free State Assignment, Hazards.

UNIT V

Memory organization,classification of semiconductor memories, ROM, PROM, DROM, EPROM, EEPROM, RAM, expansion of memory, CCD memories, content addressable memory, programmable logic devices, PROM as PLD, programmable logic array (PLA) programmable array logic (PAL), field programmable gate array (FPGA).

TEXT BOOKS:

1. M.Morris Mano & Michel D. Ciletti,"Digital Design", 3rd Edition Pearson.
2. ZviKOhavi and NirahK.Jha, "Switching theory and Finite Automata Theory", 3rd Edition Cambridge.

REFERENCES:

1. Fundamentals of Logic Design- Charles H.Routh, Thomson Publications, 5thEdition ,2004.
2. Comer, "Digital & State Machine Design", Third Indian edition, OXFORD

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem **T P C**
4 0 4

(15A04402) ELECTROMAGNETIC FIELD THEORY

Course Outcomes:

This course provides the foundational education in static electromagnetic fields, and time varying electromagnetic waves. Through lecture, and out-of-class assignments, students are provided learning experiences that enable them to:

CO1: Understand the basic laws associated with steady and time varying electromagnetic
fields and know the wave concept.
CO2: Apply the knowledge of steady and time varying electromagnetic fields in different media to solve related problems.
CO3: Analyze electric and magnetic fields at the interface of different media.
CO4: Derive Maxwell's equations for static and time varying fields, and also find the analogy between electric and magnetic fields.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		2	-	-	-	-	-	-	-	1		2
CO2	1	3	3	2	1	-	-	-	-	2	-	1	1	3
CO3	1	2	3	1	1	-	-	-	-	-	-	-	-	3
CO4	2	3	3	1		2	-	1	-	2	-	2	-	2

UNIT I

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT II

Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems.

UNIT III

Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

UNIT IV

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

UNIT V

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

TEXT BOOKS:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics", Oxford Univ. Press, 4th ed., 2008.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", TMH, 7th ed., 2006.

REFERENCES:

1. John D. Krauss, "Electromagnetics", McGraw- Hill publications.
2. Electromagnetics, Schaum's outline series, Second Edition, Tata McGraw-Hill publications, 2006.
3. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2nd Edition, 2000.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem	T	P	C
	4	0	4

(15A04403) ELECTRONIC CIRCUIT ANALYSIS & DESIGN

Course Outcomes:

CO1: Analyze the frequency response of the BJT amplifiers at low and high frequencies.
CO2: Analyze and design multistage amplifiers with compound connections, feedback amplifiers, oscillators, power amplifiers and tuned amplifiers.
CO3: Design of sinusoidal Oscillators for a given frequency.
CO4: Estimate the requirements and design the power amplifier in real time applications such astransmitters in communication systems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	2				1	3	1	1	2	1
CO2	2	1	3	2	2				3	2	1	1	3	1
CO3	2	2	3	3	2	2	1	1	3	2	2	2	3	2
CO4	2	2	3	1	2	2	2	1	3	2	2	2	2	3

UNIT I

Feedback Amplifiers: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies,Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of Analysis of Feedback Amplifiers.

Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and FET with the relevant analysis,Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and FET with relevant analysis, Crystal oscillators, Frequency and amplitude stability of oscillators.

UNIT II

BJT: Transistor at High Frequencies, Hybrid- π Common Emitter transistor model, Hybrid π conductances, Hybrid π capacitances, Validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters, CE short circuit current gain, Current gain with resistive load, Cut-off frequencies, Frequency Response and Gain Bandwidth product.

FET: Analysis of Common Source and Common Drain Amplifier circuits at High frequencies.

UNIT III

Multistage Amplifiers: Classification of amplifiers, Methods of coupling**,** Cascaded transistor amplifier and its analysis, Analysis of two stage RC coupled amplifier, High input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Analysis of multi stage amplifiers using FET, Differential amplifier using BJT.

UNIT IV

Power Amplifiers: Class A large signal Amplifiers, Second harmonic Distortions, Higher order harmonic Distortion, Transformer Coupled Audio power amplifier, Efficiency, Push-pull amplifiers, Class B Amplifiers, Class AB operation, Efficiency of Class B Amplifier, Complementary Symmetry push pull amplifier, Class D amplifier, Class S amplifier, MOSFET power amplifier, Thermal stability and Heat sink

UNIT V

Tuned Amplifiers: Introduction, Q-Factor, Small Signal Tuned Amplifier – Capacitance single tuned amplifier, Double Tuned Amplifiers, Effect of Cascading Single tuned amplifiers on Band width, Effect of Cascading Double tuned amplifiers on Band width, Staggered tuned amplifiers, Stability of tuned amplifiers

TEXT BOOKS:

1. J. Millman and C.C. Halkias, “Integrated Electronics”, McGraw-Hill, 1972.
2. Donald A. Neaman, “Electronic Circuit Analysis and Design”, McGraw Hill.
3. Salivahanan, N.Suressh Kumar, A. Vallavaraj, “Electronic Devices and Circuits”, Tata McGraw Hill, Second Edition.

REFERENCES:

1. Robert T. Paynter, “Introductory Electronic Devices and Circuits”, Pearson Education, 7th Edition
2. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory” Pearson/Prentice Hall, 9th Edition, 2006.
3. Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, Oxford University Press, 5th Edition.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem	T	P	C
	4	0	4

(15A04404) NETWORKS & TRANSMISSION LINES

Course Outcomes:
CO1: Application of Resonance principles and analyze electrical circuits by employing principles of Resonance.
CO2: Understand Two port network concepts and able to analyze and design complicated network circuits
CO3: Capable of designing wired communication systems

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	1	1	1	1		1	1	1	2	2	1
CO2	1	2	3	1	1	2	1	1	1	2	1	2	2	1
CO3	1	2	3	2	2	2	1	1	1	2	1	2	2	1

UNIT - I

Series resonance: Definition, 'quality factor **Q**' of inductor and capacitor, variation of current and voltage across L and 'C' with frequency, selectivity, Bandwidth of the series resonant circuits;
Parallel resonance: (or anti-resonance),quality factor **Q**' of parallel resonant circuit, parallel resonance in RL, RC and RLC circuits, variation of impedance with frequency, selectivity, conditions of maximum impedance Currents in parallel resonance, Bandwidth, General case of parallel resonance circuit, Anti-resonance at all frequencies; variable phase angle circuit, reactance curves, Impedance Transformation.

UNIT – II

Circuit Analysis in S-Domain- Driving point impedance 'Z(S)' and admittance 'Y(S)', Transfer impedance and admittance, Voltage and Current Transfer ratio, Concept of Poles and zeros in network functions, Restrictions on pole and zero locations for driving point functions and transfer functions, Time-domain behavior from the pole zero plot, The Complex- Frequency Plane, Natural Response and the S-Plane.
Introduction to state variables – state variables of circuits, state and output equations, advantages of state variable analysis, Circuit state equations, Proper and improper circuits, Equations for proper circuits, Transform solution of state equations, Illustrative problems

UNIT III

Two port Networks: Symmetrical and Asymmetrical networks and their properties**;** propagation constant –Attenuation constant –phase constant of twoport networks,
Attenuators: Symmetrical and Asymmetrical attenuators, T-type attenuator, Π-type attenuator, Lattice attenuator, Bridged-T attenuator, L-type attenuator.

Filters: Properties- pass and stop band - Characteristic impedance; Analysis and design of constant-k-filter low pass filter, the constant – k high pass filter, Analysis and design of m-derived low pass filter, m-derived High pass filter, Impedance Matching, Composite Filter.
Illustrative problems.

UNIT IV

Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line
Concepts, Losslessness/Low-loss Characterization, Distortion, Condition for distortion-free transmission and minimum attenuation, Loading, Types of Loading – Illustrative problems.

UNIT V

Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements; λ/4, λ/2, λ/8 Lines – Impedance Transformations, Significance of Zmin and Zmax , Smith Chart – Configuration and Applications, Single and Double Stub Matching – Illustrative Problems.

TEXT BOOKS:

1. John D. Ryder, "Networks, Lines, and Fields," PHI publications, Second Edition, 2012.
2. William H.Hayt, Jr.JackE.Kemmerly and Steven M.Durbin, " Engineering Circuit Analysis", McGraw Hill Science Engineering Seventh Edition, 2006
3. UmeshSinha, SatyaPrakashan, "Transmission Lines and Networks", 2001, Tech. India
   Publications

REFERENCES:

1. M.E.Vanvalkenburg, "Network Analysis", 3rd Edition, PHI,2003
2. Sudarshan and Shyam Mohan, "Network Theory", TMH

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem **T P C**
4 0 4

(15A04405) ANALOG COMMUNICATION SYSTEMS

Course Outcomes:
CO1: Able to compute the bandwidth and transmission power by analysing time and frequency domain spectra of signal required under various modulation schemes.
CO2: Able to apply suitable modulation schemes various applications.
CO3: Able to identify and describe different techniques in modern modern analog communications.
CO4: Able to analyzeanalog modulation techniques by using signal processing tools.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	2	1	1	1	2	1	3	1	2	3
CO2	2	2	2	2	2	1	1		2	2	2	1	2	3
CO3	2	1	2	2	2	1			2	2	2	1	2	3
CO4	1	1	2	2	2	3			2	2	2	1	2	3

UNIT- I

Introduction: Elements of communication systems, Information, Messages and Signals, Modulation, Modulation Methods, Modulation Benefits and Applications.

Amplitude Modulation & Demodulation: Baseband and carrier communication, Amplitude Modulation (AM), Rectifier detector, Envelope detector, Double sideband suppressed carrier (DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Frequency mixer, sideband and carrier power of AM, Generation of AM signals, Quadrature amplitude modulation (QAM), Single sideband (SSB) transmission, Time domain representation of SSB signals & their demodulation schemes (with carrier, and suppressed carrier), Generation of SSB signals, Vestigial sideband (VSB) modulator & demodulator, Carrier Acquisition- phased locked loop (PLL), Costas loop, Frequency division multiplexing (FDM), and Super-heterodyne AM receiver, Illustrative Problems.

UNIT- II

Angle Modulation &Demodulation: Concept of instantaneous frequency, Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Verification of Frequency modulation bandwidth relationship, Features of angle modulation, Generation of FM waves – Indirect method, Direct generation; Demodulation of FM, Bandpass limiter, Practical frequency demodulators, Small error analysis, Pre-emphasis, & De-emphasis filters, FM receiver, FM Capture Effect, Illustrative Problems.

UNIT- III

Noise in Communication Systems: Thermal noise, Time domain representation of narrowband noise, Filtered white noise, Quadrature representation of narrowband noise, Envelope of narrowband noise plus sine wave, Signal to noise ratio & probability of error, Noise equivalent bandwidth, Effective noise temperature, and Noise figure, Baseband systems with channel noise, Performance analysis (i.e. finding SNR expression) of AM, DSB-SC, SSB-SC, FM, PM in the presence of noise, Illustrative Problems.

UNIT- IV

Analog pulse modulation schemes: Pulse amplitude modulation – Natural sampling, flat top sampling and Pulse amplitude modulation (PAM) & demodulation, Pulse-Time Modulation – Pulse Duration and Pulse Position modulations, and demodulation schemes, PPM spectral analysis, Illustrative Problems.

Radio Receiver measurements: Sensitivity, Selectivity, and fidelity.

UNIT- V

Information & Channel Capacity: Introduction, Information content of message, Entropy, Entropy of symbols in long independent and dependent sequences, Entropy and information rate of Markoff sources, Shannon's encoding algorithm, Discrete communication channels, Rate of information over a discrete channel, Capacity of discrete memoryless channels, Discrete channels with memory, Shannon – Hartley theorem and its implications, Illustrative problems.

TEXT BOOKS:

1. B. P. Lathi, "Modern Digital and Analog Communication Systems," Oxford Univ. press, 3rd Edition, 2006.
2. Sham Shanmugam, "Digital and Analog Communication Systems", Wiley-India edition, 2006.

REFERENCES:

1. A. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5th Edition, 2010.
2. Simon Haykin, "Communication Systems", Wiley-India edition, 3rd edition, 2010.
3. Herbert Taub& Donald L Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 3rd Edition, 2009.
4. R.E. Ziemer& W.H. Tranter, "Principles of Communication-Systems Modulation & Noise", Jaico Publishing House, 2001.
5. George Kennedy and Bernard Davis, "Electronics & Communication System", TMH, 2004.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem	T	P	C
	4	0	4

(15A02406) CONTROL SYSTEMS ENGINEERING

Course Objective:

To make the students learn about:

- Merits and demerits of open loop and closed loop systems; the effect of feedback
- The use of block diagram algebra and Mason's gain formula to find the effective transfer function
- Transient and steady state response, time domain specifications
- The concept of Root loci
- Frequency domain specifications, Bode diagrams and Nyquist plots
- The fundamental aspects of modern control

Course Outcome:

After completing the course, the student should be able to do the following:

CO1: Evaluate the effective transfer function of a system from input to output using (i) block diagram reduction techniques (ii) Mason's gain formula

CO2: Compute the steady state errors and transient response characteristics for a given system and excitation

CO3: Determine the absolute stability and relative stability of a system

CO4: Draw root loci

CO5: Design a compensator to accomplish desired performance

CO6: Derive state space model of a given physical system and solve the state equation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3									2				
CO2	3									2				
CO3	3		1					1		2				
CO4	2		1							2				
CO5	2		1							2				
CO6	3									2				

UNIT – I CONTROL SYSTEMS CONCEPTS

Open Loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback Characteristics, Effects of positive and negative feedback. Mathematical models – Differential equations of Translational and Rotational mechanical systems, and Electrical Systems, Block diagram reduction methods – Signal flow graph - Reduction using Mason's gain formula. Transfer Function of DC Servo motor - AC Servo motor - Synchro transmitter and Receiver

UNIT-II TIME RESPONSE ANALYSIS
Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants-Effects of proportional,integral,derivativecontrollers,Design of P,PD,PI,PID controllers.

UNIT – III STABILITY ANALYSIS
The concept of stability – Routh's stability criterion – Stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT – IV FREQUENCY RESPONSE ANALYSIS
Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain margin-Stability Analysis.
Compensation techniques – Lag, Lead, Lag-Lead Compensator design in frequency Domain.

UNIT – V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS
Concepts of state, state variables and state model, derivation of state models from differential equations. Transfer function models. Block diagrams. Diagonalization. Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models.The concepts of controllability and observability.

TEXT BOOKS:
1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 5th edition, 2007.

REFERENCES:
1. Control Systems Principles & Design 4th Edition, M.Gopal, McGraw Hill Education, 2012.
2. Automatic Control Systems– by B. C. Kuo and FaridGolnaraghi – John wiley and son's, 8th edition, 2003.
3. Control Systems 3rd Edition, Joseph J Distefano III, Allen R Stubberud& Ivan J Williams, Schaum'sMcGraw Hill Education.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem	**T**	**P**	**C**
	2	**0**	**0**

(15A54402) HUMAN VALUES AND PROFESSIONAL ETHICS
(Common to ECE,EEE,CSE)

Course Outcomes: Students will be able to

- identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
- identify the multiple ethical interests at stake in a real-world situation or practice
- articulate what makes a particular course of action ethically defensible
- assess their own ethical values and the social context of problems
- identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
- demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
- integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2		3						
CO2						2		3						
CO3						2		3						
CO4						2		3						
CO5						2		3						
CO6						2		3						

UNIT I: HUMAN VALUES

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty - Courage- Co Operation – Commitment – Empathy –Self Confidence Character – Spirituality.

UNIT II: ENGINEERING ETHICS

Senses of 'Engineering Ethics- Variety of moral issued – Types of inquiry – Moral dilemmas – Moral autonomy –Kohlberg's theory- Gilligan's theory- Consensus and controversy – Models of professional roles- Theories about right action- Self-interest - Customs and religion –Uses of Ethical theories – Valuing time –Cooperation – Commitment.

UNIT III: **ENGINEERING AS SOCIAL EXPERIMENTATION**

Engineering As Social Experimentation – Framing the problem – Determining the facts – Codes of Ethics – Clarifying Concepts – Application issues – Common Ground - General Principles – Utilitarian thinking respect for persons.

UNIT IV: ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK

Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing risk-Safety and the Engineer- Designing for the safety- Intellectual Property rights(IPR).

UINIT V: GLOBAL ISSUES

Globalization – Cross culture issues- Environmental Ethics – Computer Ethics – Computers as the instrument of Unethical behavior – Computers as the object of Unethical acts – Autonomous Computers- Computer codes of Ethics – Weapons Development - Ethics and Research – Analyzing Ethical Problems in research – Intellectual property Rights(IPR).

TEXT BOOKS:

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.
2. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger – Tata McGraw-Hill– 2003.
4. "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
5. "Professional Ethics and Human Values" by A.Alavudeen, R.KalilRahman and M.Jayakumaran- LaxmiPublications.
6. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication.
7. "Professional Ethics and Human Values" by Prof.D.R.Kiran

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem

T	P	C
0	3	2

(15A04406) ELECTRONIC CIRCUIT ANALYSIS AND DESIGN LAB

Note: The students are required to design the electronic circuit and they have to perform the analysis through simulator using Multisim/ Pspice/Equivalent Licensed simulation software tool. Further they are required to verify the result using necessary hardware in the hardware laboratory**.**

Objectives:

- Help students make transition from analysis of electronic circuits to design of electronic circuits.
- To understand the Analysis of transistor at high frequencies.
- To understand the concept of designing of tuned amplifier.
- The student will construct and analyze voltage regulator circuits.
- To understand the circuit configuration and the principle operation of converters, including diode rectifiers, controlled AC-DC converters and DC choppers

Course Outcomes:

- The ability to analyze and design single and multistage amplifiers at low, mid and high frequencies.
- Designing and analyzing the transistor at high frequencies.
- Determine the efficiencies of power amplifiers.
- Determine Frequency response and design of tuned amplifiers.
- Able to Analyze all the circuits using simulation software and Hardware.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	3	2	2	1		1	3	1	2	1	2	1
CO2	1	2	3	2	2			1	3	1	2		2	1
CO3	1	3	2	2	2			1	3	1	2		2	1
CO4	2	3	3	2	2			1	3	1	2		2	1
C05	1	2	3	2	2	1	1	1	3	1	1	1	1	2

PART A: List of Experiments :(Minimum of Ten Experiments has to be performed)

1. Determination of f_T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt’s Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower

9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

PART B: Equipment required for Laboratory
Software:

i. Multisim/ Pspice/Equivalent Licensed simulation software tool
ii. Computer Systems with required specifications

Hardware:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires
12. CRO Probes etc.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

II B.Tech II Sem	T	P	C
	0	3	2

(15A04407) BASIC SIMULATION LAB

Course Outcomes:

- This lab course will enable the students to understand the fundamentals and programming knowledge in MATLAB
- Students are able to understand the basic difference between continuous time and discrete time domain signals
- Understand the generation of various signals and sequences
- Overview of signal transmission through linear systems, convolution and correlation of signals and sequences
- Gives practical understanding on generation of AM and FM signals

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2		2			1	2	1	1		1	2
CO2	1	1	2		2				2	1	1		1	2
CO3	1	2	2	1	2				2	1	1		1	2
CO4	1	2	2	1	2	1	1		2	2	2	1	1	2
CO5	1	2	2	1	2	1	1		1	1	2	1	1	2

List of Experiments: (All Experiments are to be conducted)

1. Basic Operations on Matrices
2. Generation of various signals and sequences (periodic and aperiodic) such as unit impulse, unit step, square, sawtooth, triangular, sinusoidal, ramp, sinc
3. Operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.
4. Finding the even and odd parts of signal or sequence and real and imaginary parts of signal
5. Convolution between signals and sequences
6. Autocorrelation and cross correlation between signals and sequences
7. Verification of linearity and time invariance property of a given continuous/discrete system
8. Computation of unit sample, unit step and sinusoidal responses of given LTI system and verifying its physical realizability and stability properties
9. Gibbs Phenomenon
10. Finding the Fourier Transforms of given signal and plotting its magnitude and phase spectrum.
11. Waveform synthesis using Laplace Transform
12. Locating Zero's and Pole's, and plotting the pole-zero maps in S-Plane and Z-Plane for given transfer functions
13. Generation of Gaussian noise (real and complex), computation of its mean, M.S. Values and its skew, kurtosis, and PSD, Probability Distribution Function.

14. Sampling theorem verification
15. Removal of noise by Autocorrelation/Cross correlation in a given signal corrupted by noise
16. Generation of random signals at a given data rate
17. Generation of AM and it's spectrum for single tone and for multi tone base band signals
18. Generation of FM signal and its frequency spectrum

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem **T P C**
4 0 4

(15A54501)MANAGEMENT SCIENCE

Course Objectives: The objective of the course, is to equip the student the fundamental knowledge of management science and its application for effective management of human resource, materials and operation of an organization. It also aims to expose the students about the latest and contemporary developments in the field of management**.**

Course Outcomes: After completion of this course, the prospective engineering technocrats will be able to understand various fundamentals of functional areas such general management, plant and materials management, marketing management, human resource management, statistical quality control techniques, strategic management and also aware of the latest and contemporary issues of management science.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					3			2			2			

UNIT I
INTRODUCTION TO MANAGEMENT:
Management-Concept and meaning-Nature-Functions-Management as a science and art and both. Schools of management thought-Taylor's scientific theory-Henry Fayol's principles-Weber's Ideal Bureaucracy-Eltan Mayo's Human relations-Systems theory-Situational or Contingency theory-Social responsibilities of management.**Organizational structure and design**: Features of organizational structure-work specialization-Departmentation-Span of control-Centralization and Decentralization. **Organisational designs**-Line organization-Line & Staff Organization-Functional Organization-Matrix Organization-Project Organization-Committee form of organization.

UNIT II
OPERATIONS MANAGEMENT:
Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study- Statistical Quality Control:*C* chart, *P* chart, (simple Problems) Deming's contribution to quality. **Material Management:** Objectives-Inventory-Functions,types, inventory classification techniques-EOQ-ABC Analysis-Purchase Procedure and Stores Management. **Marketing Management:** Concept- Meaning - Nature-Functions of Marketing- Marketing Mix- Channels of distribution - Advertisement and sales promotion- Marketing Strategies based on Product Life Cycle.

UNIT III
HUMAN RESOURCES MANAGEMENT (HRM):
HRM- Definition and meaning – nature-Managerial and Operative functions-Evolution of HRM-Human Resource Planning(HRP)-Employee Recruitment-sources of recruitment-

employee selection- process and tests in employee selection- Employee training and development-On- the- job and Off- the- job training methods-Performance Appraisal systems-Concept-Methods of Performance Appraisal-Placement-Employee Induction-Wage and Salary Administration-Objectives-Essentials of Wage and Salary Administration-Job Analysis-Process -Job Evaluation-Employee Grievances-techniques of handling Grievances.

UNIT IV
STRATEGIC MANAGEMENT:
Definition& meaning-Setting of Vision- Mission- Goals- Corporate Planning Process-Environmental Scanning-Steps in Strategy Formulation and Implementation-SWOT Analysis. **Project Management (PERT/CPM):**Network Analysis- Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying Critical Path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems).

UNIT V
CONTEMPORARY ISSUES IN MANAGEMENT:
The concept of MIS- Materials Requirement Planning (MRP)- Just-In-Time (JIT) System-Total Quality Management (TQM)- Six Sigma Concept- Supply Chain Management-Enterprise Resource Planning (ERP)- Performance Management- Business Process Outsourcing (BPO), Business Process Re-engineering and Bench Marking -Balanced Score Card-Knowledge Management.

The students are required to submit any one of the following- two assignments/ a mini project/submission of any two case studies in the subject.

TEXT BOOKS:
1. A.R Aryasri: Management Science, TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education,New Delhi, 2012.

REFERENCE BOOKS:
1. Kotler Philip & Keller Kevin Lane: Marketing Mangement , PHI,2013.
2. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2005.
3. Thomas N.Duening & John M.Ivancevich ManagementPrinciples and Guidelines,Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Memoria & S.V.Gauker, Personnel Management, Himalaya, 25/e, 2005
6. Samuel C.Certo: Modern Management, 9/e, PHI, 2005
7. Schermerhorn, Capling, Poole & Wiesner: Management, Wiley, 2002.
8. Parnell: Strategic Management, Biztantra, 2003.
9. Lawrence R Jauch, R.Gupta &William F.Glueck: Business Policy and Strategic Management, Frank Bros., 2005.
10. L.S.Srinath: PERT/CPM,Affiliated East-West Press, 2005.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech. I Sem	T	P	C
	4	0	4

(15A04501) COMPUTER ARCHITECTURE & ORGANIZATION

Course Objectives:

- To have a thorough understanding of the basic structure, design and operation of a computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study in detail the different types of control and the concept of pipelining
- To study the hierarchical memory system including cache memories and virtual memory
- To study the different ways of communicating with I/O devices and standard I/O interfaces

Course Outcomes:

- Ability to understand basic structure, design and operation of a computer.
- Ability to perform computer arithmetic operations & control unit operations.
- Ability to design memory organization for different word size operations.
- Ability to understand the concept of cache mapping techniques.
- Ability to understand the concept of I/O organization.
- Ability to conceptualize instruction level parallelism.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				2	1	1	1	1	2	1	2	1	1
CO2	3	1	1	1	2	1		1	1	2	1	1	1	1
CO3	2	1	1	1	2					3	2	2	1	1
CO4	3	2	2	1	2	2				2	2	2	1	1
CO5	3	2	3	1	2	1		1		2	2	2	1	1

UNIT I
INTRODUCTION

Computing and Computers, Evolution of Computers, VLSI Era, System Design- Register Level, Processor - Level, CPU Organization, Data Representation, Fixed – Point Numbers, Floating Point Numbers, Instruction Formats, Instruction Types. Addressing modes.

UNIT II
DATA PATH DESIGN
Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequential ALUs, Carry look ahead adder, Robertson algorithm, booth's algorithm, non-restoring division algorithm, Floating Point Arithmetic, Coprocessor, Pipeline Processing, Pipeline Design, Modified booth's Algorithm.

UNIT III
CONTROL DESIGN
Hardwired Control, Microprogrammed Control, Multiplier Control Unit, CPU Control Unit, Pipeline Control, Instruction Pipelines, Pipeline Performance, Superscalar Processing, Nano Programming.

UNIT IV
MEMORY ORGANIZATION
Random Access Memories, Serial - Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.

UNIT V
SYSTEM ORGANIZATION
Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and system control, IO interface circuits, Handshaking, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, operation systems, multiprocessors, fault tolerance, RISC and CISC processors, Superscalar and vector processor.

Text Books:

1. John P.Hayes, 'Computer Architecture and Organisation', Tata McGraw-Hill.
2. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, " Computer Organisation", McGraw-Hill Inc.
3. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.

References:

1. William Stallings, "Computer Organization and Architecture: Designing for performance", Eighth Edition, Pearson
2. P.PalChaudhuri, , "Computer organization and design", 2nd Ed., Prentice Hall of India, 2007.
3. G.Kane&J.Heinrich, ' MIPS RISC Architecture ', Englewood cliffs, New Jersey, Prentice Hall.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem	T	P	C
	4	0	4

(15A054502) LINEAR IC APPLICATIONS

Course Objectives:

- Basic concepts of OP-AMPs characteristics and specifications
- OP-AMP applications to signal conditioning for amplifiers, filters and oscillators
- OP-AMP applications for comparators and data conversions
- Op-AMP for advanced applications such as PLL, VCOs, and analog multipliers

Course outcomes:

- Able to learn about the operational amplifiers and its characteristics as well as various types of op-amps.
- Acquire the ability to design and test practical circuits for amplifiers, filters and oscillators.
- Able to analyze the operation of comparators, data converters and implementation of the same.
- Able to learn the functioning of PLL, VCO, V-I, I-V converters, analog multipliers and implement them for suitable applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1	-	-	-	-	2	-	-	2	1
CO2	2	1	3		2	-	-	-	-	3	-	-	2	1
CO3	2	2	3		2	-	-	-	2	3	-	-	2	1
CO4	2	2	3		1	-	-	-	2	2	-	-	2	1

UNIT I
Operational Amplifier

Basic BJT/FET Differential amplifiers – Constant current source – current mirror. Introduction, Block diagram, characteristics and equivalent circuits of an ideal op-amp, various types of Operational Amplifiers and their applications, Power supply configurations for OP-AMP applications, inverting and non-inverting amplifier configurations. The Practical op-amp: Introduction, Input offset voltage, offset current, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and gain – bandwidth product, frequency limitations and compensations, transient response.

UNIT II
Applications of Operational Amplifier

Amplifiers: Adder, subtractor, integrator, differentiator, current amplifier, difference amplifier, instrumentation amplifier, Converters: Current to voltage and voltage to current converters, Active Filters: First order filters, second order active finite and infinite gain low pass, high pass, band pass and band reject filters, Sine Wave Oscillators: RC phase shift oscillator, Wien bridge oscillator, Quadrature oscillator.

UNIT III

Non-Linear Applications of Operational Amplifier

Comparators: Inverting comparator, non-inverting comparator, zero crossing detector, window detector and level detector, Schmitt Triggers: Inverting Schmitt trigger, non-inverting Schmitt trigger with adjustable threshold levels, Waveform Generators: Square wave and triangular wave generator, Precision Rectifiers: Half and full wave precision rectifiers, log and antilog amplifiers, Peak detectors, sample and hold circuits, voltage to frequency converter, frequency to voltage converter.

UNIT IV

Data Converters

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC . Dual Slope ADC, Sigma Delta ADC and Pipeline ADC. DAC and ADC Specifications.

UNIT V

Special Purpose Integrated Circuits

Functional block diagram, working, design and applications of Timer 555 (Monostable&Astable), Functional block diagram, working and applications of VCO 566, PLL 565, multiplier MPY634, waveform generator XR 2206, power amplifier LM380. Voltage Regulators: Functional block diagram, working and design of three terminal fixed (78XX, 79XX series), three terminal adjustable (LM 317, LM 337) voltage regulators and Switching regulators (LT1070).

Text Books:

1. Roy Choudhury and S. B. Jain, “Linear Integrated Circuits”, New Age International Publishers, 4th Edition

2. Sergio Franco, “Design with operational amplifiers and analog integrated circuits”, Tata McGraw Hill, 3rd Edition.

3. Ramakant A. Gayakwad, “Op-Amps and Linear Integrated Circuits”, Pearson Prentice Hall, 4 th Edition

References:

1. Sedra A.S. & Smith K.C., “Microelectronic Circuits’, Oxford University Press 1998

2. William D. Stanley, “Operational Amplifiers with Linear Integrated Circuits ”, Pearson, 4th Edition 3. D.

3. David A. Bell, “Operation Amplifiers and Linear Integrated Circuits”, Oxford University Press, Indian Edition..

4. R. P. Jain, “Modern Digital Electronics,” Tata McGraw Hill, 3rd Edition.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem	T	P	C
	4	0	4

(15A04503) DIGITAL SYSTEM DESIGN

Course Objectives:
- Understand methodologies to know about different design entry methods
- To be able to model digital circuits in hardware description languages
- To be able to use VHDL editors, debug designs and perform logic simulation
- To be able to implement designs on Programmable Logic Devices

Course Outcomes:
Upon completion of this course, students will be able to:
- Choose appropriate design technology for a given design
- Work in a team to develop and implement designs
- Choose a right design entry method and model a digital system using a design entry
- Tool debug and test at the logic level and perform logic synthesis

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	2	1	1	1			2	2	2	1	3	2
CO2	1	3	2	2	2	1	1	1	2	3	2	1	3	2
CO3	2	3	2	2	2	1	1	1	2	3	2	1	3	2
CO4	2	3	2	2	1	1			2	2	3	1	3	2

UNIT I
Introduction to VHDL, design units, data objects, signal drivers, inertial and transport delays, delta delay, VHDL data types, concurrent and sequential statements.

UNIT II
Subprograms – Functions, Procedures, attributes, generio, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.

UNIT III
Design and VHDL implementation of Combinational logic circuit – full adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder, multiplier, divider, Hamming code encoder and correction circuits. Introduction to ROM, PLA, PAL,

UNIT IV

Design and VHDL implementation of Synchronous sequential circuits design – finite state machines, Mealy and Moore, state assignments, design and VHDL implementation of FSMs, Linear feedback shift register (Pseudorandom and CRC).
Asynchronous sequential circuit design – primitive flow table, concept of race, critical race and hazards, design issues like metastability, synchronizers, and clock skew and timing considerations.

UNIT V
Introduction to Synthesis, Testing of logic circuits,Simple Test benches. Introduction to Hierarchical and Structured Design Role of CAD Tools in the VLSI design process.

Text Books:
1. Douglas L.Perry "VHDL programming by Example" Tata McGraw Hill
2. J. Bhasker, A VHDL Primer, PH/Pearson
3. J.Bhasker, A VHDL Synthesis Primer, Second Edition, Star Galaxy.

References:
1. Fundamentals of Digital Logic with VHDL design – Stephen Brown, Zvonko Vranesic – TMH.
2. Charles H Roth Jr."Digital System Design using VHDL" Thomson learning,2004
3. Digital System Design – John Wakerley.
4. V Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem	**T**	**P**	**C**
	4	**0**	**4**

(15A04504) ANTENNAS AND WAVE PROPAGATION

Course Objectives:

- Introduces the concepts of basic antenna terminologies, fields from various charge distributions.
- Introduces the various antennas based on their operating frequency & physical arrangement, antenna measurements and also Modes of Electromagnetic wave propagation.

Course Outcomes:

Upon completion of the course, students will be able to:

- To analyze the fundamentals of antenna theory and the radiation mechanism.
- Understand the applications of the electromagnetic waves in free space and the working principles of various types of antennas.
- Understand how to measure antenna parameters like gain, directivity and radiation pattern measurement.
- Understand the concepts of radio wave propagation.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2		1	2		1			1		1	1	3
CO2	2	2		1	2			1	1	1	1		1	3
CO3	2	2	1	1	2	1			1	1	2		1	3
CO4	2	2	1	1	2	1	1		1	1	2		1	3

UNIT - I:

Antenna Basics: Introduction, Basic Antenna Parameters - Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height. Related Problems.

Thin Linear Wire Antennas: Radiation from Small Electric Dipole, Quarterwave Monopole and Halfwave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beamwidths, Directivity, Effective Area and Effective Height. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small and Large Loops (Qualitative Treatment).

UNIT - II:

VHF, UHF AND Microwave Antennas - I: Arrays with Parasitic Elements, Yagi - Uda Arrays, Folded Dipoles & their characteristics, Helical Antennas - Helical geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes. Horn Antennas - Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

UNIT - III:
VHF, UHF AND Microwave Antennas - II: Microstrip Antennas - Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas - Geometry and Parameters, Characteristics of Microstrip Antennas. Impact of Different Parameters on Characteristics, Reflector Antennas - Introdcution, Flar Sheet and Corner Reflectors, Paraboloidal Reflectors - Geometry, Pattern Characteristics, Feed Methods, Reflector Types - Related Features, Illustrative Problems.
Lens Antennas - Introduction, Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications.

UNIT - IV:
Antenna Arrays: Point Sources - Definition, Pattern, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays - Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparision, BSAs with Non-unitform Amplitude Distributions - General Considerations and Binomial Arrays, Illustrative Problems.
Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by Comparision, Absolute and 3-Antenna Methods)

UNIT - V:
Wave Propagation - I: Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Quantitative Treatment) - Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections, Space Wave Propagation - Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super retraction, M-Curves and Duct Propagation, Scattering Phenomena, Tropospheric Propagation.
Wave Propagation - II: Sky Wave Propagation - Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and skip Distance, Multi-hop Propagation.

Text Books:

1. Antennas for All Applications – John D. Kraus and R. J. Marhefka, and Ahmad S. Khan TMH, New Delhi, 4th ed., (Special Indian Edition) 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.

References:

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd ed., 2005.

2. Antennas and Wave Propagation – K.D. Prasad, SatyaPrakashan, Tech India Publications, New Delhi, 2001.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th edition, 1955.
5. Antennas – John D. Kraus, McGraw-Hill (International Edition), 2nd Ed. 1988.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem **T P C**
4 0 4

(15A04505) DIGITAL COMMUNICATION SYSTEMS

Course Objectives:

- To introduce the different digital modulation techniques such as PCM, DM and various shift keying techniques, information theory and different source coding techniques.
- To introduce different error detecting and error correcting codes like block codes, cyclic codes and convolution codes.

Course Outcomes:

Upon completion of the course, students will be able to:

- Understand the elements of digital communication system and able to analyse the different coding and modulation techniques.
- Understand the basic principles of baseband and passband digital modulation schemes.
- Analyze probability of error performance of digital systems and are able to design digital communication systems.
- Understand the basics of information theory and error correcting codes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2		1		2	2	3	2	2	3
CO2	3	2	3	1	2		1		2	2	3		2	3
CO3	3	2	3	1	2	1	1	1	2	3	3	1	2	3
CO4	3	2	3	1	2	1	1		2	2	3	1	2	3

UNIT – I

Source Coding Systems: Introduction, sampling process, quantization, quantization noise, conditions for optimality of quantizer, encoding, Pulse-Code Modulation (PCM), Line codes, Differential encoding, Regeneration, Decoding & Filtering, Noise considerations in PCM systems, Time-Division Multiplexing (TDM), Synchronization, Delta modulation (DM), Differential PCM (DPCM), Processing gain, Adaptive DPCM (ADPCM), Comparison of the above systems.

UNIT – II

Baseband Pulse Transmission: Introduction, Matched filter, Properties of Matched filter, Matched filter for rectangular pulse, Error rate due to noise, Inter-symbol Interference (ISI), Nyquist‟s criterion for distortion less baseband binary transmission, ideal Nyquist channel, Raised cosine filter & its spectrum, Correlative coding – Duo binary & Modified duo binary signaling schemes, Partial response signaling, Baseband M-array PAM transmission, Eye diagrams.

UNIT – III

Signal Space Analysis: Introduction, Geometric representation of signals, Gram-Schmidt orthogonalization procedure, Conversion of the Continuous AWGN channel into a vector channel, Coherent detection of signals in noise, Correlation receiver, Equivalence of correlation and Matched filter receivers, Probability of error, Signal constellation diagram.

UNIT - IV

Passband Data Transmission: Introduction, Passband transmission model, Coherent phase-shift keying – binary phase shift keying (BPSK), Quadrature shift keying (QPSK), Binary Frequency shift keying (BFSK), Error probabilities of BPSK, QPSK, BFSK, Generation and detection of Coherent BPSK, QPSK, & BFSK, Power spectra of above mentioned modulated signals,M-array PSK, M-array quadrature amplitude modulation (M-array QAM), Non-coherent orthogonal modulation schemesDifferential PSK, Binary FSK, Generation and detection of non-coherent BFSK, DPSK, Comparison of power bandwidth requirements for all the above schemes.

UNIT – V

Channel Coding: Error Detection & Correction - Repetition & Parity Check Codes, Interleaving, Code Vectors and Hamming Distance, Forward Error Correction (FEC) Systems, Automatic Retransmission Query (ARQ) Systems, Linear Block Codes – Matrix Representation of Block Codes, Convolutional Codes – Convolutional Encoding, Decoding Methods.

Text Books:

1. Simon Haykin, “Communication Systems,” Wiley India Edition, 4th Edition, 2011.
2. B.P. Lathi, &Zhi Ding, “Modern Digital & Analog Communication Systems”, Oxford University Press, International 4th edition, 2010.

References:

1. Sam Shanmugam, “Digital and Analog Communication Systems”, John Wiley, 2005.
2. A. Bruce Carlson, & Paul B. Crilly, “Communication Systems – An Introduction to Signals & Noise in Electrical Communication”, McGraw-Hill International Edition, 5th Edition, 2010
3. Bernard Sklar, “Digital Communications”, Prentice-Hall PTR, 2nd edition, 2001.
4.Herbert Taub& Donald L Schilling, “Principles of Communication Systems”, Tata McGraw-Hill, 3rd Edition, 2009.
5.J. G. Proakis, M Salehi, Gerhard Bauch, “Modern Communication Systems Using MATLAB,” CENGAGE, 3rd Edition, 2013.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem **T P C**
0 3 2

(15A04506) LINEAR IC & DIGITAL SYSTEMS LAB

Course Objectives:

- To understand the basics of linear integrated circuits and available ICs
- To apply operational amplifiers in linear and nonlinear applications.
- To introduce Xilinx compiler and in-built simulator
- To describe the simulation and synthesis of the systems using Hardware Description Language and explain its various abstraction levels.

Course Outcomes:

At the end of the course, the student should be able to:

- Design oscillators, amplifiers and filters using operational amplifiers.
- Analyse the working of PLL and design DC power supply using ICs.
- Write efficient hardware designs in VHDL and perform high-level HDL simulation, synthesis.
- Explain different levels of abstraction with the programming examples.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1	1			2	2	2	1	2	1
CO2	2	1	3	2	2	1	1	1	2	3	2	1	3	1
CO3	2	2	3	2	2	1	1	1	2	3	2	1	3	1
CO4	2	2	3	2	1	1			2	2	3	1	3	1

1. Interpretation of data sheets (741, TL082, 555, 565)

LINEAR IC LAB EXPERIMENTS:

Design and Testing of

1. Inverting, Non inverting amplifiers using op-amp
2. Integrator and Differentiator using op-amp
3. Active low-pass, High-pass and band-pass filters using op-amp
4. Astable and MonostableMultivibrators using op-amp
5. Phase shift and Wien bridge oscillators using op-amp
6. Astable and MonostableMultivibrators using NE555 Timer.
7. PLL characteristics and its use as Frequency Multiplier.
8. DC power supply using LM317 and LM723.

DIGITAL SYSTEM DESIGN LAB EXPERIMENTS:

Programming (Using VHDL)

List of Experiments:

1. Write structural and dataflow VHDL models for
   a) 4-bit ripple carry adder.
   b) 4-bit carry look ahead adder
   c) 8-bit comparator
2. Write a VHDL program in structural model for

a) 16:1 mux realization

b) 3:8 decoder realization through 2:4 decoder

3. Write a VHDL program in behavioral model for
a) 16:1 mux b) 3:8 decoder c) 8:3 encoder d) 8 bit parity generator and checker
4. Write a VHDL program in structural and behavioral models for
a) 8 bit asynchronous up-down counter b) 8 bit synchronous up-down counter
5. Write a VHDL program for 4 bit sequence detector through Mealy and Moore state machines.
6. Write a VHDL program for traffic light controller realization through state machine.
7. Write a VHDL program in behavioral model for 8 bit shift and add multiplier.
8. Write a VHDL program in structural model for 8 bit Universal Shift Register.

Note: *Any **SIX of** the above experiments from each part are to be conducted*

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech I Sem **T P C**
0 3 2

(15A04507) ANALOG COMMUNICATION SYSTEMS LAB

Course Objectives:
This course gives how to design of analog modulation and demodulation schemes. And to measure the radio receiver and antenna measurements, Pulse modulation techniques.

Course Outcomes:
Upon completion of the course, students will be able to:
1. Design and analyze thedifferent analog modulation schemes.
2. Technically visualize spectra of different analog modulation schemes
3. Analyze practical behavior of different elements available in analog communication system such as
filters, amplifiers etc.
4. Measure characteristics of radio receiver and antenna measurements.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	1	2		1	1	2	1	2	1	1	3
CO2	1	1	2	1	2				2	1	2	1	2	3
CO3	1	3	1	2	2	1		1	2	1	2		2	3
CO4	1	2	1	2	2	1	1		2	1	2	1	2	3

List of Experiments:
1. Amplitude modulation and demodulation.
2. Frequency modulation and demodulation.
3. a. Characteristics of Mixer.
   b. Pre-emphasis & de-emphasis.
4. Pulse amplitude modulation & demodulation.
5. Pulse width modulation & demodulation
6. Pulse position modulation & demodulation.
7. Radio receiver measurements – sensitivity selectivity and fidelity.
8. Measurement of half power beam width (HPBW) and gain of a half wave dipoleantenna.
9. Measurement of radiation pattern of a loop antenna in principal planes.

Equipment required for the Laboratory:
1. Regulated Power Supply equipments 0 – 30 V
2. CROs 0 – 20 M Hz.
3. Function Generators 0 – 3 M Hz
4. RF Signal Generators 0 – 1000 M Hz
5. Multimeters

6. Required electronic components (active and passive) for the design of experimentsfrom 1 - 7
7. Radio Receiver Demo kits or Trainers.
8. RF power meter frequency range 0 – 1000 MHz
9. Spectrum Analyzer
10. Dipole antennas (2 Nos.) 850 MHz – 1GHz
11. Loop antenna (1 no.) 850 MHz – 1GHz

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	T	P	C
	4	0	4

(15A04601) ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Course Outcomes:
After the completion of the course the students will be able to
- Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
- Measure various physical parameters by appropriately selecting the transducers.
- Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	2	1	2	1	1	1	1	1	2	2	2
CO2	1	2	2	2	3	1	1		1	1	2		2	2
CO3	1	2	3	2	2				1	1	2		2	2

UNIT-I
Performance characteristics of Instruments: Static characteristics, Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC ammeters, DC voltmeters-multirange, range extension/solid state and differential voltmeters, AC voltmeters –multirange, range extension. Thermocouple type RF ammeter, ohm meters, series type, shunt type, multimeter for voltage, current and resistance measurements.

UNIT-II
Oscilloscopes: Standard specifications of CRO,CRT features, derivation of deflection sensitivity, vertical and horizontal amplifiers, horizontal and vertical deflection systems, sweep trigger pulse, delay line, sync selector circuits, probes for CRO – active, passive, and attenuator type, triggered sweep CRO, and Delayed sweep, dual trace/beam CRO, Measurement of amplitude, frequency and phase (Lissajous method).Principles of sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Digital frequency counters, time & Period measurements.

UNIT-III
Signal generators-fixed and variable, AF oscillators, function generators, pulse, random noise, sweep, and arbitrary waveform generators, their standards, specifications and principles of working (Block diagram approach).Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers.

UNIT-IV
Review of DC Bridges: Wheatstone bridge, Wein Bridge, errors and precautions in using bridges, AC bridges: Measurement of inductance-Maxwell's bridge, Anderson Bridge.

Measurement of capacitance- Schearing Bridge.Kelvin Bridge, Q-meter, EMI and EMC, Interference and noise reduction techniques.

UNIT-V

Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples, and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

Text Books:

1. A.D. Helfrick and W.D. Cooper, “Modern Electronic Instrumentation and Measurement Techniques”, PHI, 5th Edition, 2002.
2. H.S.Kalsi, “Electronic instrumentation”, second edition, Tata McGraw Hill, 2004.
3. K. Lal Kishore, “Electronic Measurements & Instrumentations”, Pearson Education, 2009.

References:

1. H.S.Kalsi, “Electronic instrumentation”, second edition, Tata McGraw Hill, 2004.
2. Ernest O Doebelin and Dhanesh N Manik, “Measurement Systems Application and Design”, TMH, 5th Edition, 2009.
3. Oliver and Cage, “Electronic Measurement and Instrumentation”, TMH.
4. Robert A.Witte, “Electronic Test Instruments, Analog and Digital Measurements”, Pearson Education, 2nd Ed., 2004.
5. David A. Bell, “Electronic Instrumentation & Measurements”, PHI, 2nd Edition, 2003.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	**T**	**P**	**C**
	4	**0**	**4**

(15A04602) MICROPROCESSORS AND MICROCONTROLLERS

Course Objectives:

- Understand fundamental operating concepts behind microprocessors and microcontrollers.
- Appreciate the advantages in using RISC microprocessors / microcontrollers in engineering applications
- Design microprocessor / microcontroller based solutions to problems.
- Understand Low-Level Embedded system Design with basic applications
- Develop skill in simple program writing for 8086 & MSP430 and applications

Course Outcomes:

After completion of this subject the students will be able to:

- Do programming with 8085 and 8086 microprocessors
- Interface peripheral subsystems to 8086 microprocessor
- Program MSP 430 for designing any basic Embedded System
- Design and implement some specific real time applications

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	3	1	3	1	1	1	1	1	1	2	2	2
CO2	1	3	3	3	3	1			2	1	2	2	2	2
CO3	1	3	2	2	3	1			2	1	2	2	3	2
CO4	1	1	2	3	3				2	1	3	2	2	2

UNIT I

Introduction-8085 Architecture-Block Diagram, Flag Register, Pin Diagram, Timing and Control Signals, System Timing Diagram, Overview of 8086-Internal Architecture-Register Organization, Memory Segmentation, Flag Register, Pin Configuration. Interrupt structure of 8085 and 8086

UNIT II

Instruction Formats -Addressing Modes-Instruction Set of 8086, Assembler Directives-Macros and Procedures. Programs Involving Logical, Branch Instructions – Sorting and Evaluating Arithmetic Expressions – StringManipulations-Simple ALPs. Brief discussion of peripheral sub systems like 8251, 8253, 8255, 8257 and 8259 (only Pin diagrams and key features of these peripheral sub systems)

UNIT III

Comparison between RISC and CISC architecture, Low power RISC MSP430 – block diagram, features and architecture,Variants of the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x and their targeted applications, MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. Sample embedded system on MSP430 microcontroller.

UNIT-IV

I/O ports pull up/down registers concepts, Interrupts and interrupt programming. Watchdog timer. System clocks. Low Power aspects of MSP430: low power modes, Active vs Standby current consumption, FRAM vs Flash for low power & reliability.

Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

Case Study: MSP430 based embedded system application using ADC & PWM demonstrating peripheral intelligence. "Remote Controller of Air Conditioner Using MSP430"

UNIT-V:

Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices. Implementing Embedded Wi-Fi using C3100

Case Study: MSP430 based embedded system application using the interface protocols for communication with external devices: "A Low-Power Battery less Wireless Temperature and Humidity Sensor with Passive Low Frequency RFID"

Text Books:

1. "Microprocessor and Microcontrollers", N. Senthil Kumar, M. Saravanan, S. Jeevanathan,
   Oxford Publishers. 1 st Edition, 2010
2. "The X86 Microprocessors, Architecture, Programming and Interfacing" , Lyla B. Das, Pearson
   Publications, 2010
3. MSP430 microcontroller basics. John H. Davies, Newnes Publication, I st Edition

References:

http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode
http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra
Low_Power_MCU_Training

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	T	P	C
	4	0	4

(15A04603) DIGITAL SIGNAL PROCESSING

Course Outcomes:

Upon completion of the course, students will:

- Compute the fast Fourier transforms and find the relationship with other transforms.
- Understand and design FIR and IIR digital filters.
- Study about realization of digital filter structures.
- Understand DSP building blocks to achieve high speed in DSP processor.
- Understand the DSP TMS320C54XX architecture and instructions.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	2			1	2	1	2	1	2	2
CO2	3	2	3	1	2			1	1	1	2	1	2	3
CO3	3	2	3	2	2		1		1	2	2		2	3
CO4	2	3	1	2	2	1			1	2	2	1	2	3
C05	2	3	1	2	2	1			1	2	2	1	2	3

UNIT- I

Discrete Fourier Transform: Discrete Fourier series, Properties of Discrete Fourier series, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT.

Fast Fourier Transforms: Efficient computation of DFT algorithms - Radix 2-Decimation-in-Time & Decimation-in-Frequency algorithms, Inverse FFT.

UNIT- II

FIR Digital Filters: Linear phase FIR filter, characteristic response, location of zeros, Design of FIR filter - Windowing, Frequency sampling, Illustrative problems.

Realization of FIR systems: Structures for FIR systems - Direct form, Cascade form and Lattice structures.

UNIT- III

IIR Digital Filters: Design of IIR filters from Analog filters - Impulse invariance, Bilinear transformation, Comparison of FIR and IIR filters, Frequency transformation in the analog and digital domains, Illustrative problems.

Realization of IIR systems: Structures for IIR systems – Direct form, Signal flow graphs & Transposed, Cascade form, Parallel form and Lattice structures.

UNIT- IV

Introduction to DSP Processors: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory, multiport memory, VLSI Architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues.

UNIT- V

Programmable Digital Signal Processors: Introduction, Commercial Digital signal-processing Devices, Architecture of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Text Books:

1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications," Pearson Education/PHI, 4^{th} ed., 2007.
2. A.V.Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2^{nd} ed., Pearson Education, 2012.
3. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
4. Digital Signal Processors, Architecture, Programming and Applications – B. VenkataRamani and M.Bhaskar, TMH, 2004.

References:

1. Sanjit K Mitra, "Digital signal processing, A computer base approach," Tata McGraw Hill, 3^{rd} edition, 2009.
2. B. P. Lathi, "Principles of Signal Processing and Linear Systems," Oxford Univ. Press, 2011.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem **T P C**
4 0 4

(15A04604) MICROWAVE ENGINEERING

Course Outcomes:

Upon completion of the course, students will:

- To analyze completely the rectangular waveguides, their mode characteristics, and design waveguides for solving practical microwave transmission line problems.
- To distinguish between the different types of waveguide and ferrite components, explain their functioning and select proper components for engineering applications.
- To distinguish between the methods of power generation at microwave frequencies, derive the performance characteristics of 2-Cavity and Relfex Klystrons, Magnetrons, TWTs and estimate their efficiency levels, and solve related numerical problems
- To realize the need for solid state microwave sources and understand the utility of S-parameters in microwave component design.
- To set up a microwave bench, establish the measurement procedure and conduct the experiments in microwave lab for measurement of various microwave parameters.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	1	2	1	1	1	1	1	2	1	1	3
CO2	2	2	1	1	2		1		2	1	3	1	1	3
CO3	1	2	2	2	3	1			2	1	2	1	2	2
CO4	2	2	2	2	3	1			2	1	3	1	2	3
C05	1	2	2	2	3	1			2	1	3	1	2	3

UNIT-I

Waveguides: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides — Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics — Phase and Group Velocities, Wavelengths and Impedance Relations, Illustrative Problems.

Rectangular Guides: Power Transmission and Power Losses, Impossibility of TEM Mode, Micro strip Lines— Introduction, Zo Relations, Effective Dielectric Constant, Losses, Q factor.

UNIT-II

Cavity Resonators— Introduction, Rectangular Cavities, Dominant Modes and Resonant Frequencies, Q Factor and Coupling Coefficients, Illustrative Problems

Waveguide Components and Applications: Coupling Mechanisms — Probe, Loop, Aperture types. Waveguide Discontinuities — Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators — Different Types, Resistive Card and

Rotary Vane Attenuators; Waveguide Phase Shifters — Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions — E plane and H plane Tees, Magic Tee. Directional Couplers — 2 Hole, Bethe Hole types, Illustrative Problems Ferrites— Composition and Characteristics, Faraday Rotation, Ferrite Components — Gyrator, Isolator, Circulator.

UNIT-III

Microwave Tubes: Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes — 0 Type and M Type Classifications, 0-type Tubes : 2 Cavity Klystrons — Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory — Expressions for 0/P Power and Efficiency. Reflex Klystrons — Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and 0/P Characteristics, Effect of Repeller Voltage on Power 0/P, Illustrative Problems.

Helix TTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

UNIT—IV

M-Type Tubes: Introduction, Cross-field Effects, Magnetrons — Different Types, Cylindrical Traveling Wave Magnetron — Hull Cut—off and Hartree Conditions, Modes of Resonance and P1-Mode Operation, Separation of P1-Mode, 0/p characteristics, Illustrative Problems **Microwave Solid State Devices:** Introduction, Classification, Applications. TEDs — Introduction, Gunn Diodes — Principle, RWH Theory, Characteristics, Basic Modes of Operation – Gunn Oscillation Modes, LSA Mode, Introduction to Avalanche Transit Time Devices.

UNIT—V

Microwave Measurements: Scattering Matrix— Significance, Formulation and Properties, S Matrix Calculations for — 2 port Junctions, E plane and H plane Tees, Magic Tee, Circulator and Isolator, Illustrative Problems. Description of Microwave Bench — Different Blocks and their Features, Errors and Precautions, Microwave Power Measurement, Bolometers Measurement of Attenuation, Frequency Standing Wave Measurements — Measurement of Low and High VSWR, Cavity Q, Impedance Measurements.

Text Books:

- Microwave Devices and Circuits — Samuel V. Liao, Pearson, 3rd Edition, 2003.
- Microwave Principles — Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.

Reference Books:

- Foundations for Microwave Engineering — R.E. Collin, IEEE Press, John Wiley, 2ndEdition, 2002.
- Microwave Circuits and Passive Devices — M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd.,New Age International Publishers Ltd., 1995.
- Microwave Engineering Passive Circuits — Peter A. Rizzi, PHI, 1999.
- Electronic and Radio Engineering F.E. Terman, McGraw-Hill, 4th Ed., 1955.
- Microwave Engineering —A. Das and S.K. Das, TMH, 2nd Ed., 2009,
- Microwave Engineering – G. S. Raghuvanshi and K. Satya Prasad, Cengage Learning, 2012.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem **T P C**
4 0 4

(15A04605) VLSI DESIGN

Course Outcomes:

Upon completion of the course, students will:

- Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors. Choose an appropriate inverter depending on specifications required for a circuit
- Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit.
- Design different types of logic gates using CMOS inverter and analyze their transfer characteristics, provide design concepts required to design building blocks of data path using gates
- Design simple memories using MOS transistors and can understand design of large memories. Design simple logic circuit using PLA, PAL, FPGA and CPLD.
- Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	3	-	1	-	-	-	1	1	2	2	3	2
CO2	1	2	3	2	2	--	-	-	1	1	2	-	3	2
CO3	1	2	3	2	2	-	-	-	1	1	2	-	3	2
CO4	2	2	3	2	2	-	-	-	1	1	2	-	3	2
C05	2	2	3	2	2	-	-	-	1	1	2	-	3	2

UNIT-I

Introduction: Basic steps of IC fabrication, PMOS, NMOS, CMOS & BiCMOS, SOI process technologies, MOS transistors - MOS transistor switches – Basic gate using switches, working polar transistor Resistors and Capacitors.

Basic Electrical Properties of MOS and BiCMOS Circuits: Working of MOS transistors – threshold voltage; MOS design equations: $\mathbf{I_{ds}}$–$\mathbf{V_{ds}}$ relationships, Threshold Voltage, Body effect, Channel length modulation, $\mathbf{g_m}$, $\mathbf{g_{ds}}$, figure of merit $\boldsymbol{\omega_0}$; Pass transistor, NMOS Inverter, CMOS Inverter analysis and design, Various pull ups loads, Bi-CMOS Inverters.

UNIT-II

Basic Circuit Concepts: Capacitance, resistance estimations- Sheet Resistance R_S, MOS Device Capacitances, routing Capacitance, Analytic Inverter Delays, Driving large Capacitive Loads, Fan-in and fan-out.

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2μm CMOS Design rules for wires, Contacts and Transistors Layout

Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT-III

Gate level Design: Logic gates and other complex gates, Switch logic, Alternate gate circuits.

Physical Design: Floor-Planning, Placement, routing, Power delay estimation, Clock and Power routing.

UNIT-IV

Subsystem Design: Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Counters, High Density Memory Elements.

VLSI Design styles: Full-custom, Standard Cells, Gate-arrays, FPGAs, CPLDs and Design Approach for Full-custom and Semi-custom devices.

UNIT-V

VHDL Synthesis: VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools.

Test and Testability: Fault-modeling and simulation, test generation, design for testability, Built-in-self-test.

Text Books:

1. Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, “Essentials of VLSI circuits and systems”, PHI, 2013 Edition.
2. K.Lal Kishore and V.S.V. Prabhakar, “VLSI Design”, IK Publishers

References:

1. Weste and Eshraghian, “Principles of CMOS VLSI Design”, Pearson Education, 1999.
2. Wayne Wolf, “Modern VLSI Design”, Pearson Education, 3rd Edition, 1997.
3. John P. Uyemura, “Chip Design for Submicron VLSI: CMOS layout and Simulation”, Thomson Learning.
4. John P. Uyemura, “Introduction to VLSI Circuits and Systems”, John wiley, 2003.
5. John M. Rabaey, “Digital Integrated Circuits”, PHI, EEE, 1997.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem **T P C**
4 0 4

(15A04606a) DIGITAL ELECTRONICS
(OPEN ELECTIVE)

Course Objectives:

To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions

- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits
- and sequential circuits
- To introduce the concept of memories and programmable logic devices.
- To illustrate the concept of synchronous and asynchronous sequential circuits

Course Outcomes:

Students will be able to:

- Analyze different methods used for simplification of Boolean expressions.
- Design and implement Combinational circuits.
- Design and implement synchronous and asynchronous sequential circuits.
- Write simple HDL codes for the circuits

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2							1			1	1
CO2	1	2	3							1			1	2
CO3	1	2	3							1			1	2
CO4	1	2	3							1			1	2

UNIT -I :Minimization Techniques And Logic Gates

Minimization Techniques: Boolean postulates and laws – De-Morgan‟s Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions –– Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don‟t care conditions – Quine - Mc Cluskey method of minimization. Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND–NOR implementations – Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates

UNIT- II: Combinational Circuits

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial

Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators – code converters - Magnitude Comparator.

UNIT –III:Sequential Circuits

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation – Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

UNIT -IV:Memory Devices

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell –Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

UNIT –V:Synchronous and Asynchronous Sequential Circuits

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of Hazard Free Switching circuits. Design of Combinational and Sequential circuits using VERILOG.

Text Book:

1. M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003. 37

References:

1. John F.Wakerly, "Digital Design", Fourth Edition, Pearson/PHI, 2008
2. John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
3. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2006.
5. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011 6. Donald D.Givone, "Digital Principles and Design", TMH, 2003.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	T	P	C
	4	0	4

(15A04606b) PRICIPLES OF ELECTRONIC COMMUNICATION SYSTEMS
(OPEN ELECTIVE)

Course Objectives:

The objective of this subject is to:

- Introduce the students to modulation and various analog and digital modulation schemes.
- They can have a broad understanding of satellite, optical, cellular, mobile, wireless and telecom concepts.

Course Outcomes:

By completing this subject, the student can

- Work on various types of modulations.
- Should be able to use these communication modules in implementation.
- Will have a basic understanding of various wireless and cellular, mobile and telephone communication systems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	1									1	2
CO2	1	2	2	1									1	2
CO3	2	2	2	1									1	2

UNIT I:

Introduction: Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

UNIT II:

Simple description on Modulation: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

UNIT III:

Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony.

Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

UNIT IV:

Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.

Optical Communication: Optical Principles, Optical Communication Systems, Fiber – Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT V:

Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, WCDMA.

Wireless Technologies: Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

Text Books:

1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications, 2008.
2. Kennady, Davis, Electronic Communications systems, 4e, TMH, 1999

Reference Books:

1. Tarmo Anttalainen, Introduction to Telecommunications Network Engineering, Artech House Telecommunications Library.
2. Theodore Rappaport, Wireless Communications-Principles and practice, Printice Hall, 2002.
3. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.
4. Wayne Tomasi, Introduction to data communications and networking, Pearson Education, 2005.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem

T	P	C
4	0	4

(15A04606c) ELECTRONIC MEASURING INSTRUMENTS
(OPEN ELECTIVE)

Course Objectives:
- It provides an understanding of various measuring systems functioning and metrics for performance analysis.
- Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
- Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes:
On completion of this course student can be able to
- Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
- Measure various physical parameters by appropriately selecting the transducers.
- Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	2	1	2	1	1	1	1	1	2	2	2
CO2	1	2	2	2	3	1	1		1	1	2		2	2
CO3	1	2	3	2	2				1	1	2		2	2

UNIT-I:
Block Schematics of Measuring Systems and Performance Metrics: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

UNIT-II:
Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, and Specifications.

UNIT-III:
Measuring Instruments: DC Voltmeters, D’ Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments. CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes.

UNIT-IV:

Recorders: X-Y Plotter, Curve tracer, Galvanometric Recorders, Servo transducers, pen driving mechanisms, Magnetic Recording, Magnetic recording techniques.

UNIT-V:

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

Text Books:

1. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage TMH Reprint 2009.
2. Electronic Instrumentation: H.S.Kalsi – TMH, 2nd Edition 2004.

References:

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI 5th Edition 2003.
3. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
4. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem **T P C**
0 3 2

(15A04607) DIGITAL COMMUNICATIONS SYSTEMS LAB

COURSE OUTCOMES:

- Understand operation of electronic equipment used for conducting expts
- Experience the real time behavior of different digital modulation schemes and technically visualize spectra of different digital modulation schemes
- Analyze the given circuit and conduct the experiment
- Design different communication circuits for the given specifications.
- Compare theoretical and experimental results and give the appropriate conclusions

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	1	1	1	2	2	1	2	1	1	2	1	2	3
C02	2	2	2	1	2	1	1		2	2	2	1	2	3
C03	2	3	3	1	2				2	2	2	1	2	3
C04	1	1	3	1	2				2	2	2		2	3

Minimum of Ten experiments to be conducted (Five from each Part-A&B)

HARDWARE EXPERIMENTS (PART – A)

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Differential phase shift keying.
7. QPSK modulation and demodulation.

SOFTWARE EXPERIMENTS (PART-B)
Modeling of Digital Communications using MATLAB

1. Sampling Theorem – verification.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Frequency shift keying.
5. Phase shift keying.
6. Differential phase shift keying.
7. QPSK modulation and demodulation.

Equipment required for Laboratories:

1. RPS - 0 – 30 V
2. CROs - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz

4. RF Generators (3 Nos.) - 0 – 1000 M Hz.
5. Multimeters
6. Lab Experimental kit for Pulse Code Modulation (Experiment No.3 of part – A)
7. Required Electronic Components (Active and Passive) which include required ICs
8. Arbitrary Wave form generators/ PNS generators – 2 Nos. (to generate digital data at required data rates)
9. Licensed MATLAB software for 30 users with required tool boxes.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	T	P	C
	0	3	2

(15A04608) MICROPROCESSORS AND MICROCONTROLLERS LAB

Course Outcomes:

- Execution of different programs for 8086 in Assembly Level Language using MASM Assembler .
- Interfacing various I/O Devices like stepper motor, key board, ADC and DAC to 8086.
- Execution of different program s in 8051. Etc they will learn assembly language

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	1	2	1	1	2	2	2	2	1	2	2
CO2	2	1	3	1	3				2	2	2	1	2	2
CO3	2	2	3	3	3				2	2	2	1	2	2

Part A: 8086 Microprocessor Programs using NASM/8086 microprocessor kit.

1. Introduction to MASM Programming.
2. Programs using arithmetic and logical operations
3. Programs using string operations and Instruction prefix: Move Block, Reverse string, Sorting, Length of the string, String comparison.
4. Programs using CALL and RET instructions

Part B: Embedded C Experiments using MSP430 Microcontroller

1. Interfacing and programming GPIO ports in C using MSP430 (blinking LEDs, push buttons)
2. Usage of Low Power Modes: (Use MSPEXP430FR5969 as hardware platform and demonstrate the low power modes and measure the active mode and standby mode current)
3. Interrupt programming examples through GPIOs
4. PWM generation using Timer on MSP430 GPIO
5. Interfacing potentiometer with MSP430
6. PWM based Speed Control of Motor controlled by potentiometer connected to MSP430 GPIO
7. Using ULP advisor in Code Composer Studio on MSP430
8. Low Power modes and Energy trace++:
   a. Enable Energy Trace and Energy Trace ++ modes in CCS
   b. Compute Total Energy, and Estimated lifetime of an AA battery.

Note: Any six experiment from Part A and Six experiments from Part B are to be conducted

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

III B.Tech II Sem	T	P	C
	0	3	0

(15A54601) ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

1. **INTRODUCTION**

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. **OBJECTIVES:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

UNIT-I: COMMUNICATIVE COMPETENCY

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary for competitive purpose
4. Spotting errors

UNIT-II: TECHNICAL WRITING

1. Report writing
2. Curriculum vitae
3. E-mail writing
4. Abstract & Synopsis Writing
5. Reviewing (Book/Film)

UNIT-III: PRESENTATIONAL SKILLS

1. Oral presentation
2. Power point presentation
3. Poster presentation
4. Stage dynamics
5. Body Language

UNIT-IV: CORPORATE SKILLS

1. Telephonic skills
2. Net Etiquettes
3. SMART Goal setting
4. Time Management
5. Negotiation Skills

UNIT-V: GETTING READY FOR JOB

1. Group discussions-II
2. Interview skills
3. Answering Strategies
4. Mock Interviews

4. LEARNING OUTCOMES:

- Accomplishment of sound vocabulary and its proper use contextually
- Flair in Writing and felicity in written expression.
- Effective Speaking Abilities
- Enhanced job prospects.

5. MINIMUM REQUIREMENT:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

6. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

K-VAN SOLUTIONS-Advanced communication lab

1. **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
2. **TOEFL & GRE**(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
3. **Train2success.com**

7. BOOKS RECOMMENDED:

1. **Objective English for Competitive Exams**, Hari Mohana Prasad, 4th edition, Tata Mc Graw Hill.

2. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, O U Press 2009.
3. Books on **TOEFL/GRE/GMAT/CAT/IELTS** by Barron's/DELTA/Cambridge University Press.2012.
4. **Soft Skills for Everyone,** Butterfield Jeff, Cengage Publications, 2011.
5. **Practice Psychometric Tests**: How to familiarize yourself with genuine recruitment tests, 2012.
6. **Management Shapers Series** by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
7. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
8. **English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.**
9. **Word Power Made Handy,** Shalini Verma, S Chand Publications, 2011.
10. **Effective Technical Communication,** Ashrif Rizvi, TataMcGrahill, 2011.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem	T	P	C
	4	0	4

(15A04701) COMPUTER NETWORKS

Course Outcomes:

- understand and explore the basics of Computer Networks and Various Protocols. He will be in a position to understand the World Wide Web concepts.
- administrate a network and flow of information further he/she can understand easily the concepts of network security, Mobile and ad hoc networks.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	2	2	1	1	1	1	1	1	1	2	3
CO2	2	3	1	2	2	1		1	1	1	2	1	2	3

UNIT I:
Introduction to Networks: Internet, Protocols and Standards, The OSI Model, Layers in OSI Model, TCP/IP Suite, Addressing.
Physical Layer: Multiplexing, Transmission Media, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

UNIT II:
Data Link Layer: Introduction, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, Random Access Controlled Access, Channelization, IEEE Standards, Ethernet, Giga-Bit Ethernet, Wireless LANs, SONET-SDH, Frame Relay and ATM.

UNIT III:
Network Layer: Logical Addressing, Internetworking, Tunneling, Address Mapping, ICMP, IGMP, Forwarding, Routing-Flooding, Bellman& Ford, Disjkstra's routing protocols, RIP, OSPF, BGP,- and Multicast Routing Protocols. Connecting Devices-Passive Hubs, Repeaters, Active Hubs, Bridges, Routers.

UNIT IV:
Transport Layer: Process to Process Delivery, UDP, TCP and SCTP Protocols, Congestion, Congestion Control, Quality of Service.
Application Layer: Domain Name Space, DNS in Internet, Electronic Mail, File Transfer Protocol, WWW, HTTP, SNMP, Multi-Media.

UNIT V:
Network Security: Security services, mechanisms and attacks, IPSec, SSL, VPN, Firewall. Bluetooth, Zigbee, IPv4, IPv6.

Text Books:

1. Data Communications and Networking – Behrouz A. Forouzan, Fourth Edition TMH, 2006.

2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education.

References:

1. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education
2. Understanding Communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning.
3. Computer and Communication Networks, Nader F. Mir, Pearson Education
4. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose, K.W.Ross, 3rd Edition, Pearson Education.
5. Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group.
6. Data Communications and Computer Networks, P.C.Gupta, PHI.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem **T P C**
4 0 4

(15A04702) OPTICAL COMMUNICATIONS

Course Outcomes:

- Understand and analyze the constructional parameters of optical fibers
- Be able to design an optical system
- Estimate the losses due to attenuation, absorption, scattering and bending
- Compare various optical detectors and choose suitable one for different applications

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2	1	1	1	2	1	2	1	2	2
CO2	1	2	2	2	1				2	1	2		2	2
CO3	2	2	3	2	2	1			2	1	2		2	2
CO4	2	2	2	1	2	1	1		2	2	2	1	2	2

UNIT-I

Introduction to Optical Fibers: Evolution of fiber optic system- Element of an Optical FiberTransmission link- Ray Optics-Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes –Single Mode Fibers-Graded Index fiber structure.

UNIT-II

Signal Degradation Optical Fibers: Attenuation–Absorption losses, Scattering losses, BendingLosses, Core and Cladding losses, Signal Distortion in Optical Wave guides - Information Capacity determination –Group Delay- Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT-III

Fiber Optical Sources and Coupling : Direct and indirect Band gap materials-LED structures–Lightsource materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition –Rate equations –External Quantum efficiency –Resonant frequencies – Temperature effects, Introduction to Quantum laser, source-to-fiber Power Launching, Lensing schemes, Fiber –to- Fiber joints, Fiber splicing.

UNIT-IV

Fiber Optical Receivers : PIN and APD diodes–Photo detector noise, SNR, Detector Response time,Avalanche Multiplication Noise –Comparison of Photo detectors –Fundamental Receiver Operation – preamplifiers, Error Sources –Receiver Configuration –Probability of Error – Quantum Limit.

UNIT-V

System Design and Applications : Design of Analog Systems: system specification, power budget,bandwidth budget

Design of Digital Systems: system specification, rise time budget, power budget, Receiver sensitivity.

Text Books:

1. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International, Singapore, 3rd ed., 2000.
2. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.

References:

1. Max Ming-Kang Liu, "Principles and Applications of Optical Communications", TMH, 2010.
2. S.C.Gupta, "Text book on optical fiber communication and its applications", PHI, 2005.
3. Satish Kumar, "Fundamentals of Optical Fiber communications", PHI, 2009.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech. I Sem	T	P	C
	4	0	4

(15A04703) EMBEDDED SYSTEMS

Course Objectives:
- To provide an overview of Design Principles of Embedded System.
- To provide clear understanding about the role of firmware, operating systems in correlation with hardware systems.

Course Outcomes:
- Expected to understand the selection procedure of Processors in the Embedded domain.
- Design Procedure for Embedded Firmware.
- Expected to visualize the role of Real time Operating Systems in Embedded Systems.
- Expected to evaluate the Correlation between task synchronization and latency issues

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	2	1	1	-	-	1	1	1	2	2
CO2	2	3	3	2	2	1	-	-	2	1	1	1	2	2
CO3	2	3	3	2	2	-	-	-	2	1	1	1	2	2
CO4	2	2	3	2	2	-	-	-	2	1	1	1	2	2

UNIT - I
Introduction to Embedded Systems
Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT - II
Typical Embedded System:
Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT - III
Embedded Firmware:
Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT - IV
RTOS Based Embedded System Design:
Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT -V
Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

TEXT BOOKS:
1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill
2. Embedded Systems - Raj Kamal, TMH.
3. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.

REFERENCES:
1 Embedded Systems – Lyla, Pearson, 2013
2. Embedded System design : S. Heath (Elsevier)
3. An Embedded Software Primer - David E. Simon, Pearson Education.
4. Embedded microcontroller and processor design: G. Osborn (Pearson)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem **T P C**
4 0 4

(15A04704) DIGITAL IMAGE PROCESSING

Course Outcomes:

- To comprehend the relation between human visual system and machine perception and processing of digital images.
- To provide a detailed approach towards image processing applications like enhancement, segmentation and compression.
- Exploration of the limitations of the computational methods on digital images.
- Expected to implement the spatial and frequency domain image transforms on enhancement and restoration of images
- Elaborate understanding on image enhancement techniques.
  Expected to define the need for compression and evaluate the basic compression algorithms

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	3	2	1	1	1	2	1	2	1	2	2
CO2	1	3	3	2	2	1	1		2	1	2	1	2	2
CO3	2	3	3	2	2	1			2	1	2		2	2
CO4	2	3	2	2	2				2	1	2		2	2
C05	2	2	2	1	2				2	1	2		2	2
C06	2	2	2	2	2				2	1	2		2	2

UNIT–I

Introduction to Digital Image processing – Example fields of its usage- Image sensing and Acquisition – image Modeling and representation - Sampling, Quantization - Basic relationships between pixels, - Mathematical tools/ operations applied on images
2D Orthogonal and Unitary Transforms and their properties – DFT, Discrete cosine transform, Discrete Hartley transform, KL transforms; Introductory wavelets: the Gabor wavelet

UNIT–II

Image Enhancement: point operations, Histogram processing, Spatial filtering Operations Enhancement in frequency Domain, Image smoothing, Image sharpening, Homomorphic filtering.

UNIT–III

Image filtering and Restoration: Degradation model, Algebraic approach to restoration – Inverse filtering – Least Mean Square filters, Constrained Least square restoration. Blind Deconvolution

Image segmentation: Edge detection -Edge linking, Threshold based segmentation methods – Region based Approaches Template matching –use of motion in segmentation

UNIT–IV

Morphological Image Processing: Morphological operators; Erosion and Dilation; Opening and Closing ; Morphological Transforms; Basic Morphological Algorithms; Grey-scale morphology

UNIT–V

Redundancies in Images - Compression models, Information theoretic perspective-Fundamental coding theorem. Huffman Coding, Arithmetic coding, Bit plane coding, Run length coding, Transform coding, Image Formats and compression standards.

Text Books:

1. R.C .Gonzalez & R.E. Woods, “Digital Image Processing”, Addison Wesley/Pearson education, 3rd Edition, 2010.
2. A .K. Jain, “Fundamentals of Digital Image processing”, PHI.

References:

1. Rafael C. Gonzalez, Richard E woods and Steven L.Eddins, “Digital Image processing using MATLAB”, Tata McGraw Hill, 2010.
2. S jayaraman, S Esakkirajan, T Veerakumar, “Digital Image processing”,Tata McGraw Hill
3. William K. Pratt, “Digital Image Processing”, John Wilely, 3rd Edition, 2004.
4. Mark S. Nixon Alberto S. Aguado “Feature Extraction and Image Processing”, Second edition, Academic press ; ISBN: 978-0-12372-538-7

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem **T P C**
4 0 4

(15A04705) CELLULAR AND MOBILE COMMUNICATIONS

Course Objectives:

- To provide the student with an understanding of the Cellular concept, Frequency reuse, Hand-off strategies.
- To enable the student to analyze and understand wireless and mobile cellular communication systems over a stochastic fading channel.
- To provide the student with an understanding of Co-channel and Non-Co-channel interferences.
- To give the student an understanding of cell coverage for signal and traffic, diversity techniques and mobile antennas.
- To give the student an understanding of frequency management, Channel assignment and types of handoff.

Course Outcomes:

By the end of the course,

CO1: Analyze and design wireless and mobile cellular systems..
CO2: understand impairments due to multipath fading channel..
CO3: understand the fundamental techniques to overcome the different fading effects..
CO4: understand Co-channel and Non Co-channel interferences
CO5: able to familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas..
CO6: understanding of frequency management, Channel assignment and types of handoff

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	2	2	-	1	-	-	2	1	1	1	3
CO2	2	3	-	2	2	-	1	-	-	2	1	1	1	3
CO3	2	3	-	2	2	-	1	-	-	2	1	1	1	3
CO4	2	3	-	2	2	-	1	-	-	2	1	1	1	3
CO5	2	2	1	2	2	-	-	-	-	2	1	1	1	3
CO6	2	2	1	2	2	-	-	-	-	2	1	1	1	3

UNIT I

Introduction to Cellular Mobile Radio Systems:

Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Uniqueness of Mobile Radio Environment- Fading -Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

Fundamentals of Cellular Radio System Design:

Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I from a Normal Case in a Omni Directional Antenna System, System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept.

UNITII

Co-Channel Interference:

Measurement Of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and Their Effects, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.

Non-Co-Channel Interference:

Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

UNITIII

Cell Coverage for Signal and Traffic:

Signal Reflections in Flat And Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope, General Formula for Mobile Propagation Over Water and Flat Open Area, Near and Long Distance Propagation, Path Loss From a Point to Point Prediction Model in Different Conditions, Merits of Lee Model.

Cell Site and Mobile Antennas:

Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas.

UNITIV

Frequency Management and Channel Assignment:

Numbering And Grouping, Setup Access And Paging Channels, Channel Assignments to Cell Sites and Mobile Units, Channel Sharing and Borrowing, Sectorization, Overlaid Cells, Non Fixed Channel Assignment.

UNIT V

Handoffs and Dropped Calls:

Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

Text Books:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Mc Graw Hill, 2nd Edn., 1989.

2. Wireless Communications - Theodore. S. Rapport, Pearson Education, 2nd Edn., 2002.
3. Mobile Cellular Communication - Gottapu sashibhushana Rao, Pearson, 2012.

References:

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International, 2nd Edn., 2001.
2. Modern Wireless Communications-Simon Haykin, Michael Moher, Pearson Eduction, 2005.
3. Wireless Communications Theory and Techniques, Asrar U. H .Sheikh, Springer, 2004.
4. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
5. Wireless Communications – Andrea Goldsmith, Cambridge University Press, 2005.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem **T P C**
0 32

(15A04707) DIGITAL SIGNAL PROCESSING LAB

Course Objectives: The student should be made to
- To implement FIR and IIR filters
- To study the architecture of DSP processor

Course Outcomes: Students will be able to
- Carry out simulation of DSP systems
- Demonstrate their abilities towards DSP processor based implementation of DSP systems
- Demonstrate the applications of FFT to DSP

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	2	2	1	2	1	1	2	1	2	3
CO2	2	2	2	1	2	1	1		2	2	2	1	2	3
CO3	2	3	3	1	2				2	2	2	1	2	3

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. To find DFT / IDFT of given DT Signal
4. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
5. Obtain Fourier series coefficients by formula and using FET and compare for half sine wave.
6. Implementation of FFT of given Sequence
7. Determination of Power Spectrum of a given Signal(s).
8. Implementation of LP FIR Filter for a given Sequence/Signal.
9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Narrow Band Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D Sampling Rate Converters
15. Impulse Response of First order and Second Order Systems.

Note: - Minimum of 12 experiments has to be conducted.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech I Sem **T P C**
4 0 4

(15A04708) MICROWAVE & OPTICAL COMMUNICATIONS LAB

Course Objectives: The student should be made to
- Understand the working principle of optical sources, detector, fibers and microwave components
- Develop understanding of simple optical communication link.
- Learn about the characteristics and measurements in optical fiber
- Know about the behavior of microwave components.
- Practice microwave measurement procedures

Course Outcomes: At the end of the course, the student should be able to
- Analyze the performance of simple optical link.
- Test microwave and optical components.
- Analyse the mode characteristics of fiber.
- Analyse the radiation of pattern of antenna.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	2	2	1	2	1	1	2	1	2	2
CO2	2	2	2	1	2	1	1		2	2	2	1	2	2
CO3	2	3	3	1	2				2	2	2	1	2	2

Microwave Lab (PART – A) --- Any Seven (7) Experiments
1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance Measurement.
7. Frequency and Wavelength measurements using slotted section.
8. Impedance Matching and Tuning
9. Scattering parameters of Magic Tee.
10. Radiation Pattern Measurement of horn Antennas (at least two antennas).

Optical Fiber Lab (PART – B) --- Any five (5) Experiments
1. DC Characteristics of LED and PIN Photo diode
2. Mode Characteristics of Fibers
3. Measurement of connector and bending losses
4. Fiber optic Analog and Digital Link- frequency response (analog) and eye diagram (digital)
5. Numerical Aperture determination for Fibers
6. Attenuation Measurement in Fibers

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech IISem **T P C**
4 0 4

(15A04801a)SATELLITE COMMUNICATIONS
Elective – II

Course Objectives : The student should be made to

- to excel in basic knowledge of satellite communication principles
- solid foundation in orbital mechanics and launches for the satellite communication
- basic knowledge of link design of satellite with a design examples.
- better understanding of multiple access systems and earth station technology
- knowledge in satellite navigation and GPS & and satellite packet communications.

Course Outcomes: At the end of the course, the student should be able to

- Understand the historical background orbital mechanics, launch vehicles and functional principles of satellite communication systems.
- Analyze and evaluate a satellite link and suggest enhancements to improve the link performance.
- Able to study the design of Earth station and tracking of the satellites

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	2	2	-	2	1	1	2	1	2	3
CO2	2	2	2	1	2	1	-	-	2	2	2	1	2	3
CO3	2	3	3	1	2	-	-	-	2	2	2	1	2	3

UNIT I:

Introduction: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

Orbital Mechanics and Launchers: Orbital Mechanics, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance.

UNIT II:

Satellite Subsystems: Attitude and Orbit Control System, Telemetry, Tracking, Command and Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

UNIT III:

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design Of Satellite Links For Specified C/N, System Design Examples.

Multiple Access: Frequency Division Multiple Access (FDMA), Intermodulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite

Switched TDMA Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

UNIT IV:

Earth Station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

UNIT V:

Low Earth Orbit and Geo-Stationary Satellite Systems: Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational NGSO Constellation Designs.

Satellite Navigation & Global Positioning System: Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A Code Accuracy, Differential GPS.

Text Books:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

References:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 4th Edition, 2009.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem	T	P	C
	4	0	4

(15A04801b)ADVANCED COMPUTER ARCHITECTURE
Elective – II

Course s Objectives:The student should be made to:
- Understand the micro-architectural design of processors
- Learn about the various techniques used to obtain performance improvement and power in current processors

Course Outcomes:
The end of the course, the student should be able to:
- Evaluate performance of different architectures with respect to various parameters
- Analyze performance of different ILP techniques
- Identify cache and memory related issues in multi-processors

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	2											
CO2		1	2											
CO3		1	2											

UNIT -I
Fundamentals Of Computer Design
Review of Fundamentals of CPU, Memory and IO – Trends in technology, power, energy and cost, Dependability - Performance Evaluation

UNIT- II
Instruction Level Parallelism
ILP concepts – Pipelining overview - Compiler Techniques for Exposing ILP – Dynamic Branch Prediction – Dynamic Scheduling – Multiple instruction Issue – Hardware Based Speculation – Static scheduling - Multi-threading - Limitations of ILP – Case Studies.

UNIT -III
Data-Level Parallelism
Vector architecture – SIMD extensions – Graphics Processing units – Loop level parallelism.

UNIT- IV
Thread Level Parallelism
Symmetric and Distributed Shared Memory Architectures – Performance Issues – Synchronization – Models of Memory Consistency – Case studies: Intel i7 Processor, SMT & CMP Processors

UNIT -V
Memory And I/O
Cache Performance – Reducing Cache Miss Penalty and Miss Rate – Reducing Hit Time – Main Memory and Performance – Memory Technology. Types of Storage Devices – Buses – RAID – Reliability, Availability and Dependability – I/O Performance Measures.

Text Book:

1. John L Hennessey and David A Patterson, "Computer Architecture A Quantitative Approach", Morgan Kaufmann/ Elsevier, Fifth Edition, 2012.

References:

1. Kai Hwang and Faye Briggs, "Computer Architecture and Parallel Processing", Mc Graw-Hill International Edition, 2000.
2. Sima D, Fountain T and Kacsuk P, "Advanced Computer Architectures: A Design Space Approach", Addison Wesley, 2000.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem **T P C**
4 0 4

(15A04801c) RF CIRCUIT DESIGN
Elective – II

Course Objectives: The course objectives are:
- To educate students fundamental RF circuit and system design skills.
- To introduce students the basic transmission line theory, single and multiport networks, RF component modeling.
- To offer students experience on designing matching and biasing networks & RF transistor amplifier design.

Course Outcomes: Upon completion of the course, the students will be able to:
- Explore fundamental RF circuit and system design skills.
- Understand the basic transmission line theory, single and multiport networks, RF component modeling.
- Design matching and biasing networks & RF transistor amplifiers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	2											
CO2		1	2											
CO3		1	2											

UNIT I: Introduction:
Importance of RF Design-Dimensions and Units-Frequency Spectrum-RF Behaviour of Passive Components: High Frequency Resistors, High Frequency Capacitors, High Frequency Inductors.-Chip Components and Circuit Board Considerations: Chip Resistors, Chip Capacitors, and Surface Mount Inductors.
Review of Transmission Lines:
Types of Transmission Lines-Equivalent Circuit representation-R, L, C, G parameters of Different Line configurations-Terminated Lossless Transmission Lines-Special Terminations: Short Circuit, Open Circuit and Quarter Wave Transmission Lines- Sourced and Loaded Transmission Lines: Power Considerations, Input Impedance Matching, Return Loss and Insertion Loss.

UNIT II: Single and Multi-Port Networks:
The Smith Chart: Reflection Coefficient, Normalized Impedance-Impedance Transformation: Standing wave Ratio, Special Transformation Conditions-Admittance Transformation-Parallel and Series RL & RC Connections-Basic Definitions of Single and Multi-Port Networks-Interconnecting Networks.
RF Filter Design:
Scattering Parameters: Definition, Meaning, Chain Scattering Matrix, Conversion Between S- and Z-parameters, Signal Flow Chart Modeling, Generalization-Basic Resonator and Filter Configurations: Low Pass, High Pass, Band Pass and Band Stop type Filters-Filter

Implementation using Unit Element and Kuroda's Identities Transformations-Coupled Filters.

UNIT III: Active RF Component Modelling:
RF Diode Models: Nonlinear and Linear Models-Transistor Models: Large Signal and Small Signal BJT Models, Large Signal and Small Signal FET Models- Scattering Parameter, Device Characterization.

UNIT IV: Matching and Biasing Networks:
Impedance Matching Using Discrete Components: Two Component Matching Networks, Forbidden Regions, Frequency Response and Quality Factor, T and Pi Matching Networks-Amplifier Classes of Operation and Biasing Networks: Classes of Operation and Efficiency of Amplifiers, Biasing Networks for BJT, Biasing Networks for FET.

UNIT V: RF Transistor Amplifier Design:
Characteristics of Amplifiers- Amplifier Power Relations: RF Source, Transducer Power Gain, Additional Power Relations-Stability Considerations: Stability Circles, Unconditional Stability, And Stabilization Methods-Unilateral and Bilateral Design for Constant Gain- Noise Figure Circles- Constant VSWR Circles.
RF Oscillators and Mixers:
Basic Oscillator Model: Negative Resistance Oscillator, Feedback Oscillator Design, Design steps, Quartz Oscillators- Fixed Frequency High Frequency Oscillator -Basic Characteristics of Mixers: Concepts, Frequency Domain Considerations, Single Ended Mixer Design, Single and Double Balanced Mixers.

TEXT BOOKS:
1. RF Circuit Design – Theory and Applications by Reinhold Ludwig, Pavel Bsetchko – Pearson Education India, 2000.
2. Radio Frequency and Microwave Communication Circuits – Analysis and Design by Devendra K.Misra – Wiley Student Edition – John Wiley & Sons, Inc.

REFERENCES:
1. Radio Frequency and Microwave Electronics – Illustrated by Matthew M. Radmanesh – PEI.
2. RF Circuit Design – Christopher Bowick, Cheryl Aljuni and John Biyler, Elsevier Science, 2008.
3. Secrets of RF Circuit Design by Joseph J.Carr, TMH, 2000.
4. Design of RF and Microwave Amplifiersand Oscillators, Peter L.D. Abrif, Artech House, 2000.
5. The Design of CMOS Radio Frequency Integrated Circuits by Thomas H.Lee , 2/e – Cambridge University Press, 2004.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem

T	P	C
4	0	4

(15A04802a) SPEECH PROCESSING
Elective – III

Course Objectives:

- To introduce speech production and related parameters of speech.
- To show the computation and use of techniques such as short time Fourier transform, linear
- predictive coefficients and other coefficients in the analysis of speech.
- To understand different speech modeling procedures such as Markov and their implementation issues.

Course Outcomes:

Upon completion of the course, students will be able to:

- Model speech production system and describe the fundamentals of speech.
- Extract and compare different speech parameters.
- Choose an appropriate statistical speech model for a given application.
- Design a speech recognition system.
- Use different speech synthesis techniques.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1	2										1	2
CO2		1	2										1	2
CO3		1	2										1	2
CO4		1	2										1	2

UNIT -I
Basic Concepts

Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – Acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

UNIT -II
Speech Analysis

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures– mathematical and perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

UNIT- III
Speech Modeling
Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

UNIT -IV
Speech Recognition
Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word units; Applications and present status.

UNIT -V
Speech Synthesis
Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

Textbooks:
1. Lawrence Rabiner and Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education, 2003.
2. Daniel Jurafsky and James H Martin, "Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education, 2002.
3. Frederick Jelinek, "Statistical Methods of Speech Recognition", MIT Press, 1997.

References:
1. Steven W. Smith, "The Scientist and Engineer‟s Guide to Digital Signal Processing", California Technical Publishing, 1997.
2. Thomas F Quatieri, "Discrete-Time Speech Signal Processing – Principles and Practice", Pearson Education, 2004.
3. Claudio Becchetti and Lucio Prina Ricotti, "Speech Recognition", John Wiley and Sons, 1999.
4. Ben Gold and Nelson Morgan, "Speech and Audio Signal Processing, Processing and Perception of Speech and Music", Wiley- India Edition, 2006.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem	T	P	C
	4	0	4

(15A04802b) SCRIPTING LANGUAGES
Elective – III

Course Objectives:
The goal of the course is to study:
- The principles of scripting languages.
- Motivation for and applications of scripting.
- Difference between scripting languages and non- scripting languages.
- Types of scripting languages.
- Scripting languages such as PERL, TCL/TK, python and BASH.
- Creation of programs in the Linux environment.
- Usage of scripting languages in IC design flow.

Course Outcomes:
Upon learning the course, the student will have the:
- Ability to create and run scripts using PERL/TCl/Python in IC design flow.
- Ability to use Linux environment and write programs for automation of scripts in VLSI tool design flow.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			2						1					
CO2			2						1					

Unit – I : Linux Basics
Introduction to Linux , File System of the Linux, General usage of Linux kernel & basic commands, Linux users and group, Permissions for file, directory and users, searching a file & directory, zipping and unzipping concepts.

Unit – II : Linux Networking
Introduction to Networking in Linux, Network basics & Tools, File Transfer Protocol in Linux, Network file system, Domain Naming Services, Dynamic hosting configuration Protocol & Network information Services.

Unit – III : Perl Scripting
Introduction to Perl Scripting, working with simple values, Lists and Hashes, Loops and Decisions, Regular Expressions, Files and Data in Perl Scripting, References & Subroutines, Running and Debugging Perl, Modules, Object – Oriented Perl.

Unit – IV : Tcl / Tk Scripting
Tcl Fundamentals, String and Pattern Matching, Tcl Data Structures, Control Flow Commands, Procedures and Scope, Evel, Working with Unix, Reflection and Debugging, Script Libraries, Tk Fundamentals, Tk by examples, The Pack Geometry Manager, Binding Commands to X Events, Buttons and Menus, Simple Tk Widgets, Entry and List box Widgets Focus, Grabs and Dialogs.

Unit – V : Python Scripting

Introduction to Python, using the Python Interpreter, More Control Flow Tools, Data Structures, Modules, Input and Output, Errors and Exceptions, Classes, Brief Tour of the Standard Library.

Text Books:

1. Python Tutorial by Guido Van Rossum, Fred L. Drake Jr. editor , Release 2.6.4
2. Practical Programming in Tcl and Tk by Brent Welch, Updated for Tcl 7.4 and Tk 4.0.
3. Teach Yorself Perl in 21 days by David Till.
4. Red Hat Enterprise Linux 4 : System Administration Guide Copyright, 2005 Red Hat Inc.

Reference Books:

1. Learning Python – 2nd Ed., Mark Lutz and David Ascher, 2003, O'Reilly.
2. Perl in 24 Hours – 3rd Ed., Clinton Pierce, 2005, Sams Publishing.
3. Learning Perl – 4th Ed. Randal Schwartz, Tom Phoenix and Brain d foy. 2005.
4. Jython Essentials – Samuele Pedroni and Noel Pappin.2002. O'Reilly.
5. Programming Perl – Larry Wall, Tom Christiansen and John Orwant, 3rd Edition, O'Reilly, 2000. (ISBN 0596000278)

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem **T P C**
4 0 4

(15A04802c) CPLD & FPGA ARCHITECTURES
Elective – III

Course Outcomes:
After completion of this course the students will be able to
- Understand functioning of different types of Programmable Logic Devices.
- Complete knowledge pertaining to different FPGA Architectures and design applications.
- Capable of designing digital systems
- Realization of systems on FPGA/CPLD platforms

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	2	1	-	-	-	-	1	2	2	3	2
CO2	1	2	1	2	2	-	-	-	-	2	2	2	3	1
CO3	1	2	3	2	2	-	-	-	1	1	2	-	3	1
CO4	2	2	3	2	3	-	-	-	1	1	3	-	3	1

UNIT – I
Review of Logic Design Fundamentals: Combinational Logic, Designing with NAND – NOR Gates, Hazards in Combinational circuits. Implementation of logic functions with look-up tables, Design of Mealey and Moore Sequential circuits; Sequential Network timing, Setup and Hold times, Synchronous design.

UNIT – II
Design Methodologies; Architectures of Programmable Logic Devices**:** Programmable Read Only Memories (PROMs), Programmable Logic Arrays (PLAs) ; Programmable Array Logic (PAL), and CPLDs.
FPGAs: Introduction, Configurable logical blocks (CLBs), Programming Technologies: SRAM, Antifuse, EPROM and EEPROM

UNIT – III:
Design of Circuits for Athematic Operations:
Design of Digital systems with Multipliers and Dividers as examples
Digital System Design With SM chart: State Machine Chart, Derivation of SM chart, Realization of SM charts, Linked State Machines , Case Study with example

UNIT – IV
Designing with FPGAs and CPLDs: Introduction; Xilinx 3000 & 4000 series FPGAs, Designing with FPGAs, Necessary of One-hot encoding State Assignment. Altera Flex 10K series CPLDs; Xilinx Virtex–5 FPGA architecture, Altera Stratix III FPGA architecture,

UNIT – V
VHDL Synthesis:
Review of Fundamentals of VHDL, VHDL description of Combinational Circuits, Modeling a sequential Machine; Synthesis of VHDL code; Synthesis Examples,

TEXT BOOKS:

1. Charles H. Roth, Jr. "Digital Systems Design Using VHDL" PWS Publishing Company, Thomson Learning.
2. Stephen D. Brown, Robert J Francis, Jonathan Rose, Ivonko G. Vranesic, "Field Programmable Gate Arrays", Springer International Edition, First Indian Print 2007(Unit III & IV)
3. John F Wakerly, "Digital Design; Principles and Practices" , Prentice Hall.
4. Datasheets of FPGAs

REFERENCES:

1. Park K. Chan / Samiha Mourad, "Digital Design using Field Programmable Gate Arrays", Pearson, 1994 (Unit-I)
2. Ronald J Tocci, Neal S. Widmer, Gregory L. Moss, "Digital Systems: Principles & Applications", 10th Edition, Pearson, 2009 (Unit-II)
3. Stephen M. Trimberger, "Field Programmable Gate Array Technology" Springer International Edition", First Indian Reprint 2007.
4. Michel John Sebastian Smith "Application – Specific Integrated Circuits", Pearson Education, First Indian reprint 2000.
5. Charles H. Roth, Jr. University of Texas at Austin Larry L. Kinney University of Minnesota, Twin Cities " Fundamentals of Logic Design" SEVENTH EDITION,Cengage Learning

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem **T P C**
4 0 4

(15A04803a) RADAR ENGINEERING
Elective-IV

Course Objectives:
The objectives of course are:
- Radar fundamentals and analysis of radar signals.
- To understand various technologies involved in the design of radar transmitters and receivers.
- To learn various like MTI, Doppler and tracking radar and their comparison.

Course Outcomes:
After completion of the course, the student will be able to:
- Understand radar fundamentals and analysis of the radar signals.
- Understand various radar transmitters and receivers.
- Understand various radar like MTI, Doppler and tracking radar and their comparison.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	2									1	2
CO2	1	2	1	1									1	2
CO3	1	2	1	2									1	2

UNIT I
BASICS OF RADAR: Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems.
RADAR EQUATION: SNR, Envelope Detector, False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT II
CW AND FREQUENCY MODULATED RADAR: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Illustrative Problems.
FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar.

UNIT III
MTI AND PULSE DOPPLER RADAR: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, And Staggered PRFs. Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance,MTI versus Pulse Doppler radar.

UNIT IV

TRACKING RADAR: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two- coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT V

DETECTION OF RADAR SIGNALS IN NOISE: Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

RADAR RECEIVERS: Noise Figure and Noise Temperature, Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus Parallel Feeds, Applications, Advantages and Limitations.

Text Books:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Edition, 2007.

References:

1. Introduction to Radar Systems – Merrill I. Skolnik, 3rd Edition, Tata McGraw-Hill, 2001.
2. Radar Principals, Technology, Applications – Byron Edde, Pearson Education, 2004.
3. Radar Principles – Peebles, Jr., P.Z.Wiley, NweYork, 1998.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem **T P C**
4 0 4

(15A04803b) ADHOC WIRELESS SENSOR NETWORKS
Elective-IV

Course Objectives:
- To study the fundamentals of wireless Ad-Hoc Networks.
- To study the operation and performance of various Adhoc wireless network protocols.
- To study the architecture and protocols of Wireless sensor networks.

Course Outcomes:
- Students will be able to understand the basis of Ad-hoc wireless networks.
- Students will be able to understand design, operation and the performance of MAC layer protocols of Adhoc wireless networks.
- Students will be able to understand design, operation and the performance of routing protocol of Adhoc wireless network.
- Students will be able to understand design, operation and the performance of transport layer protocol of Adhoc wireless networks.
- Students will be able to understand sensor network Architecture and will be able to distinguish between protocols used in Adhoc wireless network and wireless sensor networks.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1		2							1		1	2
CO2	2	1		1							1		1	2
CO3	1	1		1							1		1	2
CO4	2	1		2							1		1	2
CO5	2	1		2							1		1	2

UNIT - I:
Wireless LANs and PANs
Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF.
AD HOC WIRELESS NETWORKS
Introduction, Issues in Ad Hoc Wireless Networks.

UNIT - II:
MAC Protocols
Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT - III:
Routing Protocols
Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

UNIT – IV:
Transport Layer Protocols
Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT – V:
Wireless Sensor Networks
Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

Text Books:
1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI.
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control - Jagannathan Sarangapani, CRC Press.

References:
1. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh , 1st Ed. Pearson Education.
2. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem **T P C**
4 0 4

(15A04803c) ADVANCED DIGITAL SIGNAL PROCESSING
Elective-IV

Course Objectives:

- To bring out the concepts related to stationary and non-stationary random signals
- To emphasize the importance of true estimation of power spectral density
- To introduce the design of linear and adaptive systems for filtering and linear prediction
- To introduce the concept of wavelet transforms in the context of image processing

Course Outcomes:

Upon completion of the course, students will be able to:

- Explain the parametric methods for power spectrum estimation.
- Discuss adaptive filtering techniques using LMS algorithm and the applications of adaptive filtering.
- Analyze the wavelet transforms.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	1	2	2	1	2	1	1	2	1	2	3
CO2	2	2	2	1	2	1	1		2	2	2	1	2	3
CO3	2	3	3	1	2				2	2	2	1	2	3

UNIT I-DISCRETE-TIME RANDOM SIGNALS

Discrete random process – Ensemble averages, Stationary and ergodic processes, Autocorrelation and Autocovariance properties and matrices, White noise, Power Spectral Density, Spectral Factorization, Innovations Representation and Process, Filtering random processes, ARMA, AR and MA processes.

UNIT II- SPECTRUM ESTIMATION

Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion

UNIT III- LINEAR ESTIMATION AND PREDICTION

Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters, Discrete Kalman filter.

UNIT IV -ADAPTIVE FILTERS

Principles of adaptive filter – FIR adaptive filter – Newton's Steepest descent algorithm – LMS algorithm – Adaptive noise cancellation, Adaptive equalizer, Adaptive echo cancellers.

UNIT V -WAVELET TRANSFORM

Multiresolution analysis, Continuous and discrete wavelet transform, Short Time Fourier Transform, Application of wavelet transform, Cepstrum and Homomorphic filtering.

Textbooks:

1. Monson H, Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley and Sons Inc., New York, Indian Reprint, 2007.
2. John G.Proakis, Dimitris G. Manolakis, "Digital Signal Processing", Pearson, Fourth 2007.

References:

1. Dwight F. Mix, "Random Signal Processing", Prentice Hall, 1995.
2. Sophocles J. Orfanidis, "Optimum Signal Processing, An Introduction", Mc Graw Hill, 1990.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem T P C
4 0 4

(15A04804a)CODING THEORY AND TECHNIQUES
(Elective-IV)

Course Objectives:
- To acquire the knowledge in measurement of information and errors.
- T study the generation of various code methods.
- To study the various application of codes.

Course Outcomes:
- Learning the measurement of information and errors.
- Obtain knowledge in designing various codes like block codes, cyclic codes, convolution codes, turbo codes and space codes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	2	1					1			1	1
CO2	2	2	1	2	1					1	1		2	1

UNIT – I:Coding for Reliable Digital Transmission and storage
Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.
Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT - II:Cyclic Codes
Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT – III:Convolutional Codes
Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT – IV:Turbo Codes
LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

UNIT - V:

Space-Time Codes

Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti's schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial Multiplexing : General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QL Decomposition and Interface Cancellation, Performance of Multi – Layer Detection Schemes, Unified Description by Linear Dispersion Codes.

Text Books:

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc.
2. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill

References:

1. Error Correcting Coding Theory-Man Young Rhee-1989,McGraw – Hill Publishing,19
2. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Digital Communications- John G. Proakis, 5th ed., 2008, TMH.
4. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006, Wiley India.
6. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, TMH.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem

T	P	C
4	0	4

(15A04804b)ARTIFICIAL NEURAL NETWORKS
(Elective-IV)

Course Objectives:
- To understand the biological neural network and to model equivalent neuron models.
- To understand the architecture, learning algorithm and issues of various feed forward and feedback neural networks.

Course Outcomes:
By completing this course the student will be able to:
- Create different neural networks of various architectures both feed forward and feed backward.
- Perform the training of neural networks using various learning rules.
- Perform the testing of neural networks and do the perform analysis of these networks for various pattern recognition applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2		1	1					2			1	2
CO2	1	2	1	1	1					2			1	2
CO3	1	2	2	1	1					2			1	2

UNIT-I:
Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks.
Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process.

UNIT-II:
Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment.
Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection.

UNIT-III:
Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning.

UNIT-IV:

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification

UNIT-V:
Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm
Hopfield Models – Hopfield Models, Computer Experiment
Text Books:
1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

References:

1. Artificial Neural Networks - B. Vegnanarayana Prentice Hall of India P Ltd 2005
2. Neural Networks in Computer Inteligance, Li Min Fu TMH 2003
3. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
   Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS): ANANTHAPURAMU
ELECTRONICS & COMMUNICATION ENGINEERING

IV B.Tech II Sem **T P C**
4 0 4

(15A04804c)INTERNET OF THINGS
(Elective-IV)

Course Objectives:
Students will be explored to the interconnection and integration of the physical world and thecyber space. They are also able to design & develop IOT Devices.

Course Outcomes:
- Able to understand the application areas of IOT.
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.
- Able to understand building blocks of Internet of Things and characteristics.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	3	1	3	1	1	1	1	1	1	2	2	2
CO2	1	3	3	3	3	1			2	1	2	2	2	2
CO3	1	3	2	2	3	1			2	1	2	2	3	2

UNIT I
Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels.

UNIT II
Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

UNIT III
M2M & System Management with NETCONF-YANG: M2M, Difference between IOT and M2M, SDN and NFV for IOT, Software defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

UNIT IV
Developing Internet of Things & Logical Design using Python: Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages

UNIT V
IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming & IOT Devices.

Text Books:

1. Vijay Madisetti, Arshdeep Bahga,” Internet of Things A Hands-On- Approach”,2014, ISBN:978 0996025515

References:

1. Adrian McEwen, “Designing the Internet of Things”, Wiley Publishers, 2013, ISBN: 978-1-118-43062-0.
2. Daniel Kellmereit, “The Silent Intelligence: The Internet of Things”. 2013, ISBN

JNTUA COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU

RULES AND REGULATIONS SCHEME OF INSTRUCTION AND SYLLABI FOR B.Tech PROGRAM

Effective from 2017 – 18

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Vision And Mission of the Institute

Vision

- Committed to expanding the horizon and inspiring young minds towards academic excellence.
- Aims at scaling new heights through advanced research and innovative techniques to keep pace with the changing needs of industry and society at large.

Mission

- To identify and implement proven, prevention oriented, forward-looking solutions to critical scientific and technological problems.
- To make technology a principal instrument of economic development of the country and to improve the quality of life of the people through technological education, innovation, research, training, and consultancy.

Vision and Mission of the Department

Vision

- To produce globally competitive and socially sensitized engineering graduates and to bring out quality research in the frontier areas of Electronics & Communication Engineering.

Mission

M1:

To provide quality and contemporary education in the domain of Electronics & Communication Engineering through periodically updated curriculum, best of breed laboratory facilities, collaborative ventures with the industries and effective teaching learning process.

M2:

To provide essential knowledge research and innovative technologies in Electronics & Communication Engineering and to inculcate innovative skills, research aptitude, team-work, ethical practices in students so as to meet expectations of the industry as well as society.

Program Educational Objectives (PEOs) of the Department

Program Educational Objective - 1

Graduates can comprehend fundamentals of engineering sciences; mathematics and multi-disciplinary engineering courses that help them to understand the design and developmental concepts of electronics and communication engineering (ECE).

Program Educational Objective - 2

Graduates acquire in-depth knowledge related to the core area of electronics and communication engineering, starting from the basics to the level of analysis, synthesis and design of circuits and systems, in addition to the exposure on latest advancements in the field.

Program Educational Objective - 3

Graduates are trained to the required technical skills necessary for solving real life problems, inspiring towards perceiving post graduate programs and encourage pursing research activities in the advanced areas of ECE.

Program Educational Objective - 4

Graduates recognize the importance of leadership, ethical attitude, communication and management skills, teamwork, social responsibility, physical fitness, and the continuous life-long learning needed for a successful professional career as engineers, scientists, technocrats, administrators, and entrepreneurs.

Mapping PEOs and Mission Statements

Mission of the department	M1	M2
PEOs		
PEO1: Graduates can comprehend fundamentals of engineering sciences; mathematics and multi- disciplinary engineering courses that help them to understand the design and developmental concepts of electronics and communication engineering (ECE).	**2**	**1**
PEO2: Graduates acquire in-depth knowledge related to the core area of electronics and communication engineering, starting from the basics to the level of analysis, synthesis and design of circuits and systems, in addition to the exposure on latest advancements in the field.	**3**	**2**
PEO3: Graduates are trained to the required technical skills necessary for solving real life problems, inspiring towards perceiving post graduate programs and encourage pursing research activities in the advanced areas of ECE.	**3**	**3**
PEO4: Graduates recognize the importance of leadership, ethical attitude, communication and management skills, teamwork, social responsibility, physical fitness, and the continuous life-long learning needed for a successful professional career as engineers, scientists, technocrats, administrators, and entrepreneurs.	**1**	**3**

Note: *M1, M2. . . Mn are distinct elements of Mission statement. Enter correlation levels 1, 2 or 3 as defined below:*

1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

If there is no correlation, put "-"

Note: *Wherever the word "process" is used in this document its meaning is process formulation, notification to all the concerned, and implementation*

Program Outcomes (POs)

PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and teamwork:** Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO1	Competence in analysis & design of analog and digital system using hardware and software tools
PSO2	Understand, analyze the present and future generations of wireless communication technologies

Course Components

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total number of credits
Basic Sciences	13.51	32	25
Engineering Sciences	5.40	16	10
Humanities and Social Sciences	8.64	22	16
Program Core	56.21	132	104
Program Electives	6.48	12	12
Open Electives	3.24	6	6
Project(s)	5.40	20	10
Internships/Seminars	1.08	4	2
Any other (Please specify)	-	-	-
Total number of Credits			185

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
B.Tech. (ECE) 2017-18
COURSE STRUCTURE

I YEAR I SEMESTER

Code	Subject	L	T	P	C
17A15501	English	3	-	-	3
17A15101	Mathematics -I	2	2	-	3
17A15201	Applied Physics	3	-	-	3
15A10101	Environmental Studies	3	-	-	3
17A10301	Engineering Drawing	1	1	3	3
17A10501	Problem Solving & Computer Programming	3	-	-	3
17A15202	Applied Physics Lab	-	1	3	2
17A10502	Computer Programming Lab	-	1	3	2
17A15502	English Language Communication Skills Lab	-	1	3	2
17A12451	Comprehensive Objective type Examination	-	-	-	1
	Total	**15**	**06**	**12**	**25**

I YEAR II SEMESTER

Code	Subject	L	T	P	C
17A25501	Technical Communication and Presentation Skills	3	-	-	3
17A25101	Mathematics -II	2	2	-	3
17A25301	Applied Chemistry	3	-	-	3
17A25102	Mathematical Methods	2	2	-	3
17A20401	Network Analysis	2	2	-	3
17A20402	Electronic Devices	3	-	-	3
17A25302	Applied Chemistry Lab	-	1	3	2
17A23501	Engineering & IT Workshop	-	1	3	2
17A20403	Electronic Devices Lab	-	1	3	2
17A29901	Community Service (Audit)	-	-	2	-
17A20406	Comprehensive Objective type Examination	-	-	-	1
	Total	**15**	**09**	**11**	**25**

II YEAR I SEMESTER

Code	Subject	L	T	P	C
17A35103	Complex Variables and Special Functions	3	-	-	3
17A30401	Probability Theory and Stochastic Processes	3	-	-	3
17A30402	Electronic Circuits - I	3	-	-	3
17A30403	Signals and Systems	3	-	-	3
17A30205	Electrical Technology	2	2	-	3
17A30404	Electronic Circuits – I Lab	-	1	3	2
17A30405	Basic Simulation Lab	-	1	3	2
17A30206	Electrical Technology Lab	-	1	3	2
17A45101	Human Values & Professional Ethics(Audit)	2	-	-	-
17A30406	Comprehensive Objective type Examination	-	-	-	1
	Total	**16**	**05**	**09**	**22**

II YEAR II SEMESTER

Code	Subject	L	T	P	C
17A40401	Electromagnetic Field Theory	3	-	-	3
17A40402	Switching Theory and Logic Design	2	2	-	3
17A40403	Electronic Circuits - II	3	-	-	3
17A40404	Networks and Transmission Lines	2	2	-	3
17A40207	Control Systems Engineering	2	2	-	3
17A40405	Data Structures & Object-Oriented Programming	2	2	-	3
17A40406	Electronic Circuits – II Lab	-	1	3	2
17A40407	Data Structures Lab	-	1	3	2
17A40408	Comprehensive Objective type Examination	-	-	-	1
	Total	**14**	**10**	**06**	**23**

III YEAR I SEMESTER

Code	Subject	L	T	P	C
17A35401	Managerial Economics and Financial Analysis	3	-	-	3
17A50401	Linear IC Applications	3	-	-	3
17A50402	Analog Communication Systems	3	-	-	3
17A50403	Digital Design using VHDL	3	-	-	3
17A50404	Antennas and Wave propagation	3	-	-	3
17A50405	Linear IC Applications Lab	-	1	3	2
17A50406	Analog Communication Systems Lab	-	1	3	2
17A50407	VHDL Programming Lab	-	1	3	2
17A50408	Object Oriented Programming Lab	-	-	2	1
17A50409	Comprehensive Objective type Examination	-	-	-	1
	Total	**15**	**03**	**11**	**23**

III YEAR II SEMESTER

Code	Subject	L	T	P	C
17A60401	Microprocessors & Microcontrollers	3	-	-	3
17A60402	VLSI Design	2	2	-	3
17A60403	Digital Communication Systems	3	-	-	3
17A60404	Digital Signal Processing	2	2	-	3
 17A60405 17A60406 17A60407	**Open Elective - I** Principles of Electronic Communication Systems Digital Electronics Principles of Digital Signal Processing	3	-	-	3
17A60408	Microprocessors & Microcontrollers Lab	-	1	3	2
17A60409	Digital Communication Systems Lab	-	1	3	2
17A65501	Advanced Communication Skills Lab	-	1	3	2
17A69901	Foreign Language (Audit)	2	-	-	-
17A60410	Comprehensive Objective type Examination	-	-	-	1
	Total	**15**	**07**	**09**	**22**

IV YEAR I SEMESTER

Code	Subject	L	T	P	C
17A75401	Management Science	3	-	-	3
17A70401	Electronic Measurements & Instrumentation	3	-	-	3
17A70402	Optical Communications	3	-	-	3
17A70403	Microwave Engineering	3	-	-	3
17A70404 17A70405 17A70406	**Elective – I** a. Data Communications & Networking b. Television Engineering c. Radar Engineering	3	-	-	3
17A70407 17A70408 17A70409	**Open Elective – II** Electronic Measuring Instruments Fuzzy Logic & Neural networks Microcontrollers and Applications	3	-	-	3
17A70410	Digital Signal Processing Lab	-	1	3	2
17A70411	Microwave & Optical Communications Lab	-	1	3	2
17A70412	Comprehensive Objective type Examination	-	-	-	1
17A70413	MOOC-I (Audit)	-	-	-	-
	Total	**18**	**02**	**06**	**23**

IV YEAR II SEMESTER

Code	Subject	L	T	P	C
17A80401 17A80402 17A80403	**Elective – II** a. Embedded Systems b. Coding Theory and Techniques c. Satellite Communications	3	-	-	3
17A80404 17A80405 17A80406	**Elective – III** a. Digital Image Processing b. Scripting Languages c. RF Circuit Design	3	-	-	3
17A80407 17A80408 17A80409	**Elective – IV** a. Artificial Intelligence b. Data Compression and Encryption c. Cellular & Mobile Communications	3	-	-	3
17A80410	Seminar	-	-	4	2
17A80411	Project Work	-	-	20	10
17A80412	Comprehensive Objective type Examination	-	-	-	1
17A80413	MOOC-II(Audit)	-	-	-	-
	Total	**09**	**00**	**24**	**22**

Note: All End Examinations (Theory and Practical) are of three hours duration.

L – Theory T- Tutorial P – Practical/Drawing C – Credits

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A15501	**English**	3	-	-	3

COURSE OBJECTIVES	
1	To enable the students to communicate in English for academic and social purpose
2	To enable the students to acquire structures and written expressions required for their profession.
3	To develop and practice critical and evaluative reading
4	To encourage investigating questions of the humanities through rhetorical study
5	To enhance the study skills of the students with emphasis on LSRW skills

COURSE OUTCOMES	
CO1	Develop facility in responding to a variety of situations and contexts calling for purposeful shifts in voice, tone, level of formality, design, medium, and/or structure
CO2	Become effective in the use of different modes of written communication in a professional environment
CO3	Develop capacity to apply different reading methods to evaluate a mass of data on the net and to glean the necessary information
CO4	Learn and use key rhetorical concepts through analyzing and composing a variety of texts
CO5	Well trained in LSRW skills and develop communicative competence

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3											2	
CO2	2												2	
CO3		3	3							3	3			3
CO4		3	3			2					3			3
CO5		3	3			2			2	3	3			3

UNIT –I

Chapter entitled *Humour* from "Using English"
Chapter entitled "Jagadish Chandra Bose" from New Horizons

L- Listening -Techniques - Importance of phonetics
L- Meet & Greet and Leave taking, Introducing Oneself and Others (Formal and Informal situations)
R- -Reading Strategies -Skimming and Scanning
W- Writing strategies- sentence structures
G-Parts of Speech –Noun-number, pronoun-personal pronoun, verb- analysis
V-Affixes-prefix and suffix, root words, derivatives

UNIT –II

Chapter entitled *Inspiration* from "Using English"
Chapter entitled "Dhyan Chand" from New Horizons

L- Listening to details
S- Apologizing, Interrupting, Requesting and Making polite conversations
R-note making strategies
W- Paragraph-types- topic sentences, unity, coherence, length , linking devices

G-Auxiliary verbs and question tags
V- synonyms-antonyms, homonyms , homophones, homographs, words often confused

UNIT –III

Chapter entitled *Sustainable Development* from "Using English"
Chapter entitled "After Twenty Years" from New Horizons
L- Listening to themes and note taking
S- Giving instructions and Directions, making suggestions, Accepting ideas, fixing a time and Advising
R- Reading for details -1
W- Resume and cover letter
G- Tenses – Present tense, Past tense and Future tense
V-Word formation and One-Word Substitutes

UNIT –IV

Chapter entitled *Relationships* from "Using English"
Chapter entitled "The Tiger in the Tunnel" from New Horizons
L- Listening to news
S- Narrating stories, Expressing ideas and opinions and telephone skills
R- Reading for specific details and Information
W- Technical Report writing-strategies, formats-types-technical report writing
G- Voice and Subject – Verb Agreement
V- Idioms and prepositional Phrases

UNIT –V

Chapter entitled Science and Humanism from "Using English"
Chapter entitled a. "Daffodils" b. "Where the mind is Without Fear" from New Horizons
L- Listening to speeches
S- Making Presentations and Group Discussions
R- Reading for Information
W- E-mail drafting
G- Conditional clauses and conjunctions
V- Collocations and Technical Vocabulary and using words appropriately

Text Books:

1. **Using English (for detailed study)** published by Orient Black Swan, 2013
2. **New Horizons (for non detailes study) published by Pearson, 2013**

References:

1. **Raymond Murphy's English Grammar with CD,** Murphy, Cambridge University Press, 2012.
2. **Every Day Dialogues in English- Robert J.Dixson, Prentice Hall of India**
3. **Communication Skills, Sanjay Kumar &Pushpalatha** Oxford University Press, 2012.
4. **A Course in Communication Skills**- KiranmaiDutt& co. Foundation Books, 2012.
5. **Current English grammar and usage-**S M Guptha, PHI, 2013.
6. **A Course in Listening and Speaking-SasiKumar.U, U.K.Cambridge**
7. **Powerful Vocabulary Builder**- AnjanaAgarwal New Age International Publishers, 2011.
8. **Writing with a Purpose, Tickoo and Sasi Kumar, OUP, 2011**
9. **Oxford Advanced Learners Dictionary, 9th edition, Oxford, 2016**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A15101	**Mathematics – I**	**2**	**2**	**-**	**3**

COURSE DESCRIPTION: First order differential equation, higher order linear differential equations; functions of several variables; applications of integration; multiple integrals, vector calculus.

COURSE OBJECTIVES	
1	To impart knowledge on the advanced concepts of linear differential equations, functions of several variables, applications of derivatives, multiple integrals and vectors calculus.
2	To develop skills in analyzing the problems, designing mathematical models, skills in differentiation, integration, and vectors calculus for the problems in engineering.

COURSE OUTCOMES	
After completion of the course a successful student is able to	
CO1	Acquire knowledge in (a) Higher order Differential equations (b) Maximum and minimum values for the functions of several variables (c) Double and triple integrals (d) Differentiation and integration of vector functions. (e) Line and surface volume (f) Transforming integrals from three dimensional surfaces and volumes on to plane surfaces
CO2	Develop skills in analyzing the (a) methods for differential equation for obtaining appropriate solutions, (b) Properties of oscillatory electrical circuits and heat transfer in engineering systems (c) The variations in the properties of functions near their stationary values (d) Flow patterns of fluids, electrical and magnetic flux and related aspects
CO3	Develop skills in designing mathematical models for (a) R-C and L-R-C oscillatory electrical circuits (b) Mechanical oscillations. (c) Deflection of Beams. (d) Heat transfer and Newton's laws of cooling (e) Engineering concepts involving lengths of curves and areas of planes Flux across surfaces
CO4	Develop analytical skills in solving the problems involving (a) Newton's laws of cooling (b) non homogeneous linear differential equations (c) maximum and minimum values for the functions (d) lengths of curves, areas of surfaces and volumes of solids in engineering (e) transformations of integrals from three dimensional surfaces and volumes on to plane surfaces
CO5	Use relevant mathematical techniques for evaluating (a) various types of particular integrals in differential equations (b) stationary values for multi variable functions (c) multiple integrals in change of variables (d) Integrations of vector functions.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	1	-	-	2	1	-	-		
CO2	1	3	-	-	-	1	-	-	2	2	-	-		
CO3	1	3	2	-	-	1	-	-	2	2	-	-		
CO4	1	1	1	3	-	1	-	-	2	1	-	-		
CO5	1	1	1	1	-	1	-	-	2	1	-	-		

UNIT I
FIRST ORDER DIFFERENTIAL EQUATIONS(6 periods)
Linear and Bernoulli type, exact equations and reducible to exact.Orthogonal trajectories (Both Cartesian and polar forms).Newton's law of cooling.

UNIT II
HIGHER ORDER LINEAR DIFFERENTIALEQUATIONS(12 periods)
Method for solution of linear equations- Differential operator *D*, Solution of second order linear homogeneous equations with constant coefficients, Solution of Higher order homogeneous linear equations with constant coefficients, Solution of Non homogeneous linear equations-Operator methods for finding particular integrals- for cases – e^{ax}, sinax, cos ax, x^n, $e^{ax}V(x)$, $xV(x)$. Method of Variation of parameters. Applications of linear differential equations - Mechanical and Electrical oscillatory circuits and Deflection of Beams.

UNIT III
Power Series Expansions &Multi-variable Calculus (8 Lectures)
Taylor series, Maclaurin series. Functions of several variables, Continuity, Partial derivatives, Total derivative, Increment theorem, Chain rule, Tangent plane and Normal line, Mixed derivative theorem, Necessary and sufficient conditions for Maxima, Minima and Saddle point, The method of Lagrange multipliers.

UNIT IV
Multiple Integrals (6 Lectures)
Double integral, Fubini's theorem, Volumes and Areas, Change of variable in a double integral, special case: Polar coordinates, Triple integral, Applications, Change of variables in a triple integral, Surface area, Line integrals, Surface integrals.

UNIT V
Vector Calculus (12 Lectures)
Vector functions, Continuity and Differentiability of vector functions, Arc length for space curves, Unit tangent vector, Unit normal and Curvature to plane and space curves, Gradient, Directional derivatives, Vector fields, Divergence and Curl of a vector field, vector integrations, Green's Theorem (without Proof), Stokes' Theorem(without Proof), The divergence theorem(without Proof), verifications and applications.

Text Books:
1. Engineering Mathematics-I, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher
2. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.

References:

1. Engineering Mathematics Volume-I, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publication.
2. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.
3. Higher Engineering Mathematics, by B.V.Ramana, McGraw Hill publishers.
4. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.
5. Advanced Engineering Mathematics 3rd Edition,by R.K.Jain&S.R.K.Iyengar, Narosa publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A15201	**Applied Physics**	3	-	-	3

COURSE OBJECTIVES	
1	To make a bridge between the physics in school and engineering courses.
2	To evoke interest on applications of superposition effects like interference and diffraction, the mechanisms of emission of light, the use of lasers as light sources for low and high energy applications, study of propagation of light through transparent dielectric waveguides along with engineering applications.
3	To enlighten the concepts regarding the bulk response of materials to the EM fields and their analytical study in the back-drop of basic Quantum Mechanics and to provide fundamentals of de'Broglie waves, quantum mechanical wave equation and its applications
4	To get an insight into the microscopic meaning of conductivity, classical and quantum free electron models, the effect of periodic potential on electron motion, evolution of band theory to distinguish materials, basic concepts and transport phenomenon of charge carriers in semiconductors.
5	To open new avenues of knowledge in dielectric and magnetic materials which find potential in the emerging micro device applications.
6.	To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications. Considering the significance of micro miniaturization of electronic devices and significance of low dimensional materials, the basic concepts of nano and smart materials, their properties and applications in modern emerging technologies are to be elicited.

COURSE OUTCOMES	
CO1	The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fiber optics.
CO2	Basics of Electromagnetic fields are focused along with the understanding of quantum mechanical picture of subatomic world.
CO3	The discrepancies between the classical estimates and laboratory observations of electron transportation phenomena are successfully explained by free electron theory and band theory. The physical properties exhibited by materials would be lifted through the understanding of properties of semiconductors.
CO4	The dielectric and magnetic response of materials are focused.
CO5	The importance of superconducting materials, nanomaterials and smart materials along with their engineering applications are well elucidated.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				2	2		2		1		2	
CO2	3	2		2		2	2		2		1		2	
CO3	3	3		2		2	2		2		1		2	
CO4	3	2		2		2	2		2		1		2	
CO5	3	2		2		2	2		2		1		2	

UNIT 1:PHYSICAL OPTICS, LASERS AND FIBRE OPTICS

***Physical Optics**:* Introduction to interference – Colours in thin films – Newton's Rings – Michelson interferometer – Fraunhofer diffraction due to single slit, double slit – Diffraction grating(Qualitative).

***Lasers**:* Introduction – Characteristics of laser – Spontaneous and stimulated emission of radiation – Einstein's coefficients – Population inversion – Pumping mechanisms – Nd:YAG laser – He-Ne laser – Applications of lasers.

Fiber optics: Introduction–Principle of optical fiber –Numerical aperture and acceptance angle – V-Number - Types of optical fibers – Optical fiber communication system – Attenuation and losses in optical fibers – Applications of optical fibers.

UNIT 2: ELECTOMAGNETIC FIELDS AND QUANTUM MECHANICS

Electromagnetic Fields: Scalar and Vector Fields – Electric Potential – Gradient, Divergence of fields - Gauss and Stokes theorems - Derivations of Maxwell's equations.

***QuantumMechanics**:* Black Body radiation – Dual nature of radiation – Schrodinger's time independent wave equation – Significance of wave function – Particle in a one dimensional infinite potential well.

UNIT 3: FREE ELECTRON THEORY AND SEMICONDUCTORS

Freeelectrontheory: Classical free electron theory – Sources of electrical resistance – Equation for electrical conductivity – Quantum free electron theory – Fermi-Dirac distribution – Kronig-Penny model (qualitative) – Origin of bands in solids – Effective mass.

***Semiconductorphysics**:* Introduction –Direct and Indirect band gap semiconductors – Drift & diffusion currents – Einstein's equation – Continuity equation – Hall Effect.

UNIT 4: **DIELECTRICS AND MAGNETIC MATERIALS**

***Dielectrics**:* Introduction – Dielectric Polarization – Types of Polarization – Lorentz field – Clausius-Mosotti equation – Piezoelectricity – Ferro electricity – Dielectric strength, loss and breakdown.

***Magneticmaterials**:* Introduction – Basic definitions – Origin of magnetic moment – Classification of magnetic materials – Hysteresis – Soft and hard magnetic materials – Applications of magnetic materials.

UNIT 5: **ADVANCED MATERIALS**

***Superconductors**:* Introduction – Properties of superconductors – Meissner effect– Type I and type II superconductors – ac and dc Josephson effects – BCS theory (qualitative) – High T_c superconductors – Applications of superconductors.

Nanomaterials: Introduction – Surface area and quantum confinement – Physical properties: optical, thermal, mechanical and magnetic – Applications of nanomaterials.

SmartMaterials: Shape Memory Alloys: Definition – Two phases – One way and two way memory effect – Pseudo elasticity – Applications of shape memory alloys.

Text books:

1. Engineering physics – D.K. Battacharya and PoonamTandon, Oxford University press.
2. Engineering physics – M.N. Avadhanulu and P.G. KrshiSagar, Chand and Co.

References:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Introduction to modern optics – Grant R Fowles
3. A text book on Optics – Brijlal&Subramanyam
4. Semiconductor physics and devices- Basic principle – Donald A, Neamen, McGraw Hill
5. Introduction to Nanotechnology – C P Poole and F J Owens, Wiley
6. Shape Memory Alloys-Modeling and Engg. Applications – C Lagoudas, Springer

7. Engineering Physics – V. Rajendran, K.Thyagarajan Tata MacGraw Hill Publishers
8. Engineering Physics – S.O.Pillai, New Age Publications
9. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press
10. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
11. Engineering Physics – M. Arumugam, Anuradha Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
15A10101	**Environmental Studies**	3	-	-	3

COURSE OBJECTIVES	
1	To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

COURSE OUTCOMES	
CO1	Critical Thinking: demonstrate critical thinking skills in relation to environmental affairs.
CO2	Communication: demonstrate knowledge and application of communication skills and the ability to write effectively in a variety of contexts.
CO3	Interdisciplinary Synthesis: demonstrate an ability to integrate the many disciplines and fields that intersect with environmental concerns
CO4	Ecological Literacy: demonstrate an awareness, knowledge, and appreciation of the intrinsic values of ecological processes and communities
CO5	Sustainability: demonstrate an integrative approach to environmental issues with a focus on sustainability

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					2			3		1				
CO2					2			3		1				
CO3					2			3		1				
CO4					1			3		1				
CO5					2			3		1				

UNIT – I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: – Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – II

ECOSYSTEMS : Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological sucession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-soports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of:

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT : Causes, effects and control measures of urban and industrial wates – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

SOCIAL ISSUES AND THE ENVIRONMENT : From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V

HUMAN POPULATION AND THE ENVIRONMENT : Population growth, variation among nations. Population explosion – Family Welfare Proggramme. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK : Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds – river, hill slopes, etc..

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Pubilishers.
3. Environmental Studies by Benny Joseph, TMH Pubilishers

References:

1. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company
2. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, CengagePubilications.
3. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
4. Comprehensive Environmental studies byJ.P.Sharma, Laxmi publications.

5. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A10301	**Engineering Drawing**	1	1	3	3

COURSE OBJECTIVES	
1	To draw and understand the practical importance of geometrical constructions.
2	To understand the representation of the regular planes and solids in first angle of projections

COURSE OUTCOMES	
CO1	Student will be familiar with the BIS conventions and dimensions
CO2	Student will be familiar with the positions of points and straight lines under different cases
CO3	Student will be able to represent regular planes and solids on the drawing sheet for various cases
CO4	Student can draw the development for regular solids
CO5	Student will familiarize with the 2D and 3D projections of various figure

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		1						1					
CO2	3		1						1					
CO3	3		1						1					
CO4	3		1						1					
CO5	3		1						1					

UNIT I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance Drawing Instruments and their Use – BIS Conventions in drawing and Lettering.

Curves used in practice:

a) Conic sections including the Rectangular Hyperbola
b) Cycloid, Epicycloid and Hypocycloid –Normals and Tangents
c) Involute of a circle –Normals and Tangents

Principles of orthographic projection, I and III angle projections –Conventions –Projections of points.

UNIT II

Projection of lines inclined to both planes –traces, Projection of plane figures inclined to both planes.

UNIT III

Projection of simple solids inclined to both planes.

UNIT IV

Sections and Developments: Sections and Sectional views of Regular solids –Prism, Cylinder, Pyramid, Cone – True shapes.

UNIT V

Isometric projections: Principles of pictorial representations-Isometric projection- Isometric scale-Isometric views- conventions- Isometric views of plane figures, solids-Isometric projection of objects with non isometric lines-Isometric projection of spherical parts.

Text Books:

1. Engineering Drawing, N.D. Bhat, Charotar Publishers
2. Engineering Drawing, K.L. Narayana& P. Kannaih, Scitech Publishers, Chennai.

References:

1. Engineering Drawing, Johle, Tata McGraw-Hill Publishers.

2. Engineering Drawing, Shah and Rana,2/e, Pearson Education
3. Engineering Drawing and Graphics, Venugopal/New age Publishers
4. Engineering Graphics, John&john.

Method of Evaluation:

The distribution shall be 40 marks for Internal Evaluation and 60 marks for the External Evaluation.

Internal mid examination for 30 marks and internal assessment for 10 marks shall be awarded for internal evaluation.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A10501	**Problem Solving and Computer Programming**	3	-	-	3

COURSE OBJECTIVES	
1	To understand the various steps in program development.
2	To understand the basic concepts in C Programming Language.
3	To learn how to write modular and readable C Programs
4	To understand the basic concepts such as Abstract Data Types, Linear and Non Linear Data structures.
5	To understand the notations used to analyze the Performance of algorithms.
COURSE OUTCOMES	
CO1	Develop flowcharts, algorithms for given complex problems.
CO2	Analyze basic programming constructs.
CO3	Write C programs for real world problems.
CO4	Implement C programming by using various control structures.
CO5	Appreciate coding standards and best practices for program development.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2			1			2	3	1	1	2	
CO2	2	3	3	1	1		1	1	2	3	1			3
CO3		2		2	3	1			3	2	2	1	3	
CO4		3	3		2		1	1	3	2			2	
CO5		0		3		3	2		1	1	1	2		

UNIT - I

Introduction: Programs and Programming, Programming Languages, Compiler, Interpreter, Loader and Linker, Program Execution, Classification of Programming, Structured Programming Concept, Algorithms, Flowcharts, System Developments.

Fundamentals Algorithms: Exchange the Values between two variables, Counting, Summation of set of numbers, Factorial Computation, Generation of the Fibonacci sequence, Reversing the digits of a integer.

Basics Of C: Introduction**,** Developing Programs in C, A Simple C program, Parts of C Program Revisited.

UNIT – II

Structure of C: Structure of a C Program, Concept of a Variable, Data Types in C, Program Statements, Declaration, Tokens, Operators and Expressions, Type conversion in C.

Input and Output: Introduction, Basic Screen and Keyboard I/O in C, Non-Formatted Input and Output, Formatted Input and Output Function.

Control Statements: Introduction, Specifying Test Condition for Selection and Iteration, Writing Test Expression, Conditional Execution and Selection, Iteration and Repetitive Execution. Nested Loops.

UNIT – III

Arrays And Strings: Introduction, One-Dimensional Array, Strings, Multidimensional Arrays, Arrays of Strings.

Function: Introduction, Concept of Functions, Using Functions, Call by Value Mechanism, Working with Functions, Passing Arrays to Functions, Scope and Extent, Inline Function, Recursion.

UNIT - IV

Factoring Methods: Finding Square root of a Number, The Smallest Deviser of an Interger, The GCD of Two Integers, Generating Prime Numbers.

Pointers – Introduction, Understanding Memory, Address Operator, Pointer, Void Pointer, Null Pointer, Use of pointer, Arrays and Pointers, Pointers and string, Pointers and string, Pointers to pointers, Array of pointers, Pointers to Function, Dynamic Memory Allocation.

Introduction to Data Structures, Single Linked List.

UNIT – V

User-Defined Data Types and Variables: Introduction, User-defined Data Types, Structures, Union, Enumeration Types.

Files in C: Introduction, Using Files in C, Working with text Files, Working with Binary Fields, Direct File Input and Output, Files of Records, Random Access to Files of Records.

Text Books:

1. Programming in C, PradipDey, ManasGhosh, Second Edition, OXFORD,
2. How to Solve it by Computer by R.G. Dromey, Pearson.

References:

1. Programming in C and Data Structures, Jeri R. Hanly, Elliot B. Koffman, Ashok Kamthane and A.AnandaRao, Pearson Education.
2. Value Range analysis of C programs by simon, Axel by New Age International Publishers.
3. C Programming with problem solving, J.A. Jones & K. Harrow, dreamtech Press
4. Programming in C – Stephen G. Kochan, III Edition, PearsonEductaion.
5. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition Education / PHI
6. C Programming & Data Structures,E.Balagurusamy,TMH.
7. Complete Reference – C, Herbert Schildt,TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – I SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A15202	**Applied Physics Laboratory**	-	1	3	2

COURSE OBJECTIVES	
1	The objective of this course is to make the students gain practical knowledge to correlate with the theoretical studies.
2	To develop practical applications of engineering materials and use of principle in the right way to implement the modern technology.
3	To train engineering students on basis of measurements and the instruments
4	To equip the students with practical knowledge in electronic, optics, and heat experiments

COURSE OUTCOMES	
CO1	On Completion of this course, students are able to – Develop skills to impart practical knowledge in real time solution.
CO2	Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.
CO3	Understand measurement technology, usage of new instruments and real time applications in engineering studies.
CO4	The student will be able to analyze the physical principle involved in the various instruments, also relate the principle to new application.
CO5	The various experiments in the areas of optics, mechanics and thermal physics will nurture the students in all branches of Engineering.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		2		2	2		2		1		2	
CO2	3	2		2		2	2		2		1		2	
CO3	3	3		2		2	2		2		1		2	
CO4	3	2		2		2	2		2		1		2	
CO5	3	2		2		2	2		2		1		2	

LIST OF EXPERIMENTS

Any TEN of the following experiments have to be performed during the SEMESTER

1. Determination of wavelengths of various colours of mercury spectrum using diffraction grating in normal incidence method.
2. Determination of dispersive power of the prism
3. Determination of thickness of thin object by wedge method.
4. Determination of radius of curvature of lens by Newton's rings.
5. Laser : Diffraction due to single slit
6. Laser : Diffraction due to double slit
7. Laser: Determination of wavelength using diffraction grating
8. Determination of Numerical aperture of an optical fiber.
9. Meldes experiment: Determination of the frequency of tuning fork
10. Sonometer: Verification of the three laws of stretched strings
11. Energy gap of a material using p-n junction diode
12. Electrical conductivity by four probe method

13. Hall effect : Determination of mobility of charge carriers in semiconductor
14. B-H curve
15. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
16. Determination of dielectric constant and Curie temperature of a ferroelectric material.

Note: Out of 10 experiments, two experiments will be performed using virtual laboratory

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – I SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A10502	**Computer Programming Lab**	-	1	3	2

COURSE OBJECTIVES	
1	To work with the compound data types
2	To explore dynamic memory allocation concepts
3	Able to design the flowchart and algorithm for real world problems
4	Able to write C programs for real world problems using simple and compound data types
5	Employee good programming style, standards and practices during program development

COURSE OUTCOMES	
CO1	Translate algorithms in to programs
CO2	Code and debug programs in C program language using various constructs.
CO3	Formulate problems and implement algorithms in C.
CO4	Able to use different data types in a computer program

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		3						1	1			1	
CO2	1		3						1	1			1	
CO3	1		3						1	1			1	
CO4	1		3						1	1			1	

LIST OF EXPERIMENTS

Week-1
1) Write a C program to make the following exchange between the variables a -> b -> c->d -> a
2) Write a C program to carry out the arithmetic operations addition, subtraction, multiplication, and division between two variables
3) Write a C program for printing prime numbers between 1 and n.

Week-2
1) Write a C program to construct a multiplication table for a given number.
2) Write a program to reverse the digit of a given integer.
3) Write a C program to find the sum of individual digits of a positive integer.
4) Write a C program to calculate the factorial of a given number

Week-3
1) Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
2) Write a program to calculate tax, given the following conditions:
   a) If income is less than 1,50,000 then no tax.
   b) If taxable income is in the range 1,50,001 – 300,000 then charge 10% tax
   c) If taxable income is in the range 3,00,001 – 500,000 then charge 20% tax
   d) If taxable income is above 5,00,001 then charge 30% tax

Week-4

1) Write a program to print the calendar for a month given the first Week- day of the month.
Input the first day of the month (Sun=0,Mon=1,Tue=2,Wed=3,.....) :: 3
Total number of days in the month : 31
Expected output

Sun	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*
-	-	-	*1*	*2*	*3*	*4*
5	*6*	*7*	*8*	*9*	*10*	*11*
12	*13*	*14*	*15*	*16*	*17*	*18*
19	*20*	*21*	*22*	*23*	*24*	*25*
25	*26*	*27*	*28*	*29*	*30*	*31*

2) Write a C program to find the roots of a quadratic equation

Week-5

1) Write a program to print the Pascal triangle for a given number
2) Write a C program to find the GCD (greatest common divisor) of two given integers
3) Write a C program to construct a pyramid of numbers.
4) Write C code to define a function cash_dispense, which takes an amount as its input, and returns the number of 1000, 500, 100, 50, 20, 10, 5, 2, 1 rupee denomination that make up the given amount

Week-6

1) Write C code to reverse the contents of the array. For example, [1,2,3,4,5] should become [5,4,3,2,1]
2) Write a C program that uses functions to perform the following:
i) Addition of Two Matrices
ii) Multiplication of Two Matrices
3) Write a program that will search and find out the position where the given key element exist in a user chosen array and print it as output.

Week-7

1) Write C code to compute the frequency table of survey responses given by 20 users. The survey responses range from 1 to 5 and are stored in an array. For example, 10 responses are stored in the array [1,1,5,2,3,3,5,5,2,2]. The frequency table will be as shown below:
   a. 1 = 2
   b. 2 = 3
   c. 3 = 2
   d. 4 = 0
   e. 5 = 3
2) Write a program to define a function to sort an array of integers in ascending order by using exchange sort.

Week-8

1) Write a C program to check whether a given string is a palindrome or not, without using any built-in functions.
2) Write a C program to determine if the given string is a palindrome or not by using string functions.
3) Write a function that accepts a string and delete the first character.
4) Write a function that accepts a string and delete all the leading spaces.

Week-9

Write a program to accept a string from user and display number of vowels, consonants, digits and special characters present in each of the words of the given string.

Week-10

1) Write a C program to define a union and structure both having exactly the same numbers using the sizeof operators print the sizeof structure variables as well as union variable
2) Declare a structure *time* that has three fields *hr, min, secs.* Create two variables,*start_time*and*end_time.* Input there values from the user. Then while *start_time* is not equal to *end_time* display GOOD DAY on screen.

Week-11

1) Write a program to read in an array of names and to sort them in alphabetical order. Use sort function that receives pointers to the functions strcmp, and swap, sort in turn should call these functions via the pointers.

2) Write a program to read and display values of an integer array. Allocate space dynamically for the array using the *malloc()*.
3) Write a program to calculate area of a triangle using function that has the input parameters as pointers as sides of the triangle.

Week-12
1) Two text files are given with the names text1 and text2. These files have several lines of text. Write a program to merge (first line of text1 followed by first line of text2 and so on until both the files reach the end of the file) the lines of text1 and text2 and write the merged text to a new file text3.
2) Write a program to split a given text file into n parts. Name each part as the name of the original file followed by .part<**n>** where n is the sequence number of the part file.

Reference Books:

1. Computer Science, A Structured Programming Approach Using C by Behrouz A. Forouzan& Richard F. Gilberg, Third Edition, Cengage Learning
2. C Programming A Problem-Solving Approach, Behrouz A. Forouzan& E.V. Prasad, F. Gilberg, Third Edition, Cengage Learning
3. Programming with C RemaTheraja, Oxford
4. “C Test Your Skills”, Kamthane, Pearson Education
5. Programming in C: A Practical Approach, Ajay Mittal, Pearson
6. Problem solving with C, M.T.Somasekhara, PHI
7. C Programming with problem solving, J.A. Jones & K. Harrow,Dreamtech Press
8. Programming withc, Byron S Gottfried, Jitender Kumar Chhabra, TMH, 2011

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – I SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A15502	**English Language Communication Skills Lab**	-	1	3	2

COURSE OBJECTIVES	
1	To facilitate computer-aided multi-media instruction enabling individualized and independent language learning
2	To sensitise the students to the nuances of English speech sounds, word accent, intonation and rhythm
3	To provide opportunities for practice in using English in day to day situations
4	To improve the fluency in spoken English and neutralize mother tongue influence
5	To train students to use language appropriately for debate, group discussion and public speaking

COURSE OUTCOMES	
CO1	Better Understanding of nuances of language through audio- visual experience and be independent learners
CO2	The significance of paralinguistic features will be understood by the students and they will try to be intelligible.
CO3	Become good at Inter-personal skills
CO4	Achieve neutral accent and be free from mother tongue influence
CO5	Being an active participant in debates and group discussion, showing ability to express agreement, argument to summarize ideas to elicit the views of others and present own ideas;

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3								3	1			
CO2	2									3	1			
CO3	1	3	3							3	3			
CO4	1	3	3			2				3	3			
CO5	1	3	3			2			2	3	3			

UNIT- I
Phonetics – Introduction to Sounds of Speech – Vowels – Consonants – Phonetic Transcription & Orthographic Transcription

UNIT – II
Syllabification – Word Stress – Rules of word stress – Intonation – Falling tone and Rising tone

UNIT – III
Situational Dialogues – Role-play – Expressions in various situations – Self Introduction – Introducing others – Greetings – Apologies – Requests – Giving directions -Social and Professional etiquettes – Telephone Etiquettes

UNIT – IV
JAM – Describing Pictures, Photographs, Products, and Process – Talking about Wishes- Information Transfer.

UNIT – V
Debates - Group Discussions-1

MINIMUM REQUIREMENT FOR ELCS LAB:

The English Language Lab shall have two parts:

1. Computer Assisted Language Learning (CALL) Lab:
   The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
2. The Communication Skills Lab with movable chairs and audio-visual aids with a P.A. system, Projector, a digital stereo-audio & video system and camcorder etc.

System Requirement (Hardware component):

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

- i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- ii) Headphones of High quality

SUGGESTED SOFTWARE:

1. Walden Infotech English Language Communication Skills.
2. Clarity Pronunciation Power – Part I (Sky Pronunciation)
3. Clarity Pronunciation Power – part II
4. LES by British council
5. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
6. *DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.*
7. Lingua TOEFL CBT Insider, by Dreamtech
8. English Pronunciation in Use (Elementary, Intermediate, Advanced) CUP
9. Cambridge Advanced Learners' English Dictionary with CD.

REFERENCE BOOKS:

1. **A Textbook of English Phonetics for Indian Students** 2nd Ed T. Balasubramanian. (Macmillian), 2012.
2. **A Course in Phonetics and Spoken English**, DhamijaSethi, Prentice-Hall of India Pvt.Ltd
3. **Speaking English Effectively**, 2nd Edition Krishna Mohan & NP Singh, 2011. (Mcmillan).
4. **A Hand book for English Laboratories**, E.Sureshkumar, P.Sreehari, Foundation Books,2011
5. **English Pronunciation in Use. Intermediate & Advanced**, Hancock, M. 2009. CUP
6. **Basics of Communication in English**, Soundararaj, Francis. 2012.. *New Delhi: Macmillan*
7. **Spoken English** (CIEFL) in 3 volumes with 6 cassettes, OUP.
8. **English Pronouncing Dictionary**, Daniel Jones Current Edition with CD.Cambridge, 17th edition, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A25501	**Technical Communication and Presentation Skills**	3	-	-	3

COURSE OBJECTIVES	
1	To develop awareness in students of the relevance and importance of technical communication and presentation skills.
2	To prepare the students for placements
3	To sensitize the students to the appropriate use of non-verbal communication
4	To train students to use language appropriately for presentations and interviews
5	To enhance the documentation skills of the students with emphasis on formal and informal writing

COURSE OUTCOMES	
CO1	Become effective technical communicators
CO2	Be job-ready and able to face interviews confidently
CO3	Sensitive use of non-verbal language suitable to different situations in professional life
CO4	Learn and use keys words, phrases and sentence structures making a mark in interviews and presentation skills
CO5	Effective writing skills with the ability to use different styles for different situations

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2					1	3	1		1	1			
CO2	2					1	3	1		1	1			
CO3	1	3	3			1	3	1		1	1			
CO4	1	3	3			1	3	1		1	1			
CO5	1	3	3			1	3	1		1	1			

UNIT I
Basics of Technical Communication – Introduction – Objectives & Characteristics of Technical Communication – Importance and need for Technical communication - LSRW Skills – Barriers to effective communication

UNIT II
Informal and Formal Conversation - Verbal and Non-verbal communication –Kinesics, Proxemics, Chronemics, Haptics, Paralanguage

UNIT III
Written communication – Differences between spoken and written communication – Features of effective writing –Advantages and disadvantages of spoken and written communication- Art of condensation- summarizing and paraphrasing

UNIT IV
Presentation Skills – Nature and importance of oral presentation – Defining the purpose – Analyzing the audience - Planning and preparing the presentation, organizing and rehearsing the presentation –Individual and group presentations - Handling stage fright

UNIT V

Interview Skills – The Interview process –Characteristics of the job interview – Pre-interview preparation techniques – Projecting the positive image – Answering Strategies

Text Books:

1. **Effective Technical Communication,** AshrifRizvi, TataMcGrahill, 2011
2. **Technical Communication** by Meenakshi Raman &Sangeeta Sharma,3rd Edition, O U Press 2015

References:

1.Communication Skills by Pushpalatha & Sanjay Kumar, Oxford Univsesity Press
2.Books on **TOEFL/GRE/GMAT/CAT/IELTS** by Barron's/DELTA/Cambridge University Press.2012.
3. **Soft Skills for Everyone,** Butterfield Jeff, Cengage Publications, 2011.
4. **Management Shapers Series** by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
5. **Successful Presentations** by John Hughes & Andrew Mallett, Oxford.
6. **Winning at Interviews** by Edgar Thorpe and Showick Thorpe, Pearson
7. Winning Resumes and Successful Interviews by MunishBhargava, McGraw Hill

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A25101	Mathematics – II	2	2	-	3

COURSE DESCRIPTION: Fourier series; Fourier integrals and transforms; Laplace transforms; z –transforms;partial differential equations.

COURSE OBJECTIVES	
1	To impart basic knowledge on Fourier series, Fourier transforms, Laplace Transforms, z-transforms and partial differential equations.
2	To develop skills in analyzing the problems, designing mathematical models,Fourier series, Fourier transforms, Laplace transforms, z-transforms and partial differential equations for the problems in engineering.

COURSE OUTCOMES	
After completion of the course a successful student is able to	
CO1	Acquire basic knowledge in (a) Fourier series and Fourier transforms (b) Fourier integrals (c) Laplace transforms and their applications (d) z- transforms and their applications (e) Solving partial differential equations (f) Heat transfer and wave motion
CO2	Develop skills in Analyzing the (a) Properties of Fourier series for a given function (b) Partial differential equations through different evaluation methods (c) Difference equations through z – transforms (d) Engineering systems and processes involving wave forms and heat transfer
CO3	Develop skills in designing mathematical models for (a) Problems involving heat transfer and wave forms (b) Engineering concepts involving, Fourier transforms, Fourier integrals, Laplace transforms, z-transforms and difference equations
CO4	Develop analytical skills in solving the problems involving (a) Fourier series and Fourier transforms (b) Laplace transforms (c) Z-transforms and difference equations (d) Heat transfer and wave motion
CO5	Use relevant transformation techniques for (a) Obtaining Fourier transforms for different types of functions (b) Laplace transforms (c) Z- transforms (d) Partial differential equations

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	1	-	-	2	1	-	-		
CO2	1	3	-	-	-	1	-	-	2	2	-	-		
CO3	1	3	2	-	-	1	-	-	2	2	-	-		
CO4	1	1	1	3	-	1	-	-	2	1	-	-		
CO5	1	1	1	1	-	1	-	-	2	1	-	-		

UNIT- I :
FOURIER SERIES (7 periods)
Fourier series: Determination of Fourier coefficients (Euler's formulae),Fourier series of even and odd functions, convergence of Fourier series (Dirichlet conditions), Half-range Fourier sine and cosine expansions, Parseval's formula, Complex form of Fourier series.

UNIT- II:
FOURIER INTEGRALS AND FOURIER TRANSFORMS(8 periods)
Fourier integral theorem (statement only), Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms –properties, Inverse transform and finite Fourier transforms.

UNIT-III:
LAPLACE TRANSFORMS (12 periods)
Laplace transforms of standard functions. Properties of Laplace transform. First and second shifting Theorems. Laplace transforms of derivatives and integrals. Inverse transforms. Convolution theorem, inverse Laplace transforms by convolution theorem. Laplace transform of periodic functions, Step and Impulse functions, Applications of Laplace transforms to ordinary differential equations of first and second order with constant coefficients.

UNIT-IV :
Z- TRANSFORMS (9 periods)
Z – transforms, inverse Z– transforms, damping rule, shifting rule, initial and final value theorems. Convolution theorem, Solution of difference equations by Z – transforms.

UNIT – V :
PARTIAL DIFFERENTIAL EQUATIONS (9 periods)
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions ,Method of separation of variables , Solutions of one dimensional wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.

Text Books:
1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.

References:
1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.
2. Higher Engineering Mathematics, by B.V.Ramana, McGraw Hill publishers.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.
4. Advanced Engineering Mathematics 3rd Edition, by R.K.Jain&S.R.K.Iyengar, Narosa publishers

.

COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A25301	**Applied Chemistry**	3	-	-	3

COURSE OBJECTIVES	
1	The Applied Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
2	The main aim of the course is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
3	The lucid explanation of the topics will help students to understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
4	The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.

COURSE OUTCOMES	
CO1	After the completion of the course, the student would understand about the concepts of chemistry in respect of Electrochemical cells, fuel cells, mechanism of corrosion and factors to influence, polymers, nanomaterials with their applications and engineering materials.
CO2	Understand the electrochemical sources of energy.
CO3	Understand industrially based polymers, various engineering materials.
CO4	Differentiation and uses of different kinds of photochemical reactions.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3											2	
CO2	2												2	
CO3		3	3											3
CO4		3	3			2								3
CO5		3	3			2								3

UNIT I :ELECTROCHEMISTRY

i) Review of electrochemical cells, Numerical calculations.
Batteries: Rechargeable batteries: Lead acid, Ni-Cd, Lithium Ion Batteries, Super capacitors Fuels cells: Fuel cell working principle, classification of fuel cells-Hydrogen-Oxygen and Methanol-Oxygen.
ii) Electrochemical sensors: Potentiometric Sensors and voltammetric sensors. Examples : analysis of Glucose and urea
iii) Corrosion: Definition, types of corrosion, Electrochemical Theory of corrosion, Factors affecting the corrosion. Prevention: Anodic and catholic protection and electro and electroless plating. (10h)

UNIT II: POLYMERS

i) Introduction to polymers, Polymerization process, mechanism: cationic, anionic, free radical and coordination covalent.
Elastomers: Natural Rubber, process of natural rubber, vulcanization, Compounding of Rubber
Synthetic Rubber: Preparation, properties and engineering applications of Buna-S, Buna-N, Polyurethene, Polysulfide (Thiokol) rubbers

Plastomers: Thermosetting and Thermoplatics, Preparation, properties and Engineering applications , PVC, Bakelite, nylons. Polydispersive index

ii) Conducting polymers: Mechanism, synthesis and applications of polyacetyline, polyaniline.

iii) Liquid Crystals: Introduction, classification and applications

iii) Inorganic Polymers: Basic Introduction, Silicones, Polyphospazins (-(R)2-P=N-) applications.(12h)

UNIT III: FUEL TECHNOLOGY

i) Classifications of Fuels – Characteristics of Fuels- Calorific Value – Units, Numerical Problems.

Solid Fuels–Coal, Coke : Manufacture of Metallurgical Coke by Beehive oven and Otto Hoffmann's by product oven processes.

ii) Liquid Fuels:Petroleum: Refining of Petroleum, Gasoline: Octane and cetane number, Synthetic Petrol: Bergius Processes, Fischer Troph's synthesis

Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

iii) Gaseous Fuels: Origin, Production and uses of Natural gas, Producer gas, Water gas, Coal gas and Biogas. Flue Gas analysis by Orsat's apparatus.

Combustion: reaction of combustion and related problems.

iv)Nuclear Fuels: Controlled and uncontrolled reactions. Breeder reactor and Power reactors. (12h)

UNIT IV: CHEMISTRY OF ENGINEERING MATERIALS

i) Electrical Insulators or Dielectric materials: Definition and classification, Characteristics of electrical insulators. Applications of electrical insulating materials (Gaseous, liquid and solid insulators)

ii) Semiconducting and Super Conducting materials-Principles and some examples

iii) Magnetic materials – Principles and types of magnetic materials-examples (9h)

UNIT V:NANOCHEMISTRY& COMPOSITE MATERIALS

i) Nanochemistry Introduction, nanomaterials, nanoparticles, nanostructure, supramolecular systems, nanotechnology applications, future perspective.

ii) Composite Materials: Classification of Composites materials, Constituents of Composite materials. Disperse Phase composite materials.

Glass fibre reinforced polymer composite and Carbon fibre reinforced polymer composite materials. Advantages and applications of Composites.

Text Books:

1. Engineering Chemistry by KNJayaveera, GVSubba Reddy and C. Ramachandraiah, McGraw Hill Higher Education, Foruth Edition, New Delhi.
2. A Text Book of Enigneering Chemistry, Jain and Jain, DhanapathiRai Publications, New Delhi

References:

1. A Text book of Engineering Chemistry by SS Dhara, S. Chand Publications, New Delhi
2. Engineering Chemistry by K.B.ChandraSekhar, UN.Das and Sujatha Mishra, SCITECH Pubblications India Pvt Limited.
3. Concepts of Engineering Chemistry- AshimaSrivastavaf and N.N. Janhavi
4. Text Book of Engineering Chemistry – C. Parameswara Murthy, C.V.Agarwal and Andra Naidu
5. Chemistry of Engineering Materials, C.V.Agarwal, C.Parameswaramurthy and Andranaidu
6. Text Book of Engineering Chemistry, Shashichawla, Dhanapathirai Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A25102	**Mathematical Methods**	**2**	**2**	**-**	**3**

COURSE DESCRIPTION:
Fundamentals of matrix theory; numerical solutions of equations curve fitting; interpolation; numerical differentiation and integration; numerical solutions of ordinary differential equations.

COURSE OBJECTIVES	
1	To impart basic knowledge on ranks of matrices, systems of linear equations, numerical methods to solve algebraic and transcendental equations, differential equations, numerical differentiation and integration.
2	To develop skills in analyzing various numerical techniques, designing mathematical models, numerical techniques for engineering problems and fitting of curves to experimental data.

COURSE OUTCOMES	
After completion of the course a successful student is able to	
CO1	Acquire basic knowledge in (a) Finding the rank of matrices and analyzing them. (b) Solving algebraic and transcendental equations by various numerical methods. (c) Fitting of various types of curves to the experimental data. (d) Estimating the missing data through interpolation methods. (e) Identification of errors in the experimental data (f) Finding the values of derivatives and integrals through various numerical methods. (g) Solving differential equations numerically when analytical methods fail to hold.
CO2	Develop skills in analyzing the (a) Methods of interpolating a given data (b) Properties of interpolating polynomials and derive conclusions (c) Properties of curves of best fit to the given data (d) Algebraic and transcendental equations through their solutions (e) Properties of functions through numerical differentiation and integration (f) Properties of numerical solutions of differential equations
CO3	Develop skills in designing mathematical models for (a) Fitting geometrical curves to the given data (b) Solving differential equations (c) Constructing polynomials to the given data and drawing inferences.
CO4	Develop numerical skills in solving the problems involving (a) Systems of linear equations (b) Fitting of polynomials and different types of equations to the experimental data (c) Derivatives and integrals (d) Ordinary differential equations
CO5	Use relevant numerical techniques for (a) Diagonalising the matrices of quadratic forms

	(b) Interpolation of data and fitting interpolation polynomials (c) Fitting of different types of curves to experimental data (d) Obtaining derivatives of required order for given experimental data
CO5	: Use relevant numerical techniques for (a) Diagonalising the matrices of quadratic forms (b) Interpolation of data and fitting interpolation polynomials (c) Fitting of different types of curves to experimental data (d) Obtaining derivatives of required order for given experimental data

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	1	-	-	2	1	-	-		
CO2	1	3	-	-	-	1	-	-	2	2	-	-		
CO3	1	3	2	-	-	1	-	-	2	2	-	-		
CO4	1	1	1	3	-	1	-	-	2	1	-	-		
CO5	1	1	1	1	-	1	-	-	2	1	-	-		

UNIT–I
MATRIX THEORY (11 periods)
Rank of a matrix, echelon form, normal form, inverse of a matrix by elementary row operations. Solutions of linear system of equations. Eigen values, Eigen vectors and properties,Diagonalization.Quadratic form, reductions to canonical form using orthogonal transformation method and nature of Quadratic forms.

UNIT-II
NUMERICAL SOLUTIONS OF EQUATIONS AND CURVE FITTING (9 periods)
Solutions of Algebraic and Transcendental equations by Regulafalsi method, Newton – Raphson's method. Solution of linear simultaneous equation: Crout'striangularisation method, Gauss - Seidal iteration method.Curve fitting by the principle of least squares, fitting of a straight line, parabola and exponential curves.

UNIT- III
INTERPOLATION (7 periods)
Interpolation, difference operators and their relationships, Newton's forward and backward interpolation formulae, Lagrange's interpolation formula.Gauss forward and backward formula, Stirling's formula, Bessel's formula.

UNIT-IV
NUMERICAL DIFFERENTIATION AND INTEGRATION(7 periods)
Numerical differentiation using Newton's forward and backward formulae. Numerical integration using Trapezoidal rule, Simpsons $1/3^{rd}$ rule and $3/8^{th}$ rule.

UNIT- V
NUMERICAL SOLUTIONS OF DIFFERENTIAL EQUATIONS (11 periods)
Numerical solutions of first order Initial value problems using Taylor series method, Euler's, modified Euler's, Runge – Kutta method (4^{th}order only) and Milne's predictor – corrector method. Numerical solutions of Laplace equation using finite difference approximation.

Text Books:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher.

References:

1. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.
2. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.
3. Higher Engineering Mathematics, by B.V.Ramana, McGraw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.
5. Advanced Engineering Mathematics 3rd Edition, by R.K.Jain&S.R.K.Iyengar, Narosa publishers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A20401	**Network Analysis**	2	2	-	3

COURSE OBJECTIVES	
1	To study about basic laws that govern flow of current, different sources of voltage and currents To understand basic concepts on basic RLC circuits and analyze.
2	To study and apply circuit theorems
3	To know the behavior of the steady states and transients states in RLC circuits.
4	To study the basic Laplace Transforms techniques and principles of coupling
5	To understand the two port network parameters & network functions

COURSE OUTCOMES	
Upon completion of the course, the students will be able to:	
CO1	Analyze different electronic and electrical circuits by employing basic laws that govern flow of current.
CO2	Apply different network theorems to electrical circuits.
CO3	Analyze the RLC circuit behavior.
CO4	Understand basic principles of coupling.
CO5	Analyze two port networks with their equivalent representations using two port parameters.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3		1					3			3	1
CO2	3	1	3		1					2			3	1
CO3	3	1	3		1	2				2			3	1
CO4	3	1	3	1	1	2				3			3	1
CO5	3	1	3	1	1					2			3	1

UNIT I
Basic Circuit Analysis:

R-L-C Parameters, Voltage and Current, Independent and Dependent Sources, Kirchoff's Laws, Loop and Nodal methods of analysis of Networks with dependent and independent voltage and current sources.
Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, f-circuit matrix and f-cutset matrix, Tie set and Cutset Matrices for planar networks.

UNIT II
Network reduction techniques: series, parallel, series-parallel, star-to-delta, delta-to-star transformation, source transformation.
Network Theorems: Thevenin's,Novton's, Superposition Theorem,Maximum power transfer, Reciprocity Theorem, Milliman, Miller and Tellegan'sTheorems.

UNIT III
Transient Analysis:

Transient analysis of RC, RL and RLC Circuits, Circuits with switches, step response, 2nd order series and parallel RLC Circuits. Network Analysis using Laplace transform techniques, step, impulse and exponential excitation,

UNIT IV

Single Phase AC Circuits: R.M.S. and Average values, Form Factor, steady state analysis of series, parallel and series-parallel combinations of R, L and C with sinusoidal excitation, concept of reactance, impedance, susceptance and admittance – phase and phase difference, Concept of power factor, j-notation, complex and polar forms of representation.

Coupled Circuits: Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

UNIT V

Two Port Networks: Two port network parameters, Z, Y, ABCD, h and g parameters, Relationship between parameter sets, Interconnection of two port networks. Characteristic impedance, Image transfer constant, image and iterative impedance.

Network functions: Driving point and transfer functions – using transformed (S) variables, Poles and Zeros.

Text Books:

1. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
2. M E Van Valkenburg, "Network Analysis", Prentice-Hall of India Pvt Ltd, New Delhi

References:

1. Linear circuit analysis (time domain phasor and Laplace transform approaches)- 2nd edition by Raymond A. DeCarlo and Pen-Min-Lin, Oxford University Press-2004.
2. Network Theory by N.C.Jagan&C.Lakshminarayana, B.S. Publications.
3. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A20402	**Electronic Devices**	3	-	-	3

COURSE OBJECTIVES	
1	Exposed to basics of semiconductor physics and electronic devices.
2	To introduce students structures, physical operations, and circuit applications of basic semiconductor devices.
3	To provide students a base for a further study of analog and digital electronics, and to develop the ability to analyze and design electronic circuits.

COURSE OUTCOMES	
Upon completion of the course, the students will be able to:	
CO1	Acquire knowledge about semiconductor physics.
CO2	Analyze the operating principles, characteristics and applications of electronic devices like diodes, transistors and special purpose devices.
CO3	An ability to understand the essence of the diode functions, grasp the techniques for the analysis of diode circuits through modeling the diode characteristics.
CO4	An ability to analyze the BJT terminal characteristics.
CO5	An ability to develop a high degree of familiarity with the MOSFET: its physical structure and operation, terminal characteristics.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	1	2				3			2	
CO2	2	2	3	1	1	2				3			2	
CO3	2	2	3	1	1	2				3			2	
CO4	2	2	3	1	1	2				3			2	
CO5	2	2	3	1	1	2				3			2	

UNIT I

Semiconductor Basics: Energy band in solids (metal, semiconductor and insulators), concept of effective mass, density of states, carrier concentration at normal equilibrium in intrinsic semiconductors, derivation of Fermi level for intrinsic semiconductors, donors, acceptors, majority carriers (electrons and holes), dependence of Fermi level on temperature and doping concentration.

Carrier Transport Phenomena: Carrier Drift, Mobility, Resistivity, Hall Effect, Diffusion Process, Einstein Relation, Current Density Equation, Carrier Injection, Generation And Recombination Processes, Continuity Equation.

UNIT II

P-N Junction Diode: Formation of Depletion Layer, Space Charge at a Junction, Derivation of Electrostatic Potential Difference at Thermal Equilibrium, Depletion Width and Depletion Capacitance of an Abrupt Junction. Concept of Linearly Graded Junction, Derivation of Diode Equation and I-V Characteristics..

UNIT III

Bipolar Junction Transistors (BJT): PNP and NPN Transistors, Basic Transistor Action, Emitter Efficiency, Base Transport Factor, Current Gain, Energy Band Diagram of Transistor in Thermal

Equilibrium, Quantitative Analysis of Static Characteristics (Minority Carrier Distribution and Terminal Currents), Base Width Modulation, Modes of operation, Input and Output Characteristics of CB, CE and CC Configurations.

UNIT IV

Field Effect Transistors: JFET, Construction, Idea of Channel Formation, Pinch-Off and Saturation Voltage, Current-Voltage Output Characteristics. MOSFET, types of MOSFETs, Circuit symbols, Working and Characteristic curves of Depletion type MOSFET (both N channel and P Channel) and Enhancement type MOSFET (both N channel and P channel), Input and Output Characteristics of CS,CD and CG Configurations, Complimentary MOS (CMOS).

UNIT V

Special Purpose Devices:

Zener and Avalanche Junction Breakdown Mechanism.Basic construction, working and characteristics of Zener diode, Tunnel diode,varactor diode, UJT, SCR, Diac, Triac, LED, LCD, Photo transistor, Opto Coupler, Solar cell, CCD.

Text Books:

1. S. M. Sze, Semiconductor Devices: Physics and Technology, 2ndEdition, Wiley India edition.
2.Robert Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory" Pearson Prentice Hall.
3. J. Millman, C. Halkias, "Electronic Devices and Circuits", TataMc-Graw Hill, Second Edition

References:

1. Donald A Neaman, "Semiconductor Physics and Devices", Third Edition, Tata McGrawHill Inc.
2. Ben G Streetman and S. Banerjee, Solid State Electronic Devices, Pearson Education
3. Allen Mottershead, Electronic Devices And Circuits: An Introduction, PHI Learning, New Delhi.
4. David A.Bell, "Electronic Devices and Circuits", Fifth Edition, Oxford University Press,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – II SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A25302	**Applied Chemistry Lab**	-	1	3	2

COURSE OBJECTIVES	
1	Will learn practical understanding of the redox reaction.
2	Will able to understand the function of fuel cells, batteries and extend the knowledge to the processes of corrosion and its prevention.
3	Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus toengineer these to suit diverse applications.
4	Will also learn the hygiene aspects of water would be in a position to design methods to produce potable water using modern technology.

COURSE OUTCOMES	
CO1	Would be confident in handling energy storage systems and would be able combat chemical corrosion.
CO2	Would have acquired the practical skill to handle the analytical methods with confidence.
CO3	Would feel comfortable to think of design materials with the requisite properties.
CO4	Would be in a postion to technically address the water related problems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1	3	2		2		2	2		2		1		2	
CO2	3	2		2		2	2		2		1		2	
CO3	3	3		2		2	2		2		1		2	
CO4	3	2		2		2	2		2		1		2	
CO5	3	2		2		2	2		2		1		2	

LIST OF EXPERIMENTS

1. Determination of total hardness of water by EDTA method.
2. Determination of Copper by EDTA method.
3. Estimation of Dissolved Oxygen by Winkler's method
4. Determination of Copper by Iodometry
5. Estimation of Iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
6. Determination of Acidity and Alkalinity of Water
7. Determination of pH of various water samples.
8. Preparation of Phenol-Formaldehyde (Bakelite)
9. Determination of Viscosity of oils using Redwood Viscometer I
10. Determination of Viscosity of oils using Redwood Viscometer II
11. Conductometric titration of strong acid Vs strong base (Neutralization titration).
12. Conductometric titration of Barium Chloride vs Sodium Sulphate (Precipitation Titration)
13. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
14. Estimation of Chloride ion using potassium Chromite indicator (Mohrs method)

Text Books:

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – J. Mendham et al, Pearson Education.
2. Chemistry Practical – SM Enterprises Lab Manual by Chandra Sekhar, GV Subba Reddy and Jayaveera.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – II SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A23501	**Engineering & IT Workshop**	-	1	3	2

ENGINEERING WORKSHOP:

COURSE OBJECTIVES	
1	The objective of this subject is to provide the basic concepts about the engineering workshop trades like Carpentry, Fitting etc.
2	Gain knowledge of the use of various workshop tools and make models in the respective trades.
3	Exposure to power tools

COURSE OUTCOMES	
CO1	Student will be aware of the safety aspects in using the tools
CO2	Student will be able to use the tools for the preparation of models in respective trades of engineering workshop.
CO3	Precautions in making the models will be known by the student.
CO4	Student will be aware of the usage of the power tools for various purposes.
CO5	Knowledge about the measuring instruments will be achieved.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1				1										
CO2				**1**										
CO3				**1**										
CO4				**1**										
CO5				**1**										

1. TRADES FOR EXERCISES:
At least 2 Exercises in each of the following trades :

1. Carpentry
2. Fitting
3. House-wiring
4. Black Smithy
5. Tin smithy
6. Power Tools Demonstration

TEXT BOOK:

1. Work shop Manual / P.Kannaiah / K.L.Narayana / Scitech Publishers.

IT WORKSHOP:

COURSE OBJECTIVES	
1	To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations
2	To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system

3	To learn about Networking of computers and use Internet facility for Browsing and Searching
COURSE OUTCOMES	
CO1	Disassemble and Assemble a Personal Computer and prepare the computer ready to use
CO2	Prepare the Documents using Word processors and Prepare spread sheets for calculations using excel
CO3	Prepare Slide presentations using the presentation tool
CO4	Interconnect two or more computers for information sharing
CO5	Access the Internet and Browse it to obtain the required information

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					**1**									
CO2					**1**									
CO3					**1**									
CO4					**1**									
CO5					**1**									

Preparing your Computer

Task 1: Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2: Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

Task 3: Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4: **Operating system features**: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

Networking and Internet

Task 5: Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc should be done by the student. The entire process has to be documented.

Task 6: Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc.

If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

Task 7: Antivirus: Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

Productivity tools

Task 8: Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

Task 9: Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement.Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

Task 10: Presentations: creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

References:

1. Introduction to Computers, Peter Norton, McGraw Hill
2. MOS study guide for word, Excel, Powerpoint& Outlook Exams", Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs", Bigelows, TMH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
I B.TECH – II SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A20403	**Electronic Devices Lab**	-	1	3	2

COURSE OBJECTIVES	
1	To provide exposure to the students with hands on experience on basic engineering practices in electronics engineering.
2	Understand the nature and scope of modern electronics.
3	To study basic electronic components.
4	To observe characteristics of electronic devices
COURSE OUTCOMES	
Upon completion of the course, the students will be able to:	
CO1	Measure voltage, frequency and phase of any waveform using CRO.
CO2	Generate sine, square and triangular waveforms with required frequency and amplitude using function generator.
CO3	Understand the specifications sheets of different electronic devices.
CO4	Analyze the characteristics of different electronic devices such as diodes, transistors etc.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	1	2				3			2	
CO2	2	2	3	1	1	2				3			2	
CO3	2	2	3	1	1	2				3			2	
CO4	2	2	3	1	1	2				3			2	

LIST OF EXPERIMENTS

PART A: Electronic Workshop Practice

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

PART B: List of Experiments

1. P-N Junction Diode Characteristics
2. Zener Diode Characteristics
3. Common Emitter input-output Characteristics
4. Common Base input-output Characteristics
5. Common Collector input – output characteristics
6. FET Characteristics (CS Configuration)
7. MOSFET Characteristics
8. SCR Characteristics
9. TRIAC Characteristics
10. UJT Characteristics
11. Characteristics of Photonic devices

Equipment required for Laboratory

1. Regulated Power supplies

2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards, Connecting Wires

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A35103	Complex Variables and Special Functions	2	2	-	3

COURSE DESCRIPTION: Beta, Gamma functions and their properties; Limits continuity and analyticity of complex functions; Integration, power series, singularities, residues; conformal mapping.

COURSE OBJECTIVES	
1	To impart basic knowledge on Beta and Gamma functions, Bessel function, Analytic functions, complex integration and power series residue theorem, Mappings of functions of complex variables.
2	To develop skills in analyzing problems, designing mathematical models, Skills in Beta and Gamma functions, analytic functions, integral formulae,Residue theorem, conformal mappings for engineering problems.

COURSE OUTCOMES	
After the completion of the course, a successful student is able to	
CO1	Acquire knowledge in (a) Beta and Gamma functions (b) Expressing complex functions in power series (c) Differentiation and integration of complex functions (d) Conformal mappings and bilinear transformations (e) Expressing complex functions in terms of graphs and power series
CO2	Develop skills in Analyzing the (a) The properties exhibited by complex functions in Argand plane (b) Properties of real integrals through complex variable techniques (c) The properties of improper integrals through residue theory (d) Conformal transformations of complex valued functions for inferences (e) The properties of complex functions by expressing them in power series and graphs
CO3	Develop skills in designing mathematical models involving (a) Integrals of complex variable functions (b) Improper integrals using beta and gamma functions (c) Residue theory of complex functions (d) Power series expansions of complex variable functions (e) Transformations of complex variable functions (f) Fluid flow patterns and flux functions.
CO4	Develop analytical skills in providing solutions for problems involving (a) Fluid, Electrical and Magnetic Potential functions (b) Integration of complex functions (c) Improper real integrals
CO5	Use relevant Complex variable techniques for (a) Residues and integrals of complex functions. (b) Improper real integrals through complex functions (c) Techniques of Beta and Gamma functions to improper integrals

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	1	-	-	2	1	-	-		
CO2	1	3	-	-	-	1	-	-	2	2	-	-		
CO3	1	3	2	-	-	1	-	-	2	2	-	-		
CO4	1	1	1	3	-	1	-	-	2	1	-	-		
CO5	1	1	1	1	-	1	-	-	2	1	-	-		

UNIT I
SPECIAL FUNCTIONS (9 periods)

Beta and Gamma functions - Properties - Relationship between Beta and Gamma functions-Evaluation of improper integrals. Series Solutions of ordinary differential equations (Power series and Frobenius Method). Bessel & Legendre function-Orthogonality -Generating function (without proof) - Recurrence relations, Rodrigue’s formula.

UNIT II
ANALYTIC FUNCTIONS (9 periods)

Function of a Complex Variable - Limits and Continuity of functions, uniform continuity, Differentiability and Analyticity – Cauchy Riemann equations (both Cartesian and polar) - Conjugate and harmonic conjugate functions - Milne Thompson method-Potential functions.

UNIT III
COMPLEX INTEGRATION AND POWER SERIES (9 periods)

Line integral - Evaluation of line integrals along curves and closed contours - Cauchy's Integral theorem (without proof) - Cauchy's integral formula - Derivatives of analytic function - Generalized integral formula- Evaluation of integrals using integral formula. Taylor’s theorem (without proof) - Laurent's theorem (without proof) - Power series expansion of complex functions.

UNIT IV
RESIDUE THEOREM (9 periods)

Zeros and Singularities – Types of singularities - Residues – Evaluation of Residues at poles- Pole of order m - Residue theorem - Evaluation of integrals using residue theorem – Evaluation of improper and real integrals of the type:

i) $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$ ii) $\int_{-\infty}^{\infty} f(x)dx$ iii) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$

UNIT V
CONFORMAL MAPPING (9 periods)

Definitions and examples, Translation, Rotation, Inversion. Mappings defined by $w = e^z, \log z, z^2, \sin z, \cos z$. Bilinear transformation - Properties - Fixed points - Cross ratio - Invariance of circles under bilinear transformation - Determination of bilinear transformation using three given points.

Text Books:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - III, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher

References:

1. Mathematics III by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publications.

2. Advanced Engineering Mathematics, Peter V.O'Neil, CENGAGE publisher.
3. Advanced Engineering Mathematics by M.C. Potter, J.L. Goldberg, Edward F.Aboufadel, Oxford.
4. Advanced Engineering Mathematics 3rd Edition, by R.K.Jain & S.R.K.Iyengar, Narosa publishers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A30401	**Probability Theory and Stochastic Processes**	2	2	-	3

COURSE OBJECTIVES	
1	To gain the knowledge of the basic probability concepts and acquire skills in handling situations involving more than one random variable and functions of random variables.
2	To understand the principles of random signals and random processes
3	To be acquainted with systems involving random signals
4	To gain knowledge of standard distributions which can describe real life phenomena

COURSE OUTCOMES	
After completion of the course, student will be able to	
CO1	determine the temporal and spectral characteristics of random signal response of a given linear system.
CO2	learn how to deal with multiple random variables, conditional probability and conditional expectation, joint distribution and independence, mean square estimation.
CO3	understand the characterization of random processes and their properties.
CO4	to do analysis of random process and application to the signal processing in the communication system
CO5	Formulate and solve the engineering problems involving random processes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1							1				
CO2	3	1	-	-	-	1	-	-	2	1	-	-		
CO3	1	3	-	-	-	1	-	-	2	2	-	-		
CO4	1	3	2	-	-	1	-	-	2	2	-	-		
CO5	1	1	1	3	-	1	-	-	2	1	-	-		

UNIT I

Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bays' Theorem, Independent Events:
Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Raleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties.

UNIT II

Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions.

Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: TwoRandom Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT III

The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT IV

The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

UNIT V

Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties.

Text Books:

1. Peyton Z. Peebles, “Probability, Random Variables & Random Signal Principles”, TMH, 4th Edition, 2001.
2. Athanasios Papoulis and S. UnnikrishnaPillai, “Probability, Random Variables and Stochastic Processes”, PHI, 4th Edition, 2002.

References:

1. R.P. Singh and S.D. Sapre, “Communication Systems Analog & Digital”, TMH, 1995.
1. Henry Stark and John W.Woods, “Probability and Random Processes with Application to Signal Processing”,Pearson Education, 3rd Edition.
3. George R. Cooper, Clave D. MC Gillem, “Probability Methods of Signal and System Analysis”, Oxford, 3rd Edition, 1999.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A30402	**Electronic Circuits - I**	3	-	-	3

COURSE OBJECTIVES	
1	To familiarize with the characteristics of non- linear wave shaping circuits for various inputs
2	To familiarize with the biasing of MOSFET and BJT.
3	To perform analysis of MOSFET and BJT amplifiers at low & high frequencies
4	To perform analysis of cascade, cascade and darlington amplifiers.

COURSE OUTCOMES	
Students will be able to	
CO1	Develop the ability to analyze and design analog electronic circuits using discrete components
CO2	design and analyze different rectifier circuits using p-n junction diodes, voltage regulator using zener diode and biasing circuits for MOSFET and BJT.
CO3	Analyze and design clipper and clamper citcuits.
CO4	analyze and design MOSFET and BJT amplifiers at low frequencies & high frequencies.
CO5	Design and analyze multistage amplifiers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		3		1					3			2	1
CO2	2	1	3		1					2			2	1
CO3	2	1	3		1					2			2	1
CO4	2		3		1					3			2	1
CO5	2		3		1					2			2	1

UNIT I
Diode Applications: Rectifiers and filter circuit: Half wave rectifier, Full wave rectifier, bridge rectifier and their analysis, L,C and Pi filters, Zener diode as regulator, Series and shunt diode clippers, Clipping at two independent levels, Clamping operation , Clamping circuit, Practical clamping circuits.

UNIT II
Transistor Biasing: Operating point, DC & AC load lines, Biasing - Fixed Bias, Emitter Feedback Bias, Collector to Emitter feedback bias, Voltage divider bias, Bias stability, Stabilization against variations in V_{BE} and β, Bias Compensation using Diodes and Transistors.
FET& MOSFET Biasing: DC load line and region of operation, Common-MOSFETs configurations, Design and analysis of various JFET & MOSFET biasing circuits.

UNIT III
BJT Amplifiers: Classification of Amplifiers – Distortion in amplifiers, Analysis of CE, CC, and CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors, Design of single stage RC coupled amplifier.

UNIT IV

Different coupling schemes used in amplifiers, Analysis of Cascaded RC Coupled amplifiers, Cascode amplifier, Darlington pair, Frequency response of BJT amplifier – Analysis at low and high frequencies, The Hybrid-pi (π) – Common Emitter transistor model, CE short circuit current gain, current gain with resistive load, single stage CE transistor amplifier response, Gain-bandwidth product.

UNIT V

FET Amplifiers: Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers, comparison of performance with BJT Amplifiers, Basic Concepts of MOS Amplifiers, MOS Small signal model, Common source amplifier with resistive, Diode connected and Current source loads, Source follower, Common Gate Stage, Cascode and Folded Cascode Amplifier – frequency response.

Text Books:

1. Millman and Halkias: Integrated Electronics, Tata Mc.Graw Hill, 2004.
2. R E Boylstead and L Nashelsky: Electronic Devices and Circuit Theory, 9/e, Pearson Education
3. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford

References:

1. David A. Bell, "Electronic Devices and Circuits", Oxford, Fifth Edition
2. Sedra and Smith: Microelectronic Circuits, 4/e, Oxford University Press 1998.
3. Donald A Neamen. : Electronic Circuit Analysis and Design, 3/e, Tata Mc.Graw Hill.
4. B. Razavi , "Fundamentals of Microelectronics", Wiley

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A30403	**Signals and Systems**	3	-	-	3

COURSE OBJECTIVES	
1	To study about signals and systems.
2	To do analysis of signals & systems (continuous and discrete) using time domain & frequency domain methods.
3	To understand the stability of systems through the concept of ROC.
4	To know various transform techniques in the analysis of signals and systems

COURSE OUTCOMES	
CO1	Classify the signals as Continuous time and Discrete time
CO2	Analyze the spectral characteristics of signals using Fourier analysis.
CO3	Classify systems based on their properties and determine the response of LTI system using convolution
CO4	Identify system properties based on impulse response and Fourier analysis
CO5	Apply transform techniques to analyze continuous-time and discrete-time signals and systems

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	2	1	1			1	1	1	2	2
CO2	3	2	3	1	2	1	1			1	1	2	2	2
CO3	3	2	3	1	2	1	1			1		1	2	2
CO4	3	2	3	1	2	1	1			1	1		2	2
CO5	3	2	3	1	2	1	1			1	1	2	2	2

UNIT I

SIGNALS & SYSTEMS: Definition and classification of Signal and Systems (Continuous time and Discrete time), Elementary signals such as Dirac delta, unit step, ramp, sinusoidal and exponential and operations on signals. Concepts of Convolution and Correlation of signals.

Analogy between vectors and signals-orthogonality, Mean Square error, Fourier series: Trigonometric & Exponential and concept of discrete spectrum.

UNIT II

CONTINUOUS TIME FOURIER TRANSFORM: Definition, Computation and properties of Fourier Transform for different types of signals and systems. Statement and proof of sampling theorem of low pass signals.

UNIT III

DISCRETE TIME FOURIER TRANSFORM: Definition, Computation and properties of Fourier Transform for different types of signals and systems.

UNIT IV

SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS: Linear system, impulse response, Response of a linear system, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time. Energy and Power spectral densities.

UNIT V

LAPLACE TRANSFORM: Definition-ROC-Properties-Inverse Laplace transforms-the S-plane and BIBO stability-Transfer functions-System Response to standard signals-Solution of differential equations with initial conditions.

The Z–TRANSFORM: Derivation and definition-ROC-Properties-Poles and Zeros in Z-plane-The inverse Z-Transform-System analysis-Transfer function-BIBO stability-System Response to standard signals-Solution of difference equations with initial conditions.

Text Books:

1. B.P. Lathi, "Signals, Systems & Communications", 2009,BS Publications.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", PHI, 2nd Edn.

References:

1. Simon Haykin and Van Veen, "Signals & Systems", Wiley, 2nd Edition.
2. B. P. Lathi, "Linear Systems and Signals", Second Edition, Oxford University press, 2008.
3. Michel J. Robert, "Fundamentals of Signals and Systems", MGH International Edition, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A30205	**Electrical Technology**	3	-	-	3

COURSE OBJECTIVES	
Student can be able to know	
1	The constructional features of DC machines, different types of DC machines and their characteristic.
2	The constructional details of single phase transformer and their performance characteristics by conducting suitable tests.
3	The analysis of three phase balanced and unbalanced circuits, Three phase induction motors and their characteristics.
4	The constructional feature and operation of synchronous machines.

COURSE OUTCOMES	
After completing the course, the student should be able to do the following	
CO1	Able to calculate the e.m.f. generated on DC Generator also able to control speed of different DC motors.
CO2	Able to conduct open circuit and short circuit tests on single phase transformer for knowing their characteristics.
CO3	Able to analyse three phase circuits, three induction motor operating principle and know their torque slip characteristics.
CO4	Able to thorough knowledge on synchronous machine with which he/she can able to apply the above conceptual things to real-world problems and applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2											
CO2	2	1	2											
CO3	2	1	2											
CO4	2	1	2											

UNIT I DC GENERATORS

D.C. Generators – Principle of Operation – Constructional Features – E. M.F Equation– Numerical Problems – Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of E.M.F - Critical Field Resistance and Critical Speed - Load Characteristics of Shunt, Series and Compound Generators- Applications

UNIT II D.C. MOTORS

D.C Motors – Principle of Operation – Back E.M.F. –Torque Equation – Characteristics and Application of Shunt, Series and Compound Motors-Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods. Three Point Starter-Losses – Constant & Variable Losses – Calculation of Efficiency - Swinburne's Test.

UNIT III THREE PHASE A.C. CIRCUITS & SINGLE PHASE TRANSFORMERS

Introduction - Analysis of Balanced Three Phase Circuits – Phase Sequence- Star and Delta Connection - Relation between Line and Phase Voltages and Currents in Balanced Systems - Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems.

Single Phase Transformers- Constructional Details- Emf Equation - Operation on No Load and on Load - Phasor Diagrams-Equivalent Circuit - Losses and Efficiency-Regulation-OC and SC Tests - Predetermination of Efficiency and Regulation.

UNIT IV 3-PHASE INDUCTION MOTORS
Polyphase Induction Motors-Construction Details of Cage and Wound Rotor Machines- - Principle of Operation – Slip- Rotor Emf and Rotor Frequency - Torque Equation- Torque Slip Characteristics.

UNIT V SYNCHRONOUS MACHINES
Principle And Constructional Features of Salient Pole and Round Rotor Machines – E.M.F Equation- Voltage Regulation by Synchronous Impedance Method- Theory of Operation of Synchronous Motor.

Text Books:

1. Electric Machines –by I.J.Nagrath & D.P.Kothari,Tata Mc Graw Hill, 7th Edition.2005
2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press.

References:

1.Fundamentals of Electric Machines by B. R. Gupta, Vandana singhal, 3rd Edition, New age international Publishers.
2. Electromachanics – III by S. Kamakashiah, overseas publishers Pvt Ltd.
3. Principles of Electrical Engineering by V.K Mehta, S.Chand Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – I SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A30404	**Electronic Circuits – I Lab**		1	3	2

COURSE OBJECTIVES	
1	To perform the analysis, design, and test of various electronic circuits.
2	Use hardware/software tools to characterize the behavior of circuits.

COURSE OUTCOMES	
Students will be able to	
CO1	Design, simulate and test diode as a rectifier, clipper and clamper.
CO2	analyze, design, simulate and test the low frequency amplifier circuits using MOSFET, FET and BJT.
CO3	analyze, design, simulate and test the cascade, cascade and darlington amplifier circuits.
CO4	write and prepare a lab report that details design procedures and experimental results.
CO5	work in a team using available resources to design circuits to meet a given specification

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		3		1					1			3	1
CO2	2		3		1					1			3	1
CO3	2	2	3	2	1					1			3	1
CO4	2	2	3	1	1					1			3	1
CO5	2	2	3	1	1					1			3	1

Note: The students are required to design the electronic circuit and they have to perform the analysis through simulator using Multisim/ Pspice/Equivalent Licensed simulation software tool. Further they are required to verify the result using necessary hardware in the hardware laboratory**.**

LIST OF EXPERIMENTS:

1. Rectifiers
a) To construct half wave, full wave & bridge rectifiers with and without filters - Calculation of ripple factors.
b) Simulation of rectifiers and trace their output waveforms with and without filters

2. Clipper & Clamper circuits using diodes
(i) To design, construct and observe output of Positive, negative, biased and combinational clippers
(ii) To design, construct and observe output of i. Positive, negative and biased clampers

3. Biasing Circuits
a. To design, construct and test different biasing circuits using BJTs, FETs & MOSFETs.
b. To simulate the biasing circuits and obtain the Q point

4. RC coupled amplifier
a. To design, construct and obtain frequency response of the circuit
b. To measure signal handling capacity, input and output impedance
c. Compare performance practically and through simulation

5. Emitter follower
a. To design, construct and obtain frequency response of the circuit
b. To measure signal handling capacity, input and output impedance
c. Compare practical and simulated results

6. Cascade Amplifier
a. To design, construct and obtain frequency response of a two stage RC coupled amplifier
b. To measure signal handling capacity, input and output impedance
c. Compare performance practically and through simulation

7. Darlington pair
To design, construct and obtain frequency response practically and through simulation

8. Cascode amplifiers
To design, construct and obtain frequency response practically and through simulation

9. FET amplifier
a. To design, construct and obtain frequency response of the JFET amplifier circuits
b. To measure signal handling capacity, input and output impedance
c. Compare performance practically and through simulation

10. MOSFET amplifier
a. To design, construct and obtain frequency response of the MOSFET amplifier circuits
b. To measure signal handling capacity, input and output impedance
c. Compare performance practically and through simulation

Equipment required for Laboratory
Software:
i. Multisim/ Pspice/Equivalent Licensed simulation software tool
ii. Computer Systems with required specifications

Hardware:
1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats, Decade Capacitance Boxes
6. Ammeters (Analog or Digital), Voltmeters (Analog or Digital)
7. Active & Passive Electronic Components
8. Bread Boards
9. Connecting Wires, CRO Probes etc.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – II SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A30405	Basic Simulation Lab	-	1	3	2

COURSE OBJECTIVES	
1	An ability to apply knowledge of mathematics, science, and engineering for the analysis and processing of signals and to generate various continuous and discrete time signals using MATLAB tool.
2	To apply the convolution theorem and correlation for continuous time signals.
3	To analyze a continuous time LTI/LTV systems using convolution.
4	An ability to design and conduct experiments on modulation techniques to analyze and interpret results.

COURSE OUTCOMES	
CO1	Recall various functions available in MATLAB for signal processing
CO2	Demonstrate the various operations on signals
CO3	Solve the response of a system by difference equation and transfer functions.
CO4	Analyze the system stability from root locus, Bode and Nyquist plots.
CO5	Students are able to understand the process of sampling the band limited continuous time domain signals

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2		1					1			2	1
CO2	2	1	2		1					1			2	1
CO3	2	1	2	1	1					1			2	1
CO4	2	1	2	2	1					1			2	1
CO5	2	1	2	1	1					1			2	1

LIST OF EXPERIMENTS

(All Experiments are to be conducted)

1. Basic Operations on Matrices
2. Generation of various signals and sequences (periodic and aperiodic) such as unit impulse, unit step, square, sawtooth, triangular, sinusoidal, ramp, sinc
3. Operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.
4. Finding the even and odd parts of signal or sequence and real and imaginary parts of signal
5. Convolution between signals and sequences
6. Autocorrelation and cross correlation between signals and sequences
7. Verification of linearity and time invariance property of a given continuous/discrete system
8. Computation of unit sample, unit step and sinusoidal responses of given LTI system and verifying its physical realizability and stability properties
9. Gibbs Phenomenon
10. Finding the Fourier Transforms of given signal and plotting its magnitude and phase spectrum.
11. Waveform synthesis using Laplace Transform

12. Locating Zero's and Pole's, and plotting the pole-zero maps in S-Plane and Z-Plane for given transfer functions
13. Generation of Gaussian noise (real and complex), computation of its mean, M.S. Values and its skew, kurtosis, and PSD, Probability Distribution Function.
14. Sampling theorem verification
15. Removal of noise by Autocorrelation/Cross correlation in a given signal corrupted by noise
16. Generation of random signals at a given data rate
17. LC resonant circuit Design and simulate an LC resonant circuit and obtain the frequency response, measure the quality factor.
18. Simulation of filters. design LPF/HPF/BPF/BEF, T / π, constant k/m derived /composite for the given cutoff frequency. Also simulate the phase and frequency response of the designed filter.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – I SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A30206	Electrical Technology Lab	-	1	3	2

COURSE OBJECTIVES	
To make the student learn about	
1	Experimental verification of theorems
2	Drawing current locus diagrams and Practical determination of two port network parameters.
3	The DC motors, DC Generators and know various characteristics, performance analysis of DC machines and speed control techniques of DC machines.
4	Various test conditions of single phase transformers.

COURSE OUTCOMES	
After completing the course, the student should be able to do the following	
CO1	Apply suitable theorems for circuit analysis and verify the results theoretically.
CO2	Experimental determination of two port network parameters, verify with theoretical , and knowing the performance of RLC circuits with help of locus diagrams.
CO3	Learn about DC motors, DC Generators and know various characteristics, performance analysis of DC machines and speed control techniques of DC machines.
CO4	Various test conditions of single phase transformers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2	2										2	
CO2		2	2										2	
CO3		2	2										2	
CO4		2	2										2	

LIST OF EXPERIMENTS

PART-A

1. Verification of KVL and KCL.
2. Time Response of First Order RC/RL Network for Periodic Non-Sinusoidal Inputs – Time Constant and Steady State Error Determination.
3. Two Port Network Parameters – Z-Y Parameters, Chain Matrix and Analytical Verification.
4. Two Port Network Parameters – ABCD and H-Parameters.
5. Verification of Superposition and Reciprocity Theorems.
6. Verification of Maximum Power Transfer Theorem. Verification on DC, Verification on AC with Resistive and Reactive Loads.
7. Experimental Determination of Thevenin's and Norton's Equivalent Circuits and Verification by Direct Test.

PART-B

1. Magnetization Characteristics of D.C. Shunt Generator. Determination of Critical Field Resistance.
2. Swinburne's Test on DC Shunt Machine (Predetermination of Efficiency of a Given DC Shunt Machine Working as Motor and Generator).
3. Brake Test on DC Shunt Motor. Determination of Performance Characteristics.

4. OC & SC Tests on Single-Phase Transformer (Predetermination of Efficiency and Regulation at Given Power Factors and Determination of Equivalent Circuit).
5. Load Test on Single Phase Transformer.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A45101	**Human Values and Professional Ethics (Audit Course)**	2	-	-	-

COURSE OBJECTIVES	
1	To bring awareness among engineering graduates on ethics, human values & obligations.
2	To understand the ethical theories and their application to work ethics.
3	To understand the risk and safety measurements to be taken in various engineering areas.
4	To know various codes of ethics used by professional bodies & to learn about professional responsibility as an engineer.
5	To identify the global issues & measures to control adversity.

COURSE OUTCOMES	
CO1	Develop awareness on ethics, human values & obligations related to Self, Family, Society and State.
CO2	Become morally and socially responsible.
CO3	As a social experimentalist they can ensure less hazards & can find out engineering solutions from the ethical platform.
CO4	Students Can know how to ensure safety by minimizing risk through detailed analysis & can plan to get Intellectual property Rights(IPR).
CO5	Can identify various global issues, moral & social responsibilities.

UNIT I HUMAN VALUES

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty - Courage- Co-operation& Commitment – Empathy –Self Confidence Character – Spirituality- Obligations to Self, Family, Society and the State.

UNIT II ENGINEERING ETHICS

Senses of 'Engineering Ethics- Variety of Moral Issues – Types of Inquiry – Moral dilemmas – Moral Autonomy –Kohlberg's Theory- Gilligan's Theory- Consensus and Controversy – Models of Professional Roles- Theories about Right Action- Self interest - Customs and Religion –Uses of Ethical Theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering As Social Experimentation – Framing the Problem – Determining the Facts – Codes of Ethics – Clarifying Concepts – Application Issues – Common Ground - General Principles – Utilitarian Thinking -Respect for Human beings.

UNIT IV ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk- Safety and the Engineer- Designing for the Safety- Intellectual Property rights (IPR).

UINIT V GLOBAL ISSUES

Globalization – Cross Culture Issues- Environmental Ethics – Computer Ethics – Computers as The Instrument of Unethical Behavior – Computers as the Object of Unethical Acts – Autonomous Computers- Computer Codes of Ethics – Weapons Development - Ethics and Research- Moral & Social Responsibility- Code of Conduct.

Text Books:

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and V.S.Senthil Kumar-PHI Learning Pvt. Ltd-2009,Rs.129.

References:

1. "Human Values & Ethics", SK Chakraborty & D.Chakraborty, Himalaya Publishing House, Mumbai,2014,Rs.398.
2. "2006Human Values & Professional Ethics ", B.S.Raghava and Jayashree Suresh, S.Chand &co., New Delhi, 2012.Rs.175
3. "Human Values & Ethics in the Workplace", Glenn Martin, GP Martin Publishing, Australia, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A40401	**Electromagnetic Field Theory**	2	2	-	3

COURSE OBJECTIVES	
1	This course provides the foundational education in static electromagnetic fields, and time varying electromagnetic waves
2	To introduce the concepts of Electrostatics and Magnetostatics.
3	To develop an understanding of Electromagnetic Waves and their Propagation.

COURSE OUTCOMES	
Through lecture, and out-of-class assignments, students are provided learning experiences that enable them to:	
CO1	Analyze and solve the problems of electric and magnetic fields that vary with three dimensional spatial co-ordinates as well as with time.
CO2	Have an understanding of Maxwell's equations and be able to manipulate and apply them to EM problems
CO3	Become proficient with analytical skills for understanding propagation of electromagnetic waves in different media.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		2								1		2
CO2	1	3	3	2	1					2		1	1	3
CO3	1	2	3	1	1									3
CO4	2	3	3	1		2		1		2		2		2

UNIT I

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems

UNIT II

Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems.

UNIT III

Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

UNIT IV

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting

Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

UNIT V

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems

Text Books:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics", Oxford Univ. Press, 4th ed., 2008.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", TMH, 7th ed., 2006.

References:

1. John D. Krauss, "Electromagnetics", McGraw- Hill publications.
2. Electromagnetics, Schaum'sout line series, Second Edition, Tata McGraw-Hill publications, 2006.
3. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2nd
4. Edition, 2000.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – II SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A40402	**Switching Theory and Logic Design**	2	2	-	3

COURSE OBJECTIVES	
This course provides in-depth knowledge of switching theory and the design techniques of digital circuits, which is the basis for design of any digital circuit. The main objectives are:	
1	To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems
2	To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations
3	To implement simple logical operations using combinational logic circuits
4	To design combinational logic circuits, sequential logic circuits.
5	To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
6	To realize logic gates using diodes & transistors

COURSE OUTCOMES	
Upon completion of the course, students should possess the following skills:	
CO1	able to manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray and BCD.
CO2	able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions
CO3	able to design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger complex circuits.
CO4	able to design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits
CO5	able to design and realize logic gates using diodes & transistors

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2			1	1	1	2	2	1	1
CO2	3	2	3	1	2			1	1	1	2	2	1	1
CO3	3	2	1	1	2			1	1	1	1	1	1	1
CO4	3	2	3	1	2			1	1	1	2	1	1	1
CO5	3	2	3	1	2			1	1	1	2	2	1	1

UNIT I

Number Systems and Switching Functions: Review of number systems, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Error Detecting and Correcting Codes.

Boolean Algebra: Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT II

Minimization methods:

Introduction, The Minimization of switching function using theorem, The Karnaaugh Map

Method-Up to Five Variable Maps, Don't Care Map Entries, Tabular Method,
Combinational Circuits: Design of Combinational Logic: Adders, Subtractors, comparators, Multiplexers, Demultiplexers, Decoders, Encoders and Code converters, Basic PLD's-ROM, PROM, PLA, PAL Realizations. Hazards and Hazard Free Relations

UNIT III
Introduction to Sequential Circuits: Basic Architectural Distinctions between Combinational and Sequential circuits, The Binary Cell, Fundamentals of Sequential Machine Operation, Latches, Flip Flops: SR, JK, Race Around Condition in JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Design of a Clocked Flip-Flop , Timing and Triggering Consideration, Clock Skew, Conversion from one type of Flip-Flop to another.
Registers and Counters: Shift Registers, Data Transmission in Shift Registers, Operation of Shift Registers, Shift Register Configuration, Bidirectional Shift Registers, Applications of Shift Registers, Design and Operation of Ring and Twisted Ring Counter, Operation Of Asynchronous And Synchronous Counters.

UNIT IV
Sequential Circuits: Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Synthesis of Synchronous Sequential Circuits, Serial Binary Adder, Sequence Detector, Parity-bit Generator, Design of Asynchronous Counters, Design of Synchronous Modulo N –Counters.

UNIT V
Finite State Machines: Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and Merger chart methods-concept of minimal cover table.
Realization of Logic Gates Using Diodes & Transistors: AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL and CML Logic Families and its Comparison.
Text Books:

1. Switching and Finite Automata Theory- ZviKohavi&Niraj K. Jha, 3rdEdition, Cambridge.
2. Digital Design- Morris Mano, PHI, 3rd Edition.
3. Digital Systems Principles and Applications (8th Edition) - Ronald J. Tocci Neal S. Widmer, 8th edition

References:

1. Millman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. PrakashRao, 2 Ed., 2008, TMH.
2. Switching Theory and Logic Design – A Anand Kumar, PHI,2013.
3. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed,John Wiley & Sons Inc.
4. Digital Fundamentals – A Systems Approach – Thomas L. Floyd, Pearson, 2013.
5. Digital Logic Design - Ye Brian and HoldsWorth, Elsevier
6. Fundamentals of Logic Design- Charles H. Roth, CengageLEanring, 5th, Edition, 2004

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A40403	**Electronic Circuits - II**	3	-	-	3

COURSE OBJECTIVES	
1	To familiarize with the feedback concept in amplifiers and stability issues
2	To perform analysis of oscillators, tuned and power amplifiers.
3	To familiarize with the operation and characteristics of multivibrators, time base generators and sweep circuits

COURSE OUTCOMES	
CO1	Analyze and design negative feedback amplifier circuits and oscillators
CO2	Analyze and design solid state power amplifier circuits
CO3	Analyze and design tuned amplifier circuits.
CO4	analyze the various multivibrator circuits
CO5	understand the principles of voltage time base generator circuits and sweep circuits .

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	3							1			2	1
CO2	2	1	3		2					1			2	1
CO3	2	1	3		2					1			2	1
CO4	2	1	3	1	2					1			2	1
CO5	2	1	3	1	1					1			2	1

UNIT – I

Feedback Amplifiers: Classification of amplifiers, Concepts of feedback – Classification of feedback amplifiers – General characteristics of negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

Oscillators: Condition for oscillations. RC and LC type Oscillators – Frequency and amplitude stability of oscillators – Generalized analysis of LC oscillators, Quartz, Hartley, and Colpitts Oscillators – RC-phase shift and Wien-bridge oscillators.

UNIT – II

Large Signal Amplifiers: Class A Power Amplifier, Maximum Value of Efficiency of Class – A Amplifier, Transformer Coupled Amplifier, Push Pull and Complimentary Symmetry Class B and Class AB Power Amplifiers – Principle of operation of class –C Amplifier, Transistor Power Dissipation, Heat Sinks.

UNIT – III

Tuned Amplifiers: Introduction, Q-Factor, Small Signal Tuned Amplifiers, Effect of Cascading single Tuned amplifiers on Bandwidth, Effect of Cascading Double Tuned amplifiers on Bandwidth, Stagger Tuned Amplifiers, Stability of Tuned amplifiers

UNIT – IV

Multivibrators: Analysis and Design of Bistable, Monostable, AstableMultivibrators and Schmitt trigger using Transistors.
Time Base Generators: General features of a Time base Signal, Methods of Generating Time Base Waveform, Transistor Miller Time Base generator, Transistor Bootstrap Time Base Generator, Transistor Current Time Base Generators, Methods of Linearity improvement

UNIT – V
Synchronization and Frequency Division: Pulse Synchronization of Relaxation Devices, Frequency division in Sweep Circuits, Stability of Relaxation Devices, Astable Relaxation Circuits, Monostable Relaxation Circuits, Synchronization of a Sweep Circuit with Symmetrical Signals, Sine wave frequency division with a Sweep Circuit, A Sinusoidal Divider using Regeneration and Modulation.

Text Books:

1. Millman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. PrakashRao, 2 Ed., 2008, TMH.
2. Solid State Pulse Circuits –David A. Bell, 4 Ed., 2002 PHI.
3. R E Boylstead and L Nashelsky: Electronic Devices and Circuit Theory, 9/e, Pearson Education

References:

1. Millman and Halkias: Integrated Electronics, Tata Mc.Graw Hill, 2004.
2. Sedra and Smith: Microelectronic Circuits, 4/e, Oxford University Press 1998.
3. Donald A Neamen. : Electronic Circuit Analysis and Design, 3/e, Tata Mc.Graw Hill.
4. B. Razavi , "Fundamentals of Microelectronics", Wiley
5. Sedra and Smith: Microelectronic Circuits, 4/e, Oxford University Press 1998.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A40404	**Networks and Transmission Lines**	2	2	-	3

COURSE OBJECTIVES	
The main objectives are:	
1	To understand the principle and concepts of resonance.
2	To design different types of filters and attenuators
3	To understand transmission line parameters, lossy and lossless lines, matching of transmission lines to their loads
4	To understand Smith Chart, Single and double stub matching and field analysis of transmission lines.

COURSE OUTCOMES	
Upon completion of the course, students will be able to	
CO1	analyze electrical circuits by employing principles of resonance.
CO2	design and analyze different types of filters & attenuators. and apply to real world applications.
CO3	determine the transmission line parameters for different lines, characterize the distortions and estimate the characteristics for different lines
CO4	analyze the RF Line features and design the same for effective impedance transformation.
CO5	apply the Smith Chart profile, sub matching features and gain ability for solving practical problems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2		3												
CO3			3											
CO4				3										
CO5														

UNIT – I
Network Synthesis: Realizability concept, Hurwitz Property, positive realness, properties of positive real functions, Synthesis of RL, RC, LC driving point functions, Foster and Cauer forms.
Resonance: Series resonance and Parallel resonance circuits, concept of bandwidth and Q factor, Locus Diagrams for RL, RC and RLC Combinations for Various Parameters.

UNIT – II
Filters: Characteristic impedance of symmetrical networks - filter fundamentals, Design of filters: Constant K - Low Pass, High Pass, Band Pass, Band Elimination, m- derived sections - low pass, high pass composite filters.
Attenuators: Symmetrical and Asymmetrical attenuators, T-type attenuator, L-type attenuator Π-type attenuator, Lattice attenuator, Bridged-T attenuator, Twin – T attenuator.

UNIT – III

Transmission Line Theory: General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion-less line - Loading and different methods of loading - Line not terminated in Z_0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss.

UNIT – IV

High Frequency Transmission Lines: Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.

UNIT – V

Impedance Matching In High Frequency Lines:

Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.

Text Books:

1. John D. Ryder, “Networks, Lines, and Fields,” PHI publications, Second Edition, 2012.
2. William H.Hayt, Jr.JackE.Kemmerly and Steven M.Durbin, “ Engineering Circuit Analysis”, McGraw Hill Science Engineering Seventh Edition, 2006
3. UmeshSinha, SatyaPrakashan, “Transmission Lines and Networks”, 2001, Tech. India Publications

References:

1. M.E.Vanvalkenburg, “Network Analysis”, 3rd Edition, PHI,2003
2. Sudarshan and Shyam Mohan, “Network Theory”, TMH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A40207	Control Systems Engineering	3	-	-	3

COURSE OBJECTIVES	
To make the students learn about:	
1	Merits and demerits of open loop and closed loop systems; the effect of feedback
2	The use of block diagram algebra and Mason's gain formula to find the effective transfer function
3	Transient and steady state response , time domain specifications and The concept of Root loci
4	Frequency domain specifications, Bode diagrams and Nyquist plots & The fundamental aspects of modern control

COURSE OUTCOMES	
After completing the course, the student should be able to do the following:	
CO1	Evaluate the effective transfer function of a system from input to output using (i) block diagram reduction techniques (ii) Mason's gain formula
CO2	Compute the steady state errors and transient response characteristics for a given system and excitation
CO3	Determine the absolute stability and relative stability of a system
CO4	Derive state space model of a given physical system and solve the state equation

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2							1				
CO2	2	1	2							1				
CO3	2	1	2							1				
CO4	2	1	2							1				

UNIT – I CONTROL SYSTEMS CONCEPTS

Open Loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback Characteristics, Effects of positive and negative feedback. Mathematical models – Differential equations of Translational and Rotational mechanical systems, and Electrical Systems, Block diagram reduction methods – Signal flow graph - Reduction using Mason's gain formula. Transfer Function of DC Servo motor - AC Servo motor - Synchro transmitter and Receiver.

UNIT-II TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional, integral, derivative Controllers, Design of P, PD, PI, PID Controllers.

UNIT – III STABILITY ANALYSIS

The concept of stability – Routh's stability criterion – Stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT – IV FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain margin-Stability Analysis.
Compensation techniques – Lag, Lead, Lead-Lag Compensators design in frequency Domain.

UNIT V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from Schematic models, differential equations, Transfer function, block diagrams, Diagonalization - Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models.

Text Books:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 5th edition, 2007.
3. Feedback Control of Dynamic Systems by Gene F. Franklin, J.D. Powell, Pearson.

References:

1. Control Systems Principles & Design 4th Edition, M.Gopal, Mc Graw Hill Education, 2012.
2. Automatic Control Systems– by B. C. Kuo and Farid Golnaraghi – John wiley and son's, 8th edition, 2003.
3. Control Systems 3rd Edition, Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, Schaum's Mc Graw Hill Education.
4. Control System Design by Goodwin.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A40405	**Data Structures & Object Oriented programming**	3	-	-	3

COURSE OBJECTIVES	
1	The student will able to understand the different methods of organizing large amounts of data.
2	The student will know the applications and efficiently implement the different types of data structures like stacks, queues, linked list and trees.
3	The student will able to understand the basics object-oriented programming concepts.
4	The student will able to understand and apply the object oriented concept like Classes and Objects, encapsulation, Inheritance, Polymorphisms in C++

COURSE OUTCOMES	
At the end of this course	
CO1	Students shall have knowledge of storing and accessing data.
CO2	Student will be able to choose appropriate data structure as applied to specified problem definition.
CO3	Students will be able to understand the concepts of class and object and features of C++ Programming.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2		2					1		1		1
CO2	1	1	2		2					1		1		1
CO3	1	1	2		2					1		1		1

UNIT I
Introduction to Data Structure, Classification Data Structure, Primitive and Composite Data Structure, Time and Space Complexity of Algorithms. STACKS: Array implementation – Operations on stacks - Applications of Stack - Infix to Postfix Conversion, Evaluation of Postfix expression, Recursion. QUEUES: Array implementation - Operations on Queues -Queue Applications, Circular Queue.

UNIT II
LINKED LISTS- Singly Linked List: Implementation - Operations - Application - Representation of a Polynomial, Polynomial Addition - Doubly Linked List: Implementation –Operations –Circular linked lists. TREES: Binary Trees - Conversion of General tree to Binary Tree, binary search tree, Operations - Tree Traversals.

UNIT III
SORTING AND SEARCHING: Sorting concepts - Types - Insertion sort - Selection sort - Bubble sort - Merge sort - Quick sort - Heap sort - Searching concepts - Linear search - Binary search

UNIT IV
Introduction to C++ - Object-Oriented Programming Concepts - Review of constructs of C used in C++: Basic Language Elements, control structures, input and output statement, structure, unions, functions, pointers and arrays, preprocessor directives - Classes and Objects : Object Scope, Data Abstraction, Enforcing Data Encapsulation, ‘this’ Pointer, Dynamic creation of objects -

Constructors and Destructors : The Default Constructor, The Destructor, Parameterized Constructors, Copy constructor.

UNIT V

Defining member functions, Methods and access modifiers, Accessing class data and methods, Friend class and friendly functions, Returning objects, Arrays of Objects - Function and Operator Overloading : Function Overloading, Operator overloading - using friend function, Dealing with strings using operators, Converting data types, Inheritance, Virtual functions and Polymorphism, Templates, Exception Handling

Text Books:

1. Tanenbaum, (2005), "Data Structures Using 'C' ", Pearson education, New Delhi, 2nd ed.
2. E. Balagurusamy, "Data Structures using C" McGraw Hill Education India Pvt. Ltd., 2013
3. Ira Pohl, "Object-Oriented Programming Using C++", 2/e, Pearson Education, 2006.

References:

1. E. Balagurusamy, "Object Oriented Programming with C++", McGraw Hill Company Ltd., 2007.
2. Lipschutz & Lipson, (2006), "Data Structure using 'C' ", Tata McGraw-Hill, New Delhi.
3. Robert L. Kruse, (2005), "Data Structures and Program Design in 'C' ", Pearson education, New Delhi, 2nd ed.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – II SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A40406	**Electronic Circuits – II Lab**	-	1	3	2

COURSE OBJECTIVES	
1	Operate electronic test equipment and hardware/software tools to characterize the behavior of devices and circuits.
2	Design, construct and test amplifier circuits and interpret the results.
3	Design and Implement Multivibrators using Transistors.
4	Design negative feedback amplifier circuits and oscillators.

COURSE OUTCOMES	
CO1	Develop the ability to Design and implement discrete analog amplifiers to meet the given specifications.
CO2	Design and implement BJT/FET based harmonic and relaxation oscillators.
CO3	Implementation of Multivibrators, Waveform generators using OP Amps.
CO4	Develop the ability to design and implement analog subsystems based on discrete component design.
CO5	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		3							3			2	1
CO2	2	1	3		1					2			2	1
CO3	2	1	3							2			2	1
CO4	2		3		1					3			2	1
CO5	2		3		1					2			2	1

Note: The students are required to design the electronic circuit and they have to perform the analysis through simulator using Multisim/ Pspice/Equivalent Licensed simulation software tool. Further they are required to verify the result using necessary hardware in the hardware laboratory.

LIST OF EXPERIMENTS:

1. Negative feedback amplifier
a. To design, construct and test response of i. voltage shunt ii. voltage series feedback amplifiers with and without feedback for the given specification
b. To compare their frequency response through simulation

2. RC Phase shift oscillators
To design, construct and test the
a. RC Phase shift oscillator b. Wien bridge oscillator for the given specification

3. Hartley and Colpitts oscillators
To design, construct and test the a. Hartley oscillator
b. Colpitts oscillator for the given specification

4. Class A power amplifier
To obtain the frequency Vs power and load Vs power characteristics

5. Class B complementary symmetry amplifier
To obtain the frequency Vs power and load Vs power characteristics

6. Astable multivibrator and Monostable multivibrator
a. To design, construct and observe output of a transistor astable multivibrator
b. To design, construct and observe output of a transistor monostable multivibrator

7. Bistable multivibrator and Schmitt trigger
To design, construct and observe output of a transistor bistable multivibrator and Schmitt trigger circuits

8. Time base generators
To construct and observe output waveforms of a Miller integrator and Bootstrap ramp generator

9. UJT saw tooth generator
To construct and observe output waveforms of a UJT sweep circuit

Equipment required for Laboratory
Software:
i. Multisim/ Pspice/Equivalent Licensed simulation software tool
ii. Computer Systems with required specifications
Hardware:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires
12. CRO Probes etc.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
II B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A40407	**Data Structures Lab**	-	1	3	2

COURSE OBJECTIVES

1	To write and execute programs to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees.
2	To learn to write programs to implement various sorting and searching algorithms

COURSE OUTCOMES

CO1	Able to identify the appropriate data structures and algorithms for solving real world problems.
CO2	Able to implement various kinds of searching and sorting techniques.
CO3	Able to implement data structures such as stacks, queues, Search trees, and hash tables to solve various computing problems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2		2					1	1		2	1
CO2	1	1	2		2					1	1		2	1
CO3	1	1	2		2					1	1		2	1

LIST OF PROGRAMS

1. Introduction to pointers. Call by Value and Call by reference.
2. Introduction to Dynamic Memory Allocation. DMA functions malloc(), calloc(), free() etc.
3. Implement a program for stack that performs following operations using array.
   (a) PUSH (b) POP (c) PEEP (d) CHANGE (e) DISPLAY
4. Implement a program to convert infix notation to postfix notation using stack.
5. Write a program to implement QUEUE using arrays that performs following operations
   (a) INSERT (b) DELETE (c) DISPLAY
5. Write a program to implement Circular Queue using arrays that performs following operations.
   (a) INSERT (b) DELETE (c) DISPLAY
6. Write a menu driven program to implement following operations on the singly linked list.
   (a) Insert a node at the front of the linked list.
   (b) Insert a node at the end of the linked list.
   (c) Insert a node such that linked list is in ascending order.(according to info. Field)
   (d) Delete a first node of the linked list.
   (e) Delete a node before specified position.
   (f) Delete a node after specified position.
7. Write a program to implement stack using linked list.
8. Write a program to implement queue using linked list.
9. Write a program to implement following operations on the doubly linked list.
   (a) Insert a node at the front of the linked list.
   (b) Insert a node at the end of the linked list.
   (c) Delete a last node of the linked list.
   (d) Delete a node before specified position.
10. Write a program to implement following operations on the circular linked list.
   (a) Insert a node at the end of the linked list.
   (b) Insert a node before specified position.
   (c) Delete a first node of the linked list.
   (d) Delete a node after specified position.
10. Write a program which create binary search tree.

11. Implement recursive and non-recursive tree traversing methods inorder, preorder and postorder traversal.
12. Write a program to implement Insertion sort, Selection sort, Bubble sort, Merge sort, Quick sort and Heap sort
13. Write a program to implement Linear search and Binary search.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A35401	Managerial Economics and Financial Analysis	3	-	-	3

COURSE OBJECTIVES	
1	The objective of this course is to inculcate the basic knowledge to the students with the concepts of Economics & Demand to make them effective business decision makers.
2	To understand fundamentals of Production & Cost Concepts which is an important subject helps to the Technocrats to take certain business decisions in the processes of optimum utilization of resources.
3	To know the various types of Market Structures & pricing methods and its strategies & Trade Blocks.
4	To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
5	To provide fundamental skills about accounting and to explain the process of preparing accounting statements & analysis for effective business decisions.

COURSE OUTCOMES	
CO1	Capable of analyzing fundamentals of Economics such as Demand, Elasticity & Forecasting methods
CO2	To apply production, pricing & supply concepts for effective business administration
CO3	Students can able to identify the influence of various markets, the forms of business organization and its International Economic Environment.
CO4	Analyze how to invest adequate amount of capital in order to get maximum return from selected business activity.
CO5	Prepare and analyze accounting statements like income & expenditure statement, balance sheet apart from the fundamental knowledge, to understand financial performance of the business and to initiate the appropriate decisions to run the business profitably.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					1			2						
CO2					1			2						
CO3					1			2						
CO4					1			2						
CO5					1			2						

UNIT I: INTRODUCTION TO MANAGERIAL ECONOMICS&DEMAND

Managerial Economics – Definition- Nature- Scope - Contemporary importance of Managerial Economics - Demand Analysis: Concept of Demand-Demand Function - Law of Demand - Elasticity of Demand- Significance - Types of Elasticity - Measurement of Elasticity of Demand - Demand Forecasting- Factors governing Demand Forecasting- Methods of Demand Forecasting - Relationship of Managerial Economics with Financial Accounting and Management.

UNIT II: THEORY OF PRODUCTION AND COST ANALYSIS

Production Function- Least cost combination- Short-run and Long- run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of returns - Internal and External Economies of scale – **Cost& Break Even Analysis**: Cost concepts and Cost behavior- Break-Even Analysis (BEA) -Determination of Break Even Point (Simple Problems)-Managerial significance and limitations of Break- Even Analysis.

UNIT III: INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT

Market structures: Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition- Monopoly-Monopolistic Competition-Oligopoly-Price-Output Determination - Pricing Methods and Strategies-Forms of Business Organizations- Sole Proprietorship- Partnership – Joint Stock Companies - Public Sector Enterprises – New Economic Environment- Economic Liberalization – Privatization - Globalization- Trade Blocks (SAARC,EU,NAFTA,BRICS)- EXIM Policy-International Economic Environment.

UNIT IV: CAPITAL AND CAPITAL BUDGETING

Concept of Capital - Significance, Types of Capital- Components of Working Capital -Sources of Shot term and Long term Capital - Estimating Working Capital Requirements – Cash Budget- **Capital Budgeting** – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

UNIT V: INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS

Accounting Concepts and Conventions-Introduction Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). ***Financial Analysis*:** Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios -Du Pont Chart.

Text Books:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Ahuja H.L Managerial economics. S.Chand, 3/e, 2013

References:

1. Aryasri: Managerial Economics and Financial Analysis, 4/e, TMH, 2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International,. 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

Data Books Required: Present Value Factors table.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A50401	Linear IC Applications	3	-	-	3

COURSE OBJECTIVES	
The main objectives of the course are:	
1	To introduce the basic building blocks of linear integrated circuits.
2	To teach the linear and non - linear applications of operational amplifiers.
3	To introduce the theory and applications of 555 timer, analog multipliers and PLL.
4	To teach the theory of ADC and DAC.
5	To introduce the concepts of waveform generation and introduce some special function ICs.
COURSE OUTCOMES	
On completion of this course, the students will be:	
CO1	able to learn about the operational amplifiers and its characteristics as well as various types of op-amps.
CO2	acquire the ability to design and test practical circuits for amplifiers, filters and oscillators.
CO3	able to analyze the operation of comparators, data converters and implementation of the same.
CO4	able to learn the functioning of PLL, VCO, V-I, I-V converters, analog multipliers and implement them for suitable applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1					2			3	
CO2	2	1	3		2					3			3	
CO3	2	2	3		2				2	3			3	
CO4	2	2	3		1				2	2				3

UNIT I
Operational Amplifier
Basic BJT/FET Differential amplifiers – Constant current source – current mirror. Introduction, Block diagram, characteristics and equivalent circuits of an ideal op-amp, various types of Operational Amplifiers and their applications, Power supply configurations for OP-AMP applications, inverting and non-inverting amplifier configurations. The Practical op-amp: Introduction, Input offset voltage, offset current, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and gain – bandwidth product, frequency limitations and compensations, transient response.

UNIT II
Applications of Operational Amplifier
Amplifiers: Adder, subtractor, integrator, differentiator, current amplifier, difference amplifier, instrumentation amplifier, Converters: Current to voltage and voltage to current converters, Active Filters: First order filters, second order active finite and infinite gain low pass, high pass,

band pass and band reject filters, Sine Wave Oscillators: RC phase shift oscillator, Wien bridge oscillator, Quadrature oscillator.

UNIT III
Non-Linear Applications of Operational Amplifier
Comparators: Inverting comparator, non-inverting comparator, zero crossing detector, window detector and level detector, Schmitt Triggers: Inverting Schmitt trigger, non-inverting Schmitt trigger with adjustable threshold levels, Waveform Generators: Square wave and triangular wave generator with duty cycle modulation, Precision Rectifiers: Half and full wave precision rectifiers, log and antilog amplifiers, Peak detectors, sample and hold circuits, voltage to frequency converter, frequency to voltage converter.

UNIT IV
Data Converters
Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC . Dual Slope ADC, Sigma Delta ADC and Pipeline ADC. DAC and ADC Specifications.

UNIT V
Special Purpose Integrated Circuits
Functional block diagram, working, design and applications of Timer 555 (Monostable&Astable), Functional block diagram, working and applications of VCO 566, PLL 565, multiplier MPY634, waveform generator XR 2206, power amplifier LM380. Voltage Regulators: Functional block diagram, working and design of three terminal fixed (78XX, 79XX series), three terminal adjustable (LM 317, LM 337) voltage regulators and Switching regulators (LT1070).

Text Books:

1. Roy Choudhury and S. B. Jain, "Linear Integrated Circuits", New Age International Publishers, 4th Edition
2. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", Tata McGraw Hill, 3rd Edition.
3. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Pearson Prentice Hall, 4 th Edition

References:

1. Sedra A.S. & Smith K.C., "Microelectronic Circuits', Oxford University Press 1998
2. William D. Stanley, "Operational Amplifiers with Linear Integrated Circuits", Pearson, 4th Edition 3. D.
3. David A. Bell, "Operation Amplifiers and Linear Integrated Circuits", Oxford University Press, Indian Edition..
4. R. P. Jain, "Modern Digital Electronics," Tata McGraw Hill, 3rd Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

III B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A50402	Analog Communication Systems	3			3

COURSE OBJECTIVES	
Students undergoing this course, are expected to	
1	Understand Modulation & demodulation techniques of AM, DSB, SSB &VSB
2	Understand Modulation & demodulation techniques of FM
3	Know Noise Figure in AM & FM receiver systems
4	Understand Function of various stages of AM, FM transmitters and Know Characteristics of AM & FM receivers.
5	Understand the concepts of information theory
COURSE OUTCOMES	
CO1	Able to analyze time and frequency domain spectra of signal required under various modulation schemes.
CO2	Understand the concepts of Angle Modulation.
CO3	Analyze the various functional blocks of radio transmitters and receivers.
CO4	Understand the performance of noise in AM and FM schemes in communication system
CO5	Understand the concepts of information theory with random processes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1	3	2	1						1	3				
CO2	2	2	2							2				
CO3		1	2							2				
CO4	1	1	2							2				

UNIT – I

Introduction: Elements of communication systems, Information, Messages and Signals, Modulation, Modulation Methods, Modulation Benefits and Applications.

Amplitude Modulation & Demodulation: Baseband and carrier communication, Amplitude Modulation (AM), Rectifier detector, Envelope detector, Double sideband suppressed carrier (DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Frequency mixer, sideband and carrier power of AM, Generation of AM signals, Quadrature amplitude modulation (QAM), Single sideband (SSB) transmission, Time domain representation of SSB signals & their demodulation schemes (with carrier, and suppressed carrier), Generation of SSB signals, Vestigial sideband (VSB) modulator & demodulator, Carrier Acquisition- phased locked loop (PLL), Costas loop, Frequency division multiplexing (FDM), and Super-heterodyne AM receiver, Illustrative Problems.

UNIT – II

Angle Modulation &Demodulation: Concept of instantaneous frequency, Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Verification of Frequency modulation bandwidth relationship, Features of angle modulation, Generation of FM waves – Indirect method, Direct generation; Demodulation of FM, Bandpass limiter, Practical frequency demodulators, Small error analysis, Pre-emphasis, & De-emphasis filters, FM Capture Effect, Illustrative Problems.

UNIT – III

Noise in Communication Systems: Thermal noise, Time domain representation of narrowband noise, Filtered white noise, Quadrature representation of narrowband noise, Envelope of narrowband noise plus sine wave, Signal to noise ratio & probability of error, Noise equivalent bandwidth, Effective noise temperature, and Noise figure, Baseband systems with channel noise, Performance analysis (i.e. finding SNR expression) of AM, DSB-SC, SSB-SC, FM, PM in the presence of noise, Illustrative Problems.

UNIT – IV

Analog pulse modulation schemes: Pulse amplitude modulation – Natural sampling, flat top sampling and Pulse amplitude modulation (PAM) & demodulation, Pulse-Time Modulation – Pulse Duration and Pulse Position modulations, and demodulation schemes, PPM spectral analysis, Illustrative Problems.

Radio Receiver: Superheterodyne Receiver, Sensitivity, Selectivity, and fidelity.

UNIT – V

Information & Channel Capacity: Introduction, Information content of message, Entropy, Entropy of symbols in long independent and dependent sequences, Entropy and information rate of Markoff sources, Shannon‟s encoding algorithm, Discrete communication channels, Rate of information over a discrete channel, Capacity of discrete memoryless channels, Discrete channels with memory, Shannon – Hartley theorem and its implications, Illustrative problems.

Text Books:

1. B. P. Lathi, "Modern Digital and Analog Communication Systems," Oxford Univ. press, 3rd Edition, 2006.
2. Communication Systems by Simon HaykinsJohn Wiley &Sons , 4th Edition.
3. Sham Shanmugam, "Digital and Analog Communication Systems", Wiley-India edition, 2006.

References:

1. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5th Edition, 2010.
2. Herbert Taub& Donald L Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 3rd Edition, 2009.
3. R.E. Ziemer& W.H. Tranter, "Principles of Communication-Systems Modulation & Noise", Jaico Publishing House, 2001.
4. George Kennedy and Bernard Davis, "Electronics & Communication System", TMH, 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A50403	Digital System Design using VHDL	3	-	-	3

COURSE OBJECTIVES	
1	Understand methodologies to know about different design entry methods
2	To be able to model digital circuits in hardware description languages
3	To be able to use VHDL editors, debug designs and perform logic simulation
4	To be able to implement designs on Programmable Logic Devices
COURSE OUTCOMES	
Upon completion of this course, students will be able to:	
CO1	Choose appropriate design technology for a given design
CO2	Work in a team to develop and implement designs
CO3	Choose a right design entry method and model a digital system using a design entry
CO4	Tool debug and test at the logic level and perform logic synthesis

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1						1	3				
CO2	2	2	2							2				
CO3		1	2							2				
CO4	1	1	2							2				

UNIT I
Introduction to VHDL, design units, data objects, signal drivers, inertial and transport delays, delta delay, VHDL data types, concurrent and sequential statements

UNIT II
Subprograms – Functions, Procedures, attributes, generio, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.

UNIT III
Design and VHDL implementation of Combinational logic circuit – full adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder, multiplier, divider, Hamming code encoder and correction circuits. Introduction to ROM, PLA, PAL,

UNIT IV
Design and VHDL implementation of Synchronous sequential circuits design – finite state machines, Mealy and Moore, state assignments, design and VHDL implementation of FSMs, Linear feedback shift register (Pseudorandom and CRC). Asynchronous sequential circuit design – primitive flow table, concept of race, critical race and hazards, design issues like metastability, synchronizers, and clock skew and timing considerations.

UNIT V
Introduction to Synthesis, Testing of logic circuits, Simple Test benches. Introduction to Hierarchical and Structured Design, Role of CAD Tools in the VLSI design process.

Text Books:
1. Douglas L.Perry "VHDL programming by Example" Tata McGraw Hill J. Bhasker, A VHDL Primer, PH/Pearson

2. J.Bhasker, A VHDL Synthesis Primer, Second Edition, Star Galaxy.

References:

1. Fundamentals of Digital Logic with VHDL design – Stephen Brown, ZvonkoVranesic, TMH.
2. Charles H Roth Jr."Digital System Design using VHDL" Thomson learning,2004
3. Digital System Design – John Wakerley.
4. V Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A50404	Antennas and Wave propagation	3	-	-	3

COURSE OBJECTIVES	
1	Introduces the concepts of basic antenna terminologies
2	Introduces the various antennas based on their operating frequency & physical arrangement
COURSE OUTCOMES Upon completion of the course, students will be able to:	
CO1	analyze the fundamentals of antenna theory and the radiation mechanism.
CO2	understand the applications of the electromagnetic waves in free space and the working principles of various types of antennas.
CO3	understand how to measure antenna parameters like gain, directivity and radiation pattern measurement.
CO4	understand the concepts of radio wave propagation.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1	3	2	1						1	3				
CO2	2	2	2							2				
CO3		1	2							2				
CO4	1	1	2							2				

UNIT I

Antenna Basics: Introduction, Basic Antenna Parameters - Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivty-Gain-Resolution, Antenna Apertures, Effective Height. Related Problems.

Thin Linear Wire Antennas: Radiation from Small Electric Dipole, Quarterwave Monopole and Halfwave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beamwidths, Directivity, Effective Area and Effective Height. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small and Large Loops (Qualitative Treatment).

UNIT II

VHF, UHF AND Microwave Antennas - I: Arrays with Parasitic Elements, Yagi - Uda Arrays, Folded Dipoles & their characteristics, Helical Antennas - Helical geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes. Horn Antennas - Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

UNIT III

VHF, UHF AND Microwave Antennas - II: Microstrip Antennas - Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas - Geometry and Parameters, Characteristics of Microstrip Antennas. Impact of Different Parameters on Characteristics,

Reflector Antennas - Introdcution, Flar Sheet and Corner Reflectors, Paraboloidal Reflectors - Geometry, Pattern Characteristics, Feed Methods, Reflector Types - Related Features, Illustrative Problems.
Lens Antennas - Introduction, Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications

UNIT IV
Antenna Arrays: Point Sources - Definition, Pattern, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays - Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparision, BSAs with Non-unitform Amplitude Distributions - General Considerations and Binomial Arrays, Illustrative Problems.
Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by Comparision, Absolute and 3-Antenna Methods)

UNIT V
Wave Propagation - I: Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Quantitative Treatment) - Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections, Space Wave Propagation - Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super retraction, M-Curves and Duct Propagation, Scattering Phenomena, Tropospheric Propagation.
Wave Propagation - II: Sky Wave Propagation - Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and skip Distance, Multi-hop Propagation.

Text Books:

1. Antennas for All Applications – John D. Kraus and R. J. Marhefka, and Ahmad S. Khan TMH, New Delhi, 4th ed., (Special Indian Edition) 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.

References:

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, SatyaPrakashan, Tech India Publications, New Delhi, 2001.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th edition, 1955.
5. Antennas – John D. Kraus, McGraw-Hill (International Edition), 2nd Ed. 1988.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – I SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A50405	Linear IC Applications Lab	-	1	3	2

COURSE OBJECTIVES	
1	Understand the building blocks and performance parameters of an operational amplifier.
2	Realize analog filters using Op-amp.
3	Design monostable and astable multivibrators using 555 IC.
4	Get knowledge to interface real life analog signals to the digital computational devices through ADCs and DACs.

COURSE OUTCOMES	
CO1	Analyze and design simple differential amplifier circuits with BJTs/FETs for Integrated circuits (IC)
CO2	Analyze and design operational amplifier circuits for linear and non-linear applications.
CO3	Design analog filters and realize them using operational amplifier based simple filter circuits.
CO4	Understand the working of mixed signal circuits like Analog to Digital Convertors, Digital to analog Convertors and Phase Locked Loop
CO5	Understand the working of a few application specific analog ICs and design circuits based on these ICs.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	3		2					1			3	1
CO2	1	1	3		2					1			3	1
CO3	1	1	3		2					1			3	1
CO4	1	1	3		2					1			3	1
CO5	1	1	3		2					1			3	1

LIST OF EXPERIMENTS

- Interpretation of data sheets (741, TL082, 555, 565)

1. Applications of Op-amp
To study the application of Opamp IC741/TL082 as
a. Inverting amplifier
b. Non-inverting amplifier
c. Voltage follower
d. Summer
e. Subtractor

2. Differentiator and Integrator
To study the op-amp performance as differentiator and integrator for various time constants

3. Comparator circuits
To study zero crossing detector, window detector and Schmitt trigger using opamp 741/TL082

4. Signal converters
To study operation of op-amp as V to I and I to V converters

5. Active filters using Op-amp
To design and test the performance of a 2nd order LPF, HPF, BPF and BSF

6. Log, antilog and instrumentation amplifier
To study 1. logarithmic and antilog amplifiers 2. Instrumentation amplifier

7. Precision rectifiers To study performance of half wave and full wave precision rectifiers using IC 741.

8. Multivibrators using Op-Amp
To design and study the working of a. astable multivibrator b. monostable multivibrator using IC 741/TL082

9. Data converters
Construction and study performance of
a. DAC circuits – R-2R and ladder type.
b. Successive approximation type ADC.

10. Multivibrators using IC 555
To design and study the working of a. astable multivibrator b. monostable multivibrator using IC 555.

11. Frequency synthesizers
To study performance of
a. Frequency multiplier using PLL IC 565
b. Frequency synthesizer using IC XR2240

12. Design and Testing of DC power supply using LM317 and LM723.

Equipment required for Laboratory
Software:
i. Multisim/ Pspice/Equivalent Licensed simulation software tool
ii. Computer Systems with required specifications

Hardware:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires
12. CRO Probes etc.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – I SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A50406	Analog Communication Systems Lab		1	3	2

COURSE OBJECTIVES	
This course is intended to	
1	Understand all types of analog modulation / demodulation principles such as AM, DSB -SC, FM
2	recognize the importance of pre-emphasis and de-emphasis
3	Substantiate pulse modulation techniques
4	To measure the radio receiver and antenna parameters.

COURSE OUTCOMES	
Upon completion of the course, students will be able to:	
CO1	Design and simulate modulation and demodulation circuits such as AM,DSB -SC,FM.
CO2	Construct pre-emphasis and de-emphasis at the transmitter and receiver respectively
CO3	Analyze practical behavior of different elements available in analog communication system such as filters, amplifiers etc.
CO4	Design and simulate the PAM,PWM&PPM circuits
CO5	Measure characteristics of radio receiver and antenna measurements.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3		2					2			2	3
CO2	3		3		1					1			2	3
CO3	3	1	3		2					2			2	3
CO4	3	1	3		2					1			2	3
CO5	1	1	2		2					1			2	2

LIST OF EXPERIMENTS

1. Amplitude modulation and demodulation.
2. AM - DSB SC - Modulation & Demodulation
3. Frequency modulation and demodulation.
4. a. Characteristics of Mixer.
   b. Pre-emphasis & de-emphasis.
5. Pulse amplitude modulation & demodulation.
6. Pulse width modulation & demodulation
7. Pulse position modulation & demodulation.
8. Radio receiver measurements – sensitivity selectivity and fidelity.
9. Measurement of half power beam width (HPBW) and gain of a half wave dipoleantenna.
10. Measurement of radiation pattern of a loop antenna in principal planes.

Any three experiments from the following using MATLAB software

1. Amplitude Modulation – Modulation & Demodulation
2. AM - DSB SC -. Modulation & Demodulation
3. Frequency Modulation – Modulation. & Demodulation
4. Pulse Amplitude Modulation – Modulation & Demodulation

5. PWM, PPM - Modulation . & Demodulation

Equipment & Software required:
Software: i.) Computer Systems with latest specifications ii) Connected in LAN (Optional) iii) Operating system (Windows XP) iv) Simulations software (MATLAB)

Equipment:

1. Regulated Power Supply equipments 0 – 30 V
2. CROs 0 – 20 M Hz.
3. Function Generators 0 – 3 M Hz
4. RF Signal Generators 0 – 1000 M Hz
5. Multimeters
6. Required electronic components (active and passive) for the design of experimentsfrom 1 - 7
7. Radio Receiver Demo kits or Trainers.
8. RF power meter frequency range 0 – 1000 MHz
9. Spectrum Analyzer
10. Dipole antennas (2 Nos.) 850 MHz – 1GHz
11. Loop antenna (1 no.) 850 MHz – 1GHz

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – I SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A50407	VHDL Programming Lab		1	3	2

COURSE OBJECTIVES	
1	To familiarize with CAD tools
2	To familiarize with design, simulation and synthesis of combinational and sequential circuits using CAD tools

COURSE OUTCOMES	
Students will be able to	
CO1	understand and use CAD tools for simulation and synthesis of digital systems
CO2	design and synthesize different combinational and sequential circuits
CO3	design and implement complex digital systems using CAD tools
CO4	Implement and test simple digital circuits on FPGA
CO5	write and prepare a lab report that details design procedures and experimental results.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		2		1					1			3	2
CO2	2		2		1					1			3	2
CO3	2	2	2		2					1			3	2
CO4	2	2	2		2					2			3	2
CO5	2	2	2		1					2			3	2

LIST OF EXPERIMENTS

Programming (Using VHDL)

1. Write structural and dataflow VHDL models for
   a) 4-bit ripple carry adder.
   b) 4-bit carry look ahead adder
   c) 8-bit comparator

2. Write a VHDL program in structural model for
   a) 16:1 mux realization
   b) 3:8 decoder realization through 2:4 decoder

3. Write a VHDL program in behavioral model for
   a) 16:1 mux b) 3:8 decoder c) 8:3 encoder d) 8 bit parity generator and checker

4. Write a VHDL program in structural and behavioral models for
   a) 8 bit asynchronous up-down counter b) 8 bit synchronous up-down counter

5. Write a VHDL program for 4 bit sequence detector through Mealy and Moore state machines.

6. Write a VHDL program for traffic light controller realization through state machine.

7. Write a VHDL program in behavioral model for 8 bit shift and add multiplier.

8. Write a VHDL program in structural model for 8 bit Universal Shift Register.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – I SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A50408	Object Oriented Programming Lab			2	1

COURSE OBJECTIVES	
1	At the end of the course students should be familiar with the main features of the C++ language.
2	Be able to write a C++ program to solve a well specified problem.
3	Be able to debug and test C++ programs
4	To make the students understand the features of object oriented principles and familiarize them with virtual functions, templates and exception handling.
5	To make the students to develop applications using C++

COURSE OUTCOMES	
CO1	Students will be able to apply the computer programming techniques to solve practical problems.
CO2	Students will be able to understand the concepts and implementation of constructors and destructors.
CO3	Students will be able to develop applications using object oriented programming language in C++.
CO4	Student can be able to understand and use the basic programming constructs of C++
CO5	Students are able to learn C++ data types, memory allocation/deallocations, functions and pointers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		1		1					2			2	1
CO2	1	2	1		1					2			2	1
CO3	1		1		1					2			2	1
CO4	2	2	1		1					2			2	1
CO5	2		1		1					2			2	1

LIST OF PROGRAMS

1. Simple C++ Programs to Implement Various Control Structures.
   a. If statement
   b. Switch case statement and do while loop
   c. For loop d. While loop
2. Programs to Understand Structure & Unions.
   a. Structure b. union
3. Programs to Understand Pointer Arithmetic.
4. Functions & Recursion.
   a. Recursion b. function
5. Inline Functions.
6. Programs to Understand Different Function Call Mechanism.
   a. Call by reference b. Call by Value
7. Programs to Understand Storage Specifiers.
8. Constructors & Destructors.
9. Use of "this" Pointer Using class
10. Programs to Implement Inheritance and Function Overriding.

a. Multiple inheritance –Access Specifiers
b. Hierarchical inheritance – Function Overriding /Virtual Function

11. Programs to Overload Unary & Binary Operators as Member Function & Non Member Function.
    a. Unary operator as member function
    b. Binary operator as non member function
12. Programs to Understand Friend Function & Friend Class.
    a. Friend Function b. Friend class
13. Programs on Class Templates

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – II SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A60401	Microprocessors & Microcontrollers	3	-	-	3

COURSE OBJECTIVES The students will be able to:	
1	Understand fundamental operating concepts behind microprocessors and microcontrollers.
2	Appreciate the advantages in using RISC microprocessors / microcontrollers in engineering applications.
3	Design microprocessor / microcontroller based solutions to problems.
4	Develop skill in simple program writing for 8086; MSP430 and applications

COURSE OUTCOMES At the end of this course the student will be able to,	
CO1	Understands the internal architecture and organization of 8085 & 8086 processors, MSP430 controller.
CO2	Design and implement programs on 8086 microprocessor.
CO3	Understands the interfacing techniques to 8086 and MSP 430 and can develop assembly language programming to design microprocessor/ micro controller based systems.
CO4	Program MSP 430 for designing any basic Embedded System.
CO5	Design and implement some specific real time applications

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	3	1	3						1			
CO2		3			3						1	2	2	2
CO3		3	2	2	3					1	1	2	3	2
CO4					3						1	2		
CO5	2			3	3						1	2	2	

UNIT I

Introduction-8085 Architecture-Block Diagram, Flag Register, Pin Diagram, Timing and Control Signals, System Timing Diagram, Overview of 8086-Internal Architecture- Register Organization, Memory Segmentation, Flag Register, Pin Configuration. Interrupt structure of 8085 and 8086

UNIT II

Instruction Formats -Addressing Modes-Instruction Set of 8086, Assembler Directives-Macros and Procedures. Programs Involving Logical, Branch Instructions – Sorting and Evaluating Arithmetic Expressions – StringManipulations-Simple ALPs. Brief discussion of peripheral sub systems like 8251, 8253, 8255, 8257 and 8259 (only Pin diagrams and key features of these peripheral sub systems)

UNIT III

Comparison between RISC and CISC architecture, Low power RISC MSP430 – block diagram, features and architecture,Variants of the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x and their targeted applications, MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. Sample embedded system on MSP430 microcontroller.

UNIT IV

I/O ports pull up/down registers concepts, Interrupts and interrupt programming. Watchdog timer.System clocks. Low Power aspects of MSP430: low power modes, Active vs Standby current consumption, FRAM vs Flash for low power & reliability.

Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

Case Study: MSP430 based embedded system application using ADC & PWM demonstrating peripheral intelligence. "Remote Controller of Air Conditioner Using MSP430"

UNIT V

Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices. Implementing Embedded Wi-Fi using C3100

Case Study: MSP430 based embedded system application using the interface protocols for communication with external devices: "A Low-Power Battery less Wireless Temperature and Humidity Sensor with Passive Low Frequency RFID"

Text Books:

1. "Microprocessor and Microcontrollers", N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Oxford Publishers. 1 st Edition, 2010
2. "The X86 Microprocessors , Architecture, Programming and Inerfacing" , Lyla B. Das, Pearson
 Publications, 2010
3. MSP430 microcontroller basics. John H. Davies, Newnes Publication, I st Edition

References:

1. http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode
2. http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra
 Low_Power_MCU_Training

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A60402	VLSI Design	3	-	-	3

COURSE OBJECTIVES	
1	Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/BICMOS transistors and passive components.
2	Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
3	Give exposure to the design rules to be followed to draw the layout of any logic circuit.
4	Provide concept to design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
5	Provide design concepts to design building blocks of data path of any system using gates.
6	Understand basic programmable logic devices and testing of CMOS circuits.

COURSE OUTCOMES	
CO1	Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors.
CO2	Choose an appropriate inverter depending on specifications required for a circuit
CO3	Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit
CO4	Design different types of logic gates using CMOS inverter and analyze their transfer characteristics
CO5	Provide design concepts required to design building blocks of data path using gates.
CO6	Design simple memories using MOS transistors and can understand design of large memories.
CO7	Design simple logic circuit using PLA, PAL, FPGA and CPLD.
CO8	Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1	1	3	2	2		2							1	
CO2		3	3	2		2							2	
CO3		3	2			2							2	
CO4		3	2			2							2	
CO5		3	3			2							3	
CO6		3				2							3	
CO7		3	2			2							3	
CO8		3	3		2	2							2	

UNIT I

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &BiCMOS

Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds}-V_{ds} relationships, MOS transistor threshold Voltage, g_m, g_{ds}, Figure of merit ω_o; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT II

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 μm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT III

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

UNIT IV

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT V

Programmable Logic Devices: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

Text Books:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, EshraghianDougles and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.
3. VLSI Design – M. Michael Vai, 2001, CRC Press.

References:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design- K.Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
5. Introduction to VLSI – Mead & Convey, BS Publications, 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – II SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A60403	Digital Communication Systems	3	-	-	3

COURSE OBJECTIVES	
1	To introduce the different digital modulation techniques such as PCM
2	To introduce different error detecting and error correcting codes like block codes

COURSE OUTCOMES
Upon completion of the course, students will be able to:

CO1	Understand the elements of digital communication system and able to analyse the different coding and modulation techniques.
CO2	Understand the basic principles of baseband and passband digital modulation schemes.
CO3	Analyze probability of error performance of digital systems and are able to design digital communication systems.
CO4	Understand the basics of information theory and error correcting codes.
CO5	Understand the elements of digital communication system and able to analyse the different coding and modulation techniques.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1	3	2	3						1	1			2	1
CO2	3	2	3						1	1			2	1
CO3	3	2	3						1	1			2	3
CO4	3	2	3						1	1			2	3
CO5	3	2	3						2	1			2	3

UNIT I
Source Coding Systems: Introduction, sampling process, quantization, quantization noise, conditions for optimality of quantizer, encoding, Pulse-Code Modulation (PCM), Line codes, Differential encoding, Regeneration, Decoding & Filtering, Noise considerati ons in PCM systems, Time-Division Multiplexing (TDM), Synchronization, Delta modulation (DM), Differential PCM (DPCM), Processing gain, Adaptive DPCM (ADPCM), Comparison of the above systems.

UNIT II
Baseband Pulse Transmission: Introduction, Matched filter, Properties of Matched filter, Matched filter for rectangular pulse, Error rate due to noise, Inter-symbol Interference (ISI), Nyquist"s criterion for distortion less baseband binary transmission, ideal Nyquist channel, Raised cosine filter & its spectrum, Correlative coding – Duo binary & Modified duo binary signaling schemes, Partial response signaling, Baseband M-array PAM transmission, Eye diagrams.

UNIT III
Signal Space Analysis: Introduction, Geometric representation of signals, Gram-Schmidt orthogonalization procedure, Conversion of the Continuous AWGN channel into a vector channel, Coherent detection of signals in noise, Correlation receiver, Equivalence of correlation and Matched filter receivers, Probability of error, Signal constellation diagram.

UNIT IV

Passband Data Transmission: Introduction, Passband transmission model, Coherent phase-shift keying – binary phase shift keying (BPSK), Quadrature shift keying (QPSK), Binary Frequency shift keying (BFSK), Error probabilities of BPSK, QPSK, BFSK, Generation and detection of Coherent BPSK, QPSK, & BFSK, Power spectra of above mentioned modulated signals,M-array PSK, M-array quadrature amplitude modulation (M-array QAM), Non-coherent orthogonal modulation schemesDifferential PSK, Binary FSK, Generation and detection of non-coherent BFSK, DPSK, Comparison of power bandwidth requirements for all the above schemes.

UNIT V

Channel Coding: Error Detection & Correction - Repetition & Parity Check Codes, Interleaving, Code Vectors and Hamming Distance, Forward Error Correction (FEC) Systems, Automatic Retransmission Query (ARQ) Systems, Linear Block Codes – Matrix Representation of Block Codes, Convolutional Codes – Convolutional Encoding, Decoding Methods.

Text Books:

1. Simon Hakin, "Communication Systems," Wiley India Edition, 4th Edition, 2011.
2. B.P. Lathi, &Zhi Ding, "Modern Digital & Analog Communication Systems", Oxford University Press, International 4th edition, 2010.

References:

1. Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley, 2005.
2. A. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5th Edition, 2010
3. Bernard Sklar, "Digital Communications", Prentice-Hall PTR, 2nd edition, 2001.
4. HerbertTaub& Donald L Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 3rd Edition, 2009.
5. J. G. Proakis, M Salehi, Gerhard Bauch, "Modern Communication Systems Using MATLAB," CENGAGE, 3rd Edition, 2013.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – II SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A60404	Digital Signal Processing	2	2	-	3

COURSE OBJECTIVES	
1	To provide background and fundamental material for the analysis and processing of digital signals.
2	To familiarize the relationships between continuous-time and discrete time signals and systems.
3	To study fundamentals of time, frequency and Z-plane analysis and to discuss the inter-relationships of these analytic method.
4	To study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications.
5	The impetus is to introduce a few real-world signal processing applications.
6	To acquaint with DSP processor.
COURSE OUTCOMES	
CO1	Compute the fast Fourier transforms and find the relationship with other transforms.
CO2	Understand and design FIR and IIR digital filters.
CO3	Study about realization of digital filter structures.
CO4	Understand DSP building blocks to achieve high speed in DSP processor.
CO5	Understand the DSP TMS320C54XX architecture and instructions.

	PO1	**PO2**	**PO3**	**PO4**	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	**PSO1**	**PSO2**
CO1	3		3							1			2	2
CO2	3		3							1			2	3
CO3	3		3						1	1			2	3
CO4	1		1						2	2			2	3
CO5	1		1						1	1			2	3

UNIT I

Discrete Fourier Transform: Discrete Fourier series, Properties of Discrete Fourier series, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT.

Fast Fourier Transforms: Efficient computation of DFT algorithms - Radix 2-Decimation-in-Time & Decimation-in-Frequency algorithms, Inverse FFT.

UNIT II

FIR Digital Filters: Linear phase FIR filter, characteristic response, location of zeros, Design of FIR filter - Windowing, Frequency sampling, Illustrative problems.

Realization of FIR systems: Structures for FIR systems - Direct form, Cascade form and Lattice structures.

UNIT III

IIR Digital Filters: Design of IIR filters from Analog filters - Impulse invariance, Bilinear transformation, Comparison of FIR and IIR filters, Frequency transformation in the analog and digital domains, Illustrative problems.
Realization of IIR systems: Structures for IIR systems – Direct form, Signal flow graphs & Transposed, Cascade form, Parallel form and Lattice structures.

UNIT IV
Introduction to DSP Processors: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory, multiport memory, VLSI Architecture, Pipelining, Special addressing modes, On-Chip Peripherals.
Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues.

UNIT V
Programmable Digital Signal Processors: Introduction, Commercial Digital signal-processing Devices, Architecture of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Text Books:
1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications," Pearson Education/PHI, 4th ed., 2007.
2. A.V.Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2nd ed., Pearson Education, 2012.
3. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
4. Digital Signal Processors, Architecture, Programming and Applications – B. VenkataRamani and M.Bhaskar, TMH, 2004.

References:
1. Sanjit K Mitra, "Digital signal processing, A computer base approach," Tata McGraw Hill, 3rd edition, 2009.
2. B. P. Lathi, "Principles of Signal Processing and Linear Systems," Oxford Univ. Press, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – II SEMESTER
Open Elective – I

Subject Code	Title of the Subject	L	T	P	C
17A60405	Principles of Electronic Communication Systems	3	-	-	3

COURSE OBJECTIVES	
1	Introduce the students to modulation and various analog and digital modulation schemes.
2	They can have a broad understanding of satellite, optical, cellular, mobile, wireless and telecom concepts.
COURSE OUTCOMES	
CO1	Work on various types of modulations.
CO2	Should be able to use these communication modules in implementation.
CO3	Will have a basic understanding of various wireless and cellular, mobile and telephone communication systems.

UNIT I
Introduction: Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

UNIT II
Simple description on Modulation: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

UNIT III
Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony.
Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

UNIT IV
Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.
Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT V
Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, WCDMA.
Wireless Technologies: Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

Text Books:
1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications, 2008.

2. Kennady, Davis, Electronic Communications systems, 4e, TMH, 1999

References:

1. TarmoAnttalainen, Introduction to Telecommunications Network Engineering, Artech House Telecommunications Library.
2. Theodore Rappaport, Wireless Communications-Principles and practice, Printice Hall, 2002.
3. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.
4. Wayne Tomasi, Introduction to data communications and networking, Pearson Education, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – II SEMESTER
Open Elective – I

Subject Code	Title of the Subject	L	T	P	C
17A60406	Digital Electronics	3	-	-	3

COURSE OBJECTIVES	
1	To introduce the methods for simplifying Boolean expressions
2	To outline the formal procedures for the analysis and design of combinational circuitsand sequential circuits
3	To introduce the concept of memories and programmable logic devices.
4	To illustrate the concept of synchronous and asynchronous sequential circuits
COURSE OUTCOMES	
CO1	Analyze different methods used for simplification of Boolean expressions.
CO2	Design and implement Combinational circuits.
CO3	Design and implement synchronous and asynchronous sequential circuits.
CO4	Write simple HDL codes for the circuits

UNIT I
Minimization Techniques And Logic Gates
Minimization Techniques: Boolean postulates and laws – De-Morgan‟s Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions –– Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don‟t care conditions – Quine - McCluskey method of minimization. Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND–NOR implementations – Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates

UNIT II
Combinational Circuits -Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators – code converters - Magnitude Comparator.

UNIT III
Sequential Circuits-Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

UNIT IV
Memory Devices
Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell –Programmable Logic Devices – Programmable Logic Array (PLA) -

Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

UNIT V

Synchronous and Asynchronous Sequential Circuits

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of Hazard Free Switching circuits.

Text Books:

1. M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003. 37

References:

1. John F.Wakerly, "Digital Design", Fourth Edition, Pearson/PHI, 2008
2. John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
3. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2006.
5. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011
6. Donald D.Givone, "Digital Principles and Design", TMH, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – II SEMESTER
Open Elective – I

Subject Code	Title of the Subject	L	T	P	C
17A60407	Principles of Digital Signal Processing	3	-	-	3

COURSE OBJECTIVES	
1	This course will provide the student with an intuitive and practical understanding of the fundamental concepts of discrete-time signal processing.
	The intended for all engineering undergraduates who may require a technical understanding of the fundamentals used in digital signal processing
2	The intention is to also provide the student with the necessary background for taking advanced level courses in signal and image processing, and ideally, for reading technical literature in DSP
3	computer simulation exercises are intended to familiarize the student with implementation aspects and the application of theoretical knowledge to practical problems.
COURSE OUTCOMES	
Upon successful completion of this course, students will be able to:	
CO1	characterize discrete time signals and LTI signal processing systems mathematically.
CO2	analyze the functions performed by simple discrete-time systems.
CO3	Develop the discrete Fourier transform (DFT) over time domain signals, its applications and its implementation by FFT techniques.
CO4	apply the design techniques for FIR type digital filters known as the —windowing method.
CO5	design IIR type digital filters over the given specifications

UNIT I Introduction to Signal and Systems

Basic Signals and Systems – properties and basic operations-1-D Signals and Filters - Random Signals - Multi-dimensional Signals – Analog and Digital signals and their conversion techniques Convolution process, Filtering process, Z-transform concepts

UNIT II Time domain analysis and Characteristics

Correlation and Discrete sequences: notation, signal characteristics, and operations Discrete linear time invariant systems -Properties and analysis of discrete linear time invariant systems Periodic sampling: aliasing and low pass filtering

UNIT III Frequency domain Analysis

Discrete Fourier transforms (DFT) DFT properties: symmetry, linearity, magnitudes, frequency axis, and shifting Inverse DFT - Fast Fourier transform (FFT): relationship to DFT, implementation considerations, radix-2 algorithm, and input/output indexing FFT: butterfly algorithm structures

UNIT IV FIR filter design

FIR filters – Introduction-Basic properties-Design using Hamming, Hanning Windows - Realization of FIR filters

UNIT V IIR filter design

Review of design of analogue Butterworth Filters, - Design of IIR digital filters using impulse invariance technique - Realization using direct, cascade and parallel forms.

Text Books:

1. Richard G. Lyons, Understanding Digital Signal Processing, Third edition, Prentice-Hall, 2011.
2.Introduction to Digital Signal Processing, J.Proakis & E. Manolakis, MacMillan, 2007 (4 th Edition)

References:

1. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, TMH/McGraw Hill International, 2007
2.E.C. Ifeachor and B.W. Jervis, " Digital signal processing - A practicalapproach",Second edition, Pearson, 2002.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – II SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A60408	Microprocessors & Microcontrollers Lab		1	3	2

COURSE OBJECTIVES	
The students will be able to:	
1	Write ALP for arithmetic and logical operations in 8086
2	Familiarize with MASM, Embedded C & Code composer studio
3	Write and execute programs in 8086 and MSP430.

COURSE OUTCOMES	
At the end of this course the student will be able to,	
CO1	Execution of different programs for 8086 in Assembly Level Language using MASM Assembler
CO2	Program MSP 430 for various applications.
CO3	Design and implement some specific real time applications

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2		1					2			3	2
CO2	2	2	2		1					2			3	2
CO3	2	2	3		1					2			3	2

LIST OF EXPERIMENTS

Part A: 8086 Microprocessor Programs using NASM/8086 microprocessor kit.

1. Introduction to MASM Programming.
2. Programs using arithmetic and logical operations
3. Programs using string operations and Instruction prefix: Move Block, Reverse string, Sorting, Length of the string, String comparison.
4. Programs using CALL and RET instructions

Part B: Embedded C Experiments using MSP430 Microcontroller

1. Interfacing and programming GPIO ports in C using MSP430 (blinking LEDs , push buttons)
2. Usage of Low Power Modes: (Use MSPEXP430FR5969 as hardware platform and demonstrate the low power modes and measure the active mode and standby mode current)
3. Interrupt programming examples through GPIOs
4. PWM generation using Timer on MSP430 GPIO
5. Interfacing potentiometer with MSP430
6. PWM based Speed Control of Motor controlled by potentiometer connected to MSP430 GPIO
7. Using ULP advisor in Code Composer Studio on MSP430
8. Low Power modes and Energy trace++:
   a. Enable Energy Trace and Energy Trace ++ modes in CCS
   b. Compute Total Energy, and Estimated lifetime of an AA battery.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
III B.TECH – II SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A60409	Digital Communication Systems Lab	-	1	3	2

COURSE OBJECTIVES	
1	Develops skills for performance analysis of practical digital communication systems.
2	This lab focuses the fundamental concepts on TDM, Pulse modulations, digital modulation techniques.
3	Evaluate the performance of PCM, DPCM and DM in a digital communication system.
4	Learns to use new tools software and hardware effectively and creatively to synthesis digital communication systems.

COURSE OUTCOMES	
CO1	After completion of the course the students will be able to experience real time behavior of different digital modulation schemes and technically visualize spectra of different digital modulation schemes.
CO2	Able to design and implement different modulation and demodulation techniques.
CO3	Able to analyze digital modulation techniques by using MATLAB tools.
CO4	Ability to design efficient and effective digital communication system with the help of modulation techniques.
CO5	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2		2					1			2	3
CO2	3		3	1	2					1			2	3
CO3	3		3	1	2					1			2	3
CO4	3		3	1	2					1			2	3

LIST OF EXPERIMENTS

Minimum of Ten experiments to be conducted (Five from each Part-A&B)

HARDWARE EXPERIMENTS (PART – A)

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Differential phase shift keying.
7. QPSK modulation and demodulation.

SOFTWARE EXPERIMENTS (PART-B)

Modeling of Digital Communications using MATLAB

1. Sampling Theorem – verification.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Frequency shift keying.
5. Phase shift keying.
6. Differential phase shift keying.
7. QPSK modulation and demodulation.

Equipment required for Laboratories:

1. RPS - 0 – 30 V
2. CROs - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. RF Generators (3 Nos.)- 0 – 1000 M Hz.
5. Multimeters
6. Lab Experimental kit for Pulse Code Modulation (Experiment No.3 of part – A)
7. Required Electronic Components (Active and Passive) which include required ICs
8. Arbitrary Wave form generators/ PNS generators – 2 Nos. (to generate digital data at required data rates)
9. Licensed MATLAB software for 30 users with required tool boxes.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

III B.TECH – II SEMESTER

Subject Code	Title of the Lab	L	T	P	C
17A65501	Advanced English Language Communication Skills Lab	-	1	3	2

COURSE OBJECTIVES	
1	To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
2	Further, they would be required to communicate their ideas relevantly and coherently in writing.
3	To prepare all the students for their placements.
4	To initiate them into greater use of the computer in resume preparation, report writing, format making etc.
5	To train them to use language effectively to face interviews, group discussions, public speaking.

COURSE OUTCOMES	
CO1	Accomplishment of sound vocabulary and its proper use contextually
CO2	Flair in Writing and felicity in written expression.
CO3	Effective Speaking Abilities for enhanced job prospects.
CO4	Able to use technology to enhance job oppurtunities
CO5	Develop language competency and become confident users of English in interviews, Group Discussions, and Public Speaking

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2		2					1			2	3
CO2	3		3	1	2					1			2	3
CO3	3		3	1	2					1			2	3
CO4	3		3	1	2					1			2	3

UNIT-I: COMMUNICATIVE COMPETENCY

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary for competitive purpose
4. Spotting errors

UNIT-II: TECHNICAL WRITING

1. Report writing
2. Curriculum vitae
3. E-mail writing
4. Abstract & Synopsis Writing
5. Reviewing (Book/Film)

UNIT-III: PRESENTATIONAL SKILLS

1. Oral presentation
2. Power point presentation
3. Poster presentation
4. Stage dynamics
5. Body Language

UNIT-IV: CORPORATE SKILLS

1. Telephonic skills
2. Net Etiquettes
3. SMART Goal setting
4. Time Management
5. Negotiation Skills

UNIT-V: GETTING READY FOR JOB

1. Group discussions-II
2. Interview skills
3. Answering Strategies
4. Mock Interviews

MINIMUM REQUIREMENT FOR ELCS LAB:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

SUGGESTED SOFTWARE:

10. Walden Infotech English Language Communication Skills.
11. Clarity Pronunciation Power – Part I (Sky Pronunciation)
12. Clarity Pronunciation Power – part II
13. LES(Learn English Select) by British council
14. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
15. *DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.*
16. Lingua TOEFL CBT Insider, by Dreamtech
17. English Pronunciation in Use (Elementary, Intermediate, Advanced) CUP
18. Cambridge Advanced Learners' English Dictionary with CD.

REFERENCE BOOKS:

The software consisting of the prescribed topics elaborated above should be procured and used.

1. **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
2. **TOEFL & GRE**(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
3. **Train2success.com**

1. **Objective English for Competitive Exams**, Hari Mohana Prasad, 4th edition, Tata Mc Graw Hill.
2. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, O U Press 2009.
3. Books on **TOEFL/GRE/GMAT/CAT/ IELTS** by Barron's/DELTA/Cambridge University Press.2012.
4. **Soft Skills for Everyone,** Butterfield Jeff, Cengage Publications, 2011.
5. **Practice Psychometric Tests**: How to familiarize yourself with genuine recruitment tests, 2012.
6. **Management Shapers Series** by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
7. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
8. **English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.**

9. **Word Power Made Handy,** Shalini Verma, S Chand Publications, 2011.
10. **Effective Technical Communication,** Ashrif Rizvi, TataMcGrahill, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A75401	Management Science	3	-	-	3

COURSE OBJECTIVES	
1	To provide fundamental knowledge on Management, Administration, Organization & its concepts.
2	To understand the role of management in Production
3	To study Materials/Purchases/Stores/Inventory/Marketing Management and Quality control
4	To study HRM in order to have an idea on Recruitment, Selection, Training &Development, job evaluation and Merit rating concepts.
5	To identify Strategic Management areas & to Study the PERT/CPM for better Project Management.

COURSE OUTCOMES	
CO1	1. To apply the concepts & principles of management & designs of organization in a practical world.
CO2	To design good plant layout and apply Work-study principles, Quality Control techniques, in real life industry & To maintain & control the Inventory & students can able to identify the importance of marketing in emerging world.
CO3	To apply the concepts of HRM in Recruitment, Selection, Training & Development.
CO4	To develop PERT/CPM Charts for projects of an enterprise and estimate time & cost of project & to analyse the business through SWOT .
CO5	They can aware of the latest and contemporary issues of management science.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1						2	1							
CO2						2	1							
CO3						2	1							
CO4						2	1							
CO5						2	1							

UNIT I: INTRODUCTION TO MANAGEMENT:
Management-Concept and meaning-Nature-Functions-Management as a Science and Art and both. Schools of Management Thought-Taylor's Scientific Theory-Henry Fayol's principles- Eltan Mayo's Human relations-Systems Theory- **Organizational Structure and Design**: Features of Organizational Structure-Work Specialization-Departmentation-Span of Control-Centralization and Decentralization. **Organisational Designs**-Line organization-Line & Staff Organization-Functional Organization-Matrix Organization-Project Organization-Committee form of Organization-Social responsibilities of Management.

UNIT II: OPERATIONS MANAGEMENT:
Principles and Types of Plant Layout-Methods of Production (Job, batch and Mass Production), Work Study- Statistical Quality Control**:** *C* chart, *P* chart, (simple Problems) Deming's contribution

to Quality. **Material Management:** Objectives-Inventory-Functions, Types, Inventory Techniques-EOQ-ABC Analysis-Purchase Procedure and Stores Management- Just-In-Time (JIT). **Marketing Management:** Concept- Meaning - Nature- Functions of Marketing- Marketing Mix- Channels of Distribution -Advertisement and Sales Promotion- Marketing Strategies based on Product Life Cycle.

UNIT III: HUMAN RESOURCES MANAGEMENT (HRM):
HRM- Definition and Meaning – Nature-Managerial and Operative functions-Evolution of HRM- Job Analysis -Human Resource Planning(HRP)-Employee Recruitment-Sources of Recruitment- Employee Selection- Process and Tests in Employee Selection- Employee Training and Development-On- the- job & Off- the- job training methods-Performance Appraisal Concept- Methods of Performance Appraisal-Placement-Employee Induction-Wage and Salary Administration-Objectives-Essentials of Wage and Salary Administration-Job Evaluation- Employee Grievances-Techniques of handling Grievances.

UNIT IV: STRATEGIC & PROJECT MANAGEMENT:
Definition& Meaning-Setting of Vision- Mission- Goals- Corporate Planning Process- Environmental Scanning-Steps in Strategy Formulation and Implementation-SWOT Analysis. **Project Management:**Network Analysis- Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying Critical Path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems).

UNIT V: CONTEMPORARY ISSUES IN MANAGEMENT:
The concept of Management Information System(MIS)- Materials Requirement Planning (MRP)- Customer Relations Management(CRM)- Total Quality Management (TQM)- Six Sigma Concept- Supply Chain Management(SCM)- Enterprise Resource Planning (ERP)- Performance Management- Business Process Outsourcing (BPO), Business Process Re-engineering and Bench Marking -Balanced Score Card-Knowledge Management.

Text Books:
1. A.R Aryasri: Management Science, TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education,New Delhi, 2012.

References:
1. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2005.
2. Thomas N.Duening & John M.Ivancevich ManagementPrinciples and Guidelines,Biztantra.
3. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
4. Memoria & S.V.Gauker, Personnel Management, Himalaya, 25/e, 2005
5. Samuel C.Certo: Modern Management, 9/e, PHI, 2005
6. Schermerhorn, Capling, Poole & Wiesner: Management, Wiley, 2002.
7. Parnell: Strategic Management, Biztantra, 2003.
8. Lawrence R Jauch, R.Gupta &William F.Glueck: Business Policy and Strategic Management, Frank Bros., 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A70401	Electronic Measurements & Instrumentation	3			3

COURSE OBJECTIVES	
1	To provide an understanding of various measuring systems functioning and metrics for performance analysis.
2	Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3	Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.
COURSE OUTCOMES	
CO1	Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
CO2	Measure various physical parameters by appropriately selecting the transducers.
CO3	Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1	3	2	3	1	1					1			1	1
CO2	1	2		2	1					1			1	2
CO3	1	3	3	1	1								2	3

UNIT I

Performance characteristics of Instruments: Static characteristics, Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC ammeters, DC voltmeters-multirange, range extension/solid state and differential voltmeters, AC voltmeters –multirange, range extension. Thermocouple type RF ammeter, ohm meters, series type, shunt type, multimeter for voltage, current and resistance measurements.

UNIT II

Oscilloscopes: Standard specifications of CRO,CRT features, derivation of deflection sensitivity, vertical and horizontal amplifiers, horizontal and vertical deflection systems, sweep trigger pulse, delay line, sync selector circuits, probes for CRO – active, passive, and attenuator type, triggered sweep CRO, and Delayed sweep, dual trace/beam CRO, Measurement of amplitude, frequency and phase (Lissajous method).Principles of sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Digital frequency counters, time & Period measurements.

UNIT III

Signal generators-fixed and variable, AF oscillators, function generators, pulse, random noise, sweep, and arbitrary waveform generators, their standards, specifications and principles of working (Block diagram approach).Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers.

UNIT IV

Review of DC Bridges: Wheatstone bridge, Wein Bridge, errors and precautions in using bridges, AC bridges: Measurement of inductance-Maxwell's bridge, Anderson Bridge. Measurement of capacitance- SchearingBridge.Kelvin Bridge, Q-meter, EMI and EMC, Interference and noise reduction techniques.

UNIT V

Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples, and thermistor s), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

Text Books:

1. A.D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 5th Edition, 2002.
2. H.S.Kalsi, "Electronic instrumentation", second edition, Tata McGraw Hill, 2004.
3. K. Lal Kishore, "Electronic Measurements & Instrumentations", Pearson Education, 2009.

References:

1. H.S.Kalsi, "Electronic instrumentation", second edition, Tata McGraw Hill, 2004.
2. Ernest O Doebelin and Dhanesh N Manik, "Measurement Systems Application and Design", TMH, 5th Edition, 2009.
3. Oliver and Cage, "Electronic Measurement and Instrumentation", TMH.
4. Robert A.Witte, "Electronic Test Instruments, Analog and Digital Measurements", Pearson Education, 2nd Ed., 2004.
5. David A. Bell, "Electronic Instrumentation & Measurements", PHI, 2nd Edition, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A70402	Optical Communications	3	-	-	3

	COURSE OBJECTIVES
1	To realize the significance of optical fibre communications.
2	To understand the construction and characteristics of optical fibre cable.
3	To develop the knowledge of optical signal sources and power launching.
4	To identify and understand the operation of various optical detectors.
5	To understand the design of optical systems and WDM.
	COURSE OUTCOMES
At the end of the course, the student will be able to:	
CO1	Understand and analyze the constructional parameters of optical fibres.
CO2	Be able to design an optical system.
CO3	Estimate the losses due to attenuation, absorption, scattering and bending.
CO4	Compare various optical detectors and choose suitable one for different applications.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1	3		3	3	3									1
CO2	3	3	3		3									
CO3			3	3	3	1		1	2				1	2
CO4		3	3		3	1	2		1			1	1	3

UNIT I
Introduction to Optical Fibers: Evolution of fiber optic system- Element of an Optical FiberTransmission link- Ray Optics-Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes –Single Mode Fibers-Graded Index fiber structure.

UNIT II
Signal Degradation Optical Fibers: Attenuation–Absorption losses, Scattering losses, BendingLosses, Core and Cladding losses, Signal Distortion in Optical Wave guides - Information Capacity determination –Group Delay- Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT III
Fiber Optical Sources and Coupling : Direct and indirect Band gap materials-LED structures–Lightsource materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition –Rate equations –External Quantum efficiency –Resonant frequencies – Temperature effects, Introduction to Quantum laser, source-to-fiber Power Launching, Lensing schemes, Fiber –to- Fiber joints, Fiber splicing.

UNIT IV
Fiber Optical Receivers : PIN and APD diodes–Photo detector noise, SNR, Detector Response time,Avalanche Multiplication Noise –Comparison of Photo detectors –Fundamental Receiver Operation – preamplifiers, Error Sources –Receiver Configuration –Probability of Error – Quantum Limit.

UNIT V

System Design and Applications: Design of Analog Systems: system specification, power budget,bandwidth budget

Design of Digital Systems: system specification, rise time budget, power budget, Receiver sensitivity.

Text Books:

1. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International, Singapore, 3rd ed., 2000.
2. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.

References:

1. Max Ming-Kang Liu, "Principles and Applications of Optical Communications", TMH, 2010.
2. S.C.Gupta, "Text book on optical fiber communication and its applications", PHI, 2005.
3. Satish Kumar, "Fundamentals of Optical Fiber communications", PHI, 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A70403	Microwave Engineering	3	-	-	3

COURSE OBJECTIVES	
1	To get familiarized with microwave frequency bands
2	To develop the theory related to microwave transmission lines
3	To distinguish between different types of microwave tubes
4	To impart the knowledge of Scattering Matrix
5	To understand the concepts of microwave measurements
COURSE OUTCOMES	
CO1	To analyze completely the rectangular waveguides, their mode characteristics, and design waveguides for solving practical microwave transmission line problems.
CO2	To distinguish between the different types of waveguide and ferrite components, explain their functioning and select proper components for engineering applications.
CO3	To distinguish between the methods of power generation at microwave frequencies, derive the performance characteristics of 2-Cavity and Reflex Klystrons, Magnetrons, TWTs and estimate their efficiency levels, and solve related numerical problems
CO4	To realize the need for solid state microwave sources and understand the utility of S-parameters in microwave component design.
CO5	To set up a microwave bench, establish the measurement procedure and conduct the experiments in microwave lab for measurement of various microwave parameters.

	PO1	**PO2**	**PO3**	**PO4**	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	**PSO1**	**PSO2**
CO1	2	2	3		1					1			1	2
CO2	2	2	3							1			1	2
CO3	2	2	3		1					1			1	2
CO4	2	2	3		1					1			1	2
CO5	2	2	3		1					1			1	2

UNIT I

Waveguides: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides — Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics — Phase and Group Velocities, Wavelengths and Impedance Relations, Illustrative Problems.

Rectangular Guides: Power Transmission and Power Losses, Impossibility of TEM Mode, Micro strip Lines— Introduction, Zo Relations, Effective Dielectric Constant, Losses, Q factor.

UNIT II

Cavity Resonators— Introduction, Rectangular Cavities, Dominant Modes and Resonant Frequencies, Q Factor and Coupling Coefficients, Illustrative Problems

Waveguide Components and Applications: Coupling Mechanisms — Probe, Loop, Aperture types. Waveguide Discontinuities — Waveguide Windows, Tuning Screws and Posts, Matched

Loads. Waveguide Attenuators — Different Types, Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters — Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions — E plane and H plane Tees, Magic Tee. Directional Couplers — 2 Hole, Bethe Hole types, Illustrative Problems Ferrites— Composition and Characteristics, Faraday Rotation, Ferrite Components — Gyrator, Isolator, Circulator.

UNIT III

Microwave Tubes: Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes — 0 Type and M Type Classifications, 0-type Tubes : 2 Cavity Klystrons — Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory — Expressions for 0/P Power and Efficiency. Reflex Klystrons — Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and 0/P Characteristics, Effect of Repeller Voltage on Power 0/P, Illustrative Problems.

Helix TTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

UNIT IV

M-Type Tubes: Introduction, Cross-field Effects, Magnetrons — Different Types, Cylindrical Traveling Wave Magnetron — Hull Cut—off and Hartree Conditions, Modes of Resonance and P1-Mode Operation, Separation of P1-Mode, 0/p characteristics, Illustrative Problems **Microwave Solid State Devices:** Introduction, Classification, Applications. TEDs — Introduction, Gunn Diodes — Principle, RWH Theory, Characteristics, Basic Modes of Operation – Gunn Oscillation Modes, LSA Mode, Introduction to Avalanche Transit Time Devices.

UNIT V

Microwave Measurements: Scattering Matrix— Significance, Formulation and Properties, S Matrix Calculations for — 2 port Junctions, E plane and H plane Tees, Magic Tee, Circulator and Isolator, Illustrative Problems. Description of Microwave Bench — Different Blocks and their Features, Errors and Precautions, Microwave Power Measurement, Bolometers Measurement of Attenuation, Frequency Standing Wave Measurements — Measurement of Low and High VSWR, Cavity Q, Impedance Measurements.

Text Books:

1. Microwave Devices and Circuits — Samuel V. Liao, Pearson, 3rd Edition, 2003.
2. Microwave Principles — Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.

References:

1. Foundations for Microwave Engineering — R.E. Collin, IEEE Press, John Wiley, 2ndEdition, 2002.
2. Microwave Circuits and Passive Devices — M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd.,New Age International Publishers Ltd., 1995.
3. Microwave Engineering Passive Circuits — Peter A. Rizzi, PHI, 1999.
4. Electronic and Radio Engineering F.E. Terman, McGraw-Hill, 4th Ed., 1955.
5. Microwave Engineering —A. Das and S.K. Das, TMH, 2nd Ed., 2009,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER
Elective – I

Subject Code	Title of the Subject	L	T	P	C
17A70404	Data Communications & Networking	3	-	-	3

COURSE OBJECTIVES	
1	To explain the basic concept of computer communication networks
2	To demonstrate the TCP/IP and OSI models with merits and demerits.
3	To explore the various layers of OSI Model.
4	To introduce IP addressing, UDP and TCP Models.
5	To have the concept of different routing techniques for data communications.
COURSE OUTCOMES	
CO1	Understand the requirement of theoretical & practical aspect of computer network
CO2	Students will be in a position to administrate a network and flow of information further he/she can understand easily the concepts of network security.
CO3	To explain the role of protocols in networking and to analyze the services and features of the various layers in the protocol stack.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3		1					2			1	2
CO2	1	2	3		2					2			1	2
CO3	1	2	3		2					2			1	2

UNIT I

Introduction to Computer Networks: Uses of computer Network, Network Software-design Issues for layers, Service primitives and relationship of services to Protocols, Reference models-OSI &TCP/IP, network architectures introduction, Example of networks-X.25, Frame Relay & ATM, Protocols and Standards.

UNIT II

Physical Layer: Physical layer-Data rate limits, Transmission media-guided and Unguided, Switching systemsCircuit switching, Datagram Switching & Virtual circuit switching, Structure of circuit and packet switch, cable modem and DSL technologies, SONET basics, selection of IEEE std 802.11 ,a,b,c,g.

UNIT III

Data link layer: Framing, Flow & Error control Protocols, HDLC, PPP, Multiple access techniquesrandom access, controlled access & Channelization, Ethernet types-bridged, Switched, Full duplex, Fast & gigabit Ethernet, Introduction to Data link layer in 802.11 LAN, Connecting devices like passive hubs, repeaters, Active hubs, Bridges, Two-layer Switches, Routers, three layer switches, Gateway etc., Backbone networks, Virtual LANs, Simple Router architecture, Sliding window protocol.

UNIT IV

Network Layer: IPv4 address, IPv6 address, Address mapping-ARP, RARP & DHCP, IPv4 datagram detail format, IPv6 datagram detail format, ICMP, IGMP, Network layer issues like Delivery, forwarding, intra-domain and Inter-domain routing, Routing algorithms like Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, Path vector routing etc., Addressing types-Physical, Logical & port address.

Transport Layer: Transport layer-Process to process delivery, Connection oriented & Connectionless Transport, UDP, TCP, congestion control and Quality of Service.

UNIT V

Application Layer: Application layer protocols and applications like Ping, FTP, telnet, http (www), SMTP, SNMP, Trace route, TFTP, BOOTP, DNS, NFS, RPC, X-server, E-mail, Introduction to streaming Audio/Video, P2P file sharing, Introduction to socket programming.

Text Books:

1. Behrouz A. Forouzan," Data Communications and Networking", 4th Edition, Tata McGraw Hill
2. Andrew Tenenbaum, "Computer Networks", 4th Edition, Pearson Education.
3. Kurose & Ross, "Computer Networking- A top Down Approach featuring the Internet", 3rd edition, Pearson Education.
4. William Stallings, "computer Networks and Cryptography", 3rd edition, Pearson Education

References:

1. Behrouz A. Forouzan, "TCP/IP protocol Suit", 3rd edition, Tata McGraw Hill Publications
2. Stevens,"TCP/IP illustrated Volume - I & II", Pearson education.
3. Feibel Werner, "Encyclopaedia of networking", Pearson education.
4. Frank J. Derfler, "Practical Networking", 2nd edition, QUE international Publishing.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER
Elective – I

Subject Code	Title of the Subject	L	T	P	C
17A70405	Television Engineering	3	-	-	3

COURSE OBJECTIVES	
1	Study the different camera and picture tubes.
2	Know about various standard TV channels.
3	Study about TV receiver, sync separation, detector etc.
4	Study about TV receiver, sync separation, detector etc.
COURSE OUTCOMES	
CO1	Expected to understand the concept of TV transmission and reception
CO2	Acquired knowledge about complete TV receiver.
CO3	Expected to learn about color separation, color coding etc.

UNIT I

Introduction:
TV transmitter and receivers, synchronization. Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal, TV standards. Camera tubes: image Orthicon, Plumbicon, vidicon, silicon Diode Array vidicon, Comparison of camera tubes, Monochrome TV camera,

TV Signal Transmission and Propagation:
Picture Signal transmission, positive and negative modulation, VSB transmission, sound signal transmission, standard channel BW,TV transmitter, TV signal propagation, interference, TV broadcast channels, TV transmission Antennas.

UNIT II

Monochrome TV Receiver:
RF tuner, IF subsystem, video amplifier, sound section, sync separation and processing, deflection circuits, scanning circuits, AGC, noise cancellation, video and inter carrier sound signal detection, vision IF subsystem of Black and White receivers, Receiver sound system: FM detection, FM Sound detectors, and typical applications.

UNIT III

Sync Separation and Detection:
TV Receiver Tuners, Tuner operation, VHF and UHF tuners, digital tuning techniques, remote control of receiver functions. Sync Separation, AFC and Deflection Oscillators: Synchronous separation, k noise in sync pulses, separation of frame and line sync pulses. AFC, single ended AFC circuit, Deflection Oscillators, deflection drive Ics, Receiver Antennas, Picture Tubes.

UNIT IV

Color Television:
Colour signal generation, additive colour mixing, video signals for colours, colour difference signals, encoding, Perception of brightness and colours luminance signal, Encoding of colour difference signals, formation of chrominance signals, color cameras, Colour picture tubes.

Color Signal Encoding and Decoding:
NTSC colour system PAL colour system, PAL encoder, PAL-D Decoder, chrome signal amplifiers, separation of U and V signals, colour burst separation, Burst phase discriminator, ACC amplifier, Reference oscillator, Indent and colour killer circuits, U& V demodulators.

UNIT V

Color Receiver:
Introduction to colour receiver, Electron tuners, IF subsystem, Y-signal channel, Chroma decoder, Separation of U & V Color, Phasors, synchronous demodulators, Sub carrier generation, raster circuits.

Digital TV:
Introduction to Digital TV, Digital Satellite TV, Direct to Home Satellite TV, Digital TV Transmitter, Digital TV Receiver, Digital Terrestrial TV, LCD TV, LED TV, CCD Image Sensors, HDTV.

Text Books:
1. Television and Video Engineering- A.M.Dhake, 2nd Edition.
2. Modern Television Practice – Principles, Technology and Service- R.R.Gallatin, New Age International Publication, 2002.
3. Monochrome and Colour TV- R.R. Gulati, New Age International Publication, 2002.

References:
1. Colour Television Theory and Practice-S.P.Bali, TMH, 1994.
2. Basic Television and Video Systems-B.Grob and C.E.Herndon, McGraw Hill, 1999.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER
Elective - I

Subject Code	Title of the Subject	L	T	P	C
17A70406	Radar Engineering	3	-	-	3

COURSE OBJECTIVES	
1	Radar fundamentals and analysis of radar signals.
2	To understand various technologies involved in the design of radar transmitters and receivers.
3	To learn various like MTI, Doppler and tracking radar and their comparison.
COURSE OUTCOMES	
CO1	Understand radar fundamentals and analysis of the radar signals.
CO2	Understand various radar transmitters and receivers.
CO3	Understand various radar like MTI, Doppler and tracking radar and their comparison.

UNIT I

BASICS OF RADAR: Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems.

RADAR EQUATION: SNR, Envelope Detector, False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT II

CW AND FREQUENCY MODULATED RADAR: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Illustrative Problems.

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar.

UNIT III

MTI AND PULSE DOPPLER RADAR: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, And Staggered PRFs. Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance,MTI versus Pulse Doppler radar.

UNIT IV

TRACKING RADAR: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two- coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT V

DETECTION OF RADAR SIGNALS IN NOISE: Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.
RADAR RECEIVERS: Noise Figure and Noise Temperature, Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus Parallel Feeds, Applications, Advantages and Limitations.

Text Books:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Edition, 2007.

References:

1. Introduction to Radar Systems – Merrill I. Skolnik, 3rd Edition, Tata McGraw-Hill, 2001.
2. Radar Principals, Technology, Applications – Byron Edde, Pearson Education, 2004.
3. Radar Principles – Peebles, Jr., P.Z.Wiley, NweYork, 1998.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER
Open Elective – II

Subject Code	Title of the Subject	L	T	P	C
17A70407	Electronic Measuring Instruments	3	-	-	3

COURSE OBJECTIVES	
1	It provides an understanding of various measuring systems functioning and metrics for performance analysis.
2	Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3	Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.
COURSE OUTCOMES	
CO1	Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
CO2	Measure various physical parameters by appropriately selecting the transducers.
CO3	Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	1					1			1	1
CO2	1	2		2	1					1			1	2
CO3	1	3	3	1	1								2	3

UNIT I
Block Schematics of Measuring Systems and Performance Metrics: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

UNIT II
Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, and Specifications

UNIT III
Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments. CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes.

UNIT IV
Recorders: X-Y Plotter, Curve tracer, Galvanometric Recorders, Servo transducers, pen driving mechanisms, Magnetic Recording, Magnetic recording techniques.

UNIT V
Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples,

Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

Text Books:

1. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage TMH Reprint 2009.
2. Electronic Instrumentation: H.S.Kalsi – TMH, 2nd Edition 2004.

References:

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI 5th Edition 2003.
3. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
4. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER
Open Elective – II

Subject Code	Title of the Subject	L	T	P	C
17A70408	Fuzzy Logic & Neural Networks	3	-	-	3

COURSE OBJECTIVES	
1	To provide the student with the basic understanding of neural networks and fuzzy logic fundamentals
2	To make the students well acquainted with Soft computing techniques, especially Fuzzy logic and neural networks.
3	To make the students able to identify the complex problems in conventional structures, obtain intelligent acceptable solutions for these problems using soft computing techniques and take the necessary corrective action in the light of ongoing events
COURSE OUTCOMES	
By the end of the course ,the students shall be able to	
CO1	Understand the adequate knowledge about neural networks, program the related algorithms and design the required and related systems.
CO2	Understand the fuzzy set theory .
CO3	study and understand defuzzification techniques.
CO3	provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic

UNIT I
INTRODUCTION: Fundamentals and Models of Artificial Neural Systems, Neural computation: Examples and applications, Biological neurons and their artificial models, Models of artificial networks, Neural processing, Learning and adaptation, Neural network learning rules, Overview of neural networks, Single Layer Perception , multilayer perception & its limitation.

UNIT II
MULTILAYER FEED FORWARD NETWORKS:
Linearly non separable pattern classification, Delta learning rule for multi-perceptron layer, generalized delta learning rule, feed forward recall and error back propagation training, learning factors.

UNIT III
SINGLE LAYER FEEDBACK NETWORKS: Basic concepts and dynamical systems, Mathematical foundations of discrete-time and gradient-type Hopfield networks Application of Neural Networks: control system application like washing machine, refrigerator, signal processing application like ECG, EMG, EEG.

UNIT IV
INTRODUCTION TO FUZZY LOGIC:
Uncertainty and imprecision, Classical sets and Fuzzy sets, Classical relation and fuzzy relations, Operations on crisp and fuzzy relations. Fuzzy tolerance and equivalence

UNIT V
FUZZYFICATION AND DEFUZZIFICATION: Membership functions, Membership assignment, lambda cuts, Defuzzification methods, Fuzzy Arithmetic: Fuzzy numbers, vectors, extension

principle, crisp functions, mapping, fuzzy transforms, interval analysis, fuzzy logic controller design.

Text Books:

1. J. M. Zurada, Introduction to Artificial Neural Networks, Jaico Publishing house.
2. T. M. Ross, Fuzzy logic, Mc-Graw Hill Inc. 3. Kosoko, Neural Networks and Fuzzy Systems, PHI Publications

References:

1. Artificial Neural Network – Simon Haykin, Pearson Education, 2nd Ed.
2. Fuzzy Logic with Engineering Applications, Timothy J. Ross, 2nd edition, McGraw Hill.
3. Fuzzy Sets & Fuzzy Logic- Theory & Applications, George J. Klir, Bo Yuan , Prentice Hall Publications
4. Neural Network, Fuzzy Logic & Genetic Algorithm, S. Rajasekaran, G.A. Vijayalakshmi Pai, PHI Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER
Open Elective – II

Subject Code	Title of the Subject	L	T	P	C
17A70409	Microcontrollers and Applications	3	-	-	3

COURSE OBJECTIVES	
1	To introduce the architecture, programming and interfacing of 8051 Micro controller
2	To introduce microcontroller to different real time applications
	To introduce different peripherals and their interfacing concepts with microcontroller
3	To introduce ARM 32 bit Microcontrollers
4	Students will be are able to positively and appropriately apply knowledge in doing open ended project
COURSE OUTCOMES	
CO1	Ability to apply knowledge of mathematics, engineering to understand concepts in microcontroller based systems
CO2	Ability to analyze a problem and formulate appropriate computing solution for microcontroller based applications
CO3	An ability to design experiments in microcontrollers and analyze computer based process to meet desired needs
CO4	Ability to understand ARM 32 bit Microcontrollers & development tools.

UNIT I - OVERVIEW OF ARCHITECTURE AND MICROCONTROLLER RESOURCES
Architecture of a microcontroller –Microcontroller resources –Resources in advanced and next generation microcontrollers –8051 microcontroller –Internal and External memories –Counters and Timers –Synchronous serial-cum asynchronous serial communication - Interrupts.

UNIT II - INSTRUCTION SET OF 8051 FAMILY MICROCONTROLLERS
Basic assembly language programming –Data transfer instructions –Data and Bit-manipulation instructions –Arithmetic instructions –Instructions for Logical operations among the Registers, Internal RAM, and SFRs –Program flow control instructions –Interrupt control flow.

UNIT III - REAL TIME CONTROL
Interrupts: Interrupt handling structure of an MCU –Interrupt Latency and Interrupt deadline –Multiple sources of the interrupts –Non-Maskable interrupt sources –Enabling or disabling of the sources –Polling to determine the interrupt source and assignment of the priorities among them –Interrupt structure in Intel 8051. Timers: Programmable Timers in the MCUs –Free running counter and real time control –Interrupt interval and density constraints.

UNIT IV - 8051 PROGRAMMING AND APPLICATIONS
Interfacing Serial I/O (8251)- parallel I/O (8255) -Keyboard and Display controller (8279) - ADC/DAC interfacing - Inter Integrated Circuits interfacing (I2C Standard)- LCD-LED and Array of LEDs-Interfacing with the Flash Memory- Prototype MCU based Measuring instruments – Robotics and Embedded control Bus: RS232C-RS485-GPIB8051

UNIT V - REAL TIME OPERATING SYSTEM FOR MICROCONTROLLERS

Real Time operating system –RTOS of Keil (RTX51) –Use of RTOS in Design –Software development tools for Microcontrollers. ARM 32 Bit MCUs: Introduction to 16/32 Bit processors –ARM architecture and organization –ARM / Thumb programming model –ARM / Thumb instruction set –Development tools.

Text Books:

1. Raj Kamal, "Microcontrollers Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.
2. Mohammed Ali Mazidi and Janice Gillispie Mazidi, "The 8051 Microcontroller and Embedded Systems", Pearson Education Asia, New Delhi, 2003.

References:

1. Deshmuk.A.V, "Microcontrollers (Theory & Applications)", TMH, 2005.
2. John B. Peatman, "Design with PIC Microcontrollers", Pearson Education, 2005.
3. Kenneth J Ayala, "The 8051 Microcontroller Architecture Programming and Application", 2 nd Edition, Penram International Publishers (India), New Delhi, 1996.
4. Rafi Quazzaman.M, "Microprocessors Theory and Applications: Intel and Motorola", Prentice Hall of India, Pvt. Ltd., New Delhi, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A70410	Digital Signal Processing Lab	-	1	3	2

COURSE OBJECTIVES	
1	Students can learn the basics of using DSP chips to perform real-time digital signal processing.
2	Ability to apply knowledge of mathematics, science and engineering: Construction of tools for visualizing the basic concepts of discrete signal representation such as Fourier transforms, discrete time representations.
3	Students will learn numerous programming tools for design and implementations of filtering algorithms.
4	Understand the concept of Multi-rate signal processing and sample rate conversion.
5	Develop and Implement DSP algorithms in software using CCS with DSP floating point Processor.

COURSE OUTCOMES	
CO1	Ability to design-test, to verify, to evaluate, and to benchmark a real-time DSP system.
CO2	Ability to calculate discrete time domain and frequency domain of signals using discrete Fourier Series and Fourier transform.
CO3	Ability to design, using Matlab-based filter design techniques, FIR and IIR digital filters and Determine the frequency response of filters.
CO4	Implementation of basic signal processing algorithms such as convolution, difference equation implementation and application of them in the construction of FIR and IIR filters.
CO5	Design DSP based real time processing systems to meet desired needs of th e society.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3		1					1			1	2
CO2	2	2	3		1					1			1	2
CO3	2	2	3		1					1			1	2
CO4	2	2	3		1					1			1	2
CO5	2	2	3		1					1			1	2

LIST OF EXPERIMENTS

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. To find DFT / IDFT of given DT Signal
4. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
5. Obtain Fourier series coefficients by formula and using FET and compare for half sine wave.
6. Implementation of FFT of given Sequence
7. Determination of Power Spectrum of a given Signal(s).
8. Implementation of LP FIR Filter for a given Sequence/Signal.

9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Narrow Band Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D Sampling Rate Converters
15. Impulse Response of First order and Second Order Systems.

Note: - Minimum of 12 experiments has to be conducted.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER

Subject Code	Title of the Subject	L	T	P	C
17A70411	Microwave & Optical Communications Lab	-	1	3	2

COURSE OBJECTIVES	
1	Understand the working principle of optical sources, detector, fibers and microwave components
2	Develop understanding of simple optical communication link.
3	Learn about the characteristics and measurements in optical fiber
4	Know about the behavior of microwave components.
5	Practice microwave measurement procedures
COURSE OUTCOMES	
CO1	Analyze the performance of simple optical link.
CO2	Test microwave and optical components.
CO3	Analyse the mode characteristics of fiber.
CO4	Analyse the radiation of pattern of antenna.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1	2	2	3		1					1			1	2
CO2	2	2	3		1					1			1	2
CO3	2	2	3		1					1			1	2
CO4	2	2	3		1					1			1	2

LIST OF EXPERIMENTS

Microwave Lab (PART – A) --- Any Seven (7) Experiments

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance Measurement.
7. Frequency and Wavelength measurements using slotted section.
8. Impedance Matching and Tuning
9. Scattering parameters of Magic Tee.
10. Radiation Pattern Measurement of horn Antennas (at least two antennas).

Optical Fiber Lab (PART – B) --- Any five (5) Experiments

1. DC Characteristics of LED and PIN Photo diode
2. Mode Characteristics of Fibers
3. Measurement of connector and bending losses
4. Fiber optic Analog and Digital Link- frequency response (analog) and eye diagram (digital)
5. Numerical Aperture determination for Fibers
6. Attenuation Measurement in Fibers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – II SEMESTER
Elective - II

Subject Code	Title of the Subject	L	T	P	C
17A80401	Embedded Systems	3	-	-	3

COURSE OBJECTIVES	
1	To provide an overview of design principles of Embedded System.
2	To provide clear understanding about the role of firmware , operating systems in correlation with hardware systems.
COURSE OUTCOMES	
CO1	Expected to understand the selection procedure of Processors in the Embedded domain.
CO2	Design Procedure for Embedded Firmware.
CO3	Expected to visualize the role of Real time Operating Systems in Embedded Systems.
CO4	Expected to evaluate the Correlation between task synchronization and latency issues

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		3		3					1			2	2
CO2	2	3		1	3					1			2	2
CO3	2	3	2	2	3					1			3	2
CO4	2	2	3		1					1			1	2

UNIT I
Introduction to Embedded Systems
Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT II
Typical Embedded System
Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT III
Embedded Firmware
Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT IV
RTOS Based Embedded System Design
Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT V
Task Communication
Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

Text Books:

1. Introduction to Embedded Systems - Shibu K.V, McGraw Hill
2. Embedded Systems - Raj Kamal, TMH.
3. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.

References:

1 Embedded Systems – Lyla, Pearson, 2013
2. Embedded System design : S. Heath (Elsevier)
3. An Embedded Software Primer - David E. Simon, Pearson Education.
4. Embedded microcontroller and processor design: G. Osborn (Pearson)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH –I SEMESTER
Elective - II

Subject Code	Title of the Subject	L	T	P	C
17A80402	Coding Theory and Techniques	3	-	-	3

COURSE OBJECTIVES	
1	To acquire the knowledge in measurement of information and errors.
2	To study the generation of various code methods
3	To study the various application of codes.
COURSE OUTCOMES	
CO1	Learning the measurement of information and errors.
CO2	Obtain knowledge in designing various codes like block codes, cyclic codes, convolution codes, turbo codes and space codes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														
CO5														

UNIT – I:
Coding for Reliable Digital Transmission and storage
Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.
Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT - II:
Cyclic Codes
Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT – III:
Convolutional Codes
Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT – IV:
Turbo Codes
LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated

convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

UNIT - V:
Space-Time Codes
Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti's schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial Multiplexing : General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QL Decomposition and Interface Cancellation, Performance of Multi – Layer Detection Schemes, Unified Description by Linear Dispersion Codes.

TEXT BOOKS:
1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc.
2. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill

REFERENCE BOOKS:
1. Error Correcting Coding Theory-Man Young Rhee-1989,McGraw – Hill Publishing,19
2. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Digital Communications- John G. Proakis, 5th ed., 2008, TMH.
4. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006, Wiley India.
6. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER
Elective - II

Subject Code	Title of the Subject	L	T	P	C
17A80403	Satellite Communications	3	-	-	3

COURSE OBJECTIVES	
1	Excel in basic knowledge of satellite communication principles
2	solid foundation in orbital mechanics and launches for the satellite communication
3	basic knowledge of link design of satellite with a design examples.
4	better understanding of multiple access systems and earth station technology
5	knowledge in satellite navigation and GPS & and satellite packet communications.
COURSE OUTCOMES	
CO1	Understand the historical background orbital mechanics, launch vehicles and functional principles of satellite communication systems.
CO2	Analyze and evaluate a satellite link and suggest enhancements to improve the link performance.
CO3	Able to study the design of Earth station and tracking of the satellites.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														
CO5														

UNIT I

Introduction: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

Orbital Mechanics and Launchers: Orbital Mechanics, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance.

UNIT II

Satellite Subsystems: Attitude and Orbit Control System, Telemetry, Tracking, Command And Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

UNIT III

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design Of Satellite Links For Specified C/N, System Design Examples.

Multiple Access: Frequency Division Multiple Access (FDMA), Intermodulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

UNIT IV

Earth Station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

UNIT V

Low Earth Orbit and Geo-Stationary Satellite Systems: Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational NGSO Constellation Designs.

Satellite Navigation & Global Positioning System : Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A Code Accu racy, Differential GPS.

Text Books:
1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

References:
1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 4th Edition, 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – I SEMESTER
Elective - II

Subject Code	Title of the Subject	L	T	P	C
17A80404	Digital Image Processing	3	-	-	3

COURSE OBJECTIVES	
1	To comprehend the relation between human visual system and machine perception and processing of digital images.
2	To provide a detailed approach towards image processing applications like enhancement, segmentation and compression.
COURSE OUTCOMES	
CO1	Exploration of the limitations of the computational methods on digital images.
CO2	Expected to implement the spatial and frequency domain image transforms on enhancement and restoration of images.
CO3	Elaborate understanding on image enhancement techniques.
CO4	Expected to define the need for compression and evaluate the basic compression algorithms.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		3	3	3									1
CO2	3	3	3		3			1						
CO3			3	3	3	1				2			1	2
CO4		3	3		3	1	2			1		1	1	3

UNIT I

Digital Image Fundamentals & Image Transforms: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels.

Image Transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT II

Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood creterion, Median Filter, Spatial Domain High-Pass Filtering.

Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain

UNIT III

Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT IV

Image Segmentation: Detection of Discontinuities, Edge Linking And Boundary Detection, thresholding, Region Oriented Segmentation.

Morphological Image Processing: Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

UNIT V

Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

Text Books:

1. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008
2. Fundamentals of Digital Image Processing – A.K.Jain , PHI, 1989

References:

1. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010.
2. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools - ScotteUmbaugh, 2nd Ed, CRC Press, 2011
3. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Edition, TMH, 2010.
4. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle- Cengage Learning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – II SEMESTER
Elective - V

Subject Code	Title of the Subject	L	T	P	C
17A80405	Scripting Languages	3			3

COURSE OBJECTIVES	
The goal of the course is to study	
1	The principles of scripting languages.
2	Motivation for and applications of scripting
3	Difference between scripting languages and non- scripting languages.
4	Types of scripting languages such as PERL, TCL/TK, python and BASH.
5	Creation of programs in the Linux environment and usage of scripting languages in IC design flow.
COURSE OUTCOMES	
Upon learning the course, the student will have the:	
CO1	Ability to create and run scripts using PERL/TCl/Python in IC design flow.
CO2	Ability to use Linux environment and write programs for automation of scripts in VLSI tool design flow.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1	1		2	3	2					2				3
CO2	2	2	2	3	1					2				3

UNIT I Linux Basics
Introduction to Linux , File System of the Linux, General usage of Linux kernel & basic commands, Linux users and group, Permissions for file, directory and users, searching a file & directory, zipping and unzipping concepts.

UNIT II Linux Networking
Introduction to Networking in Linux, Network basics & Tools, File Transfer Protocol in Linux, Network file system, Domain Naming Services, Dynamic hosting configuration Protocol & Network information Services.

UNIT III Perl Scripting.
Introduction to Perl Scripting, working with simple values, Lists and Hashes, Loops and Decisions, Regular Expressions, Files and Data in Perl Scripting, References & Subroutines, Running and Debugging Perl, Modules, Object – Oriented Perl.

UNIT IV Tcl / Tk Scripting
Tcl Fundamentals, String and Pattern Matching, Tcl Data Structures, Control Flow Commands, Procedures and Scope, Evel, Working with Unix, Reflection and Debugging, Script Libraries, Tk Fundamentals, Tk by examples, The Pack Geometry Manager, Binding Commands to X Events, Buttons and Menus, Simple Tk Widgets, Entry and List box Widgets Focus, Grabs and Dialogs.

UNIT V Python Scripting.
Introduction to Python, using the Python Interpreter, More Control Flow Tools, Data Structures, Modules, Input and Output, Errors and Exceptions, Classes, Brief Tour of the Standard Library.

Text Books:

1. Python Tutorial by Guido Van Rossum, Fred L. Drake Jr. editor , Release 2.6.4
2. Practical Programming in Tcl and Tk by Brent Welch, Updated for Tcl 7.4 and Tk 4.0.
3. Teach Yorself Perl in 21 days by David Till.
4. Red Hat Enterprise Linux 4 : System Administration Guide Copyright, 2005 Red Hat Inc.

References:

1. Learning Python – 2nd Ed., Mark Lutz and David Ascher, 2003, O'Reilly.
2. Perl in 24 Hours – 3rd Ed., Clinton Pierce, 2005, Sams Publishing.
3. Learning Perl – 4th Ed. Randal Schwartz, Tom Phoenix and Brain d foy. 2005.
4. Jython Essentials – Samuele Pedroni and Noel Pappin.2002. O'Reilly.
5. Programming Perl – Larry Wall, Tom Christiansen and John Orwant, 3rd Edition, O'Reilly, 2000. (ISBN 0596000278)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – II SEMESTER
Elective - IV

Subject Code	Title of the Subject	L	T	P	C
17A80406	RF Circuit Design	3	-	-	3

COURSE OBJECTIVES	
The course objectives are:	
1	To educate students fundamental RF circuit and system design skills.
2	To introduce students the basic transmission line theory, single and multiport networks, RF component modeling
3	To offer students experience on designing matching and biasing networks & RF transistor amplifier design.
COURSE OUTCOMES	
Upon completion of the course, the students will be able to:	
CO1	Explore fundamental RF circuit and system design skills.
CO2	Understand the basic transmission line theory, single and multiport networks, RF component modeling.
CO3	Design matching and biasing networks & RF transistor amplifiers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														
CO5														

UNIT I: Introduction:
Importance of RF Design-Dimensions and Units-Frequency Spectrum-RF Behaviour of Passive Components: High Frequency Resistors, High Frequency Capacitors, High Frequency Inductors.-Chip Components and Circuit Board Considerations: Chip Resistors, Chip Capaci tors, and Surface Mount Inductors.
Review of Transmission Lines:
Types of Transmission Lines-Equivalent Circuit representation-R, L, C, G parameters of Different Line configurations-Terminated Lossless Transmission Lines-Special Terminations: Short Circuit, Open Circuit and Quarter Wave Transmission Lines- Sourced and Loaded Transmission Lines: Power Considerations, Input Impedance Matching, Return Loss and Insertion Loss.

UNIT II: Single and Multi-Port Networks:
The Smith Chart: Reflection Coefficient, Normalized Impedance-Impedance Transformation: Standing wave Ratio, Special Transformation Conditions-Admittance Transformation-Parallel and Series RL & RC Connections-Basic Definitions of Single and Multi-Port Networks-Interconnecting Networks.
RF Filter Design:
Scattering Parameters: Definition, Meaning, Chain Scattering Matrix, Conversion Between S- and Z-parameters, Signal Flow Chart Modeling, Generalization-Basic Resonator and Filter Configurations: Low Pass, High Pass, Band Pass and Band Stop type Filters-Filter Implementation using Unit Element and Kuroda's Identities Transformations-Coupled Filters.

UNIT III: Active RF Component Modelling:
RF Diode Models: Nonlinear and Linear Models-Transistor Models: Large Signal and Small Signal BJT Models, Large Signal and Small Signal FET Models- Scattering Parameter, Device Characterization.

UNIT IV: Matching and Biasing Networks:
Impedance Matching Using Discrete Components: Two Component Matching Networks, Forbidden Regions, Frequency Response and Quality Factor, T and Pi Matching Networks-Amplifier Classes of Operation and Biasing Networks: Classes of Operation and Efficiency of Amplifiers, Biasing Networks for BJT, Biasing Networks for FET.

UNIT V: RF Transistor Amplifier Design:
Characteristics of Amplifiers- Amplifier Power Relations: RF Source, Transducer Power Gain, Additional Power Relations-Stability Considerations: Stability Circles, Unconditional Stability, And Stabilization Methods-Unilateral and Bilateral Design for Constant Gain- Noise Figure Circles- Constant VSWR Circles.
RF Oscillators and Mixers:
Basic Oscillator Model: Negative Resistance Oscillator, Feedback Oscillator Design, Design steps, Quartz Oscillators- Fixed Frequency High Frequency Oscillator -Basic Characteristics of Mixers: Concepts, Frequency Domain Considerations, Single Ended Mixer Design, Single and Double Balanced Mixers.

Text Books:

1. RF Circuit Design – Theory and Applications by Reinhold Ludwig, Pavel Bsetchko – Pearson Education India, 2000.
2. Radio Frequency and Microwave Communication Circuits – Analysis and Design by Devendra K.Misra – Wiley Student Edition – John Wiley & Sons, Inc.

References:

1. Radio Frequency and Microwave Electronics – Illustrated by Matthew M. Radmanesh – PEI.
2. RF Circuit Design – Christopher Bowick, Cheryl Aljuni and John Biyler, Elsevier Science, 2008.
3. Secrets of RF Circuit Design by Joseph J.Carr, TMH, 2000.
4. Design of RF and Microwave Amplifiersand Oscillators, Peter L.D. Abrif, Artech House, 2000.
5. The Design of CMOS Radio Frequency Integrated Circuits by Thomas H.Lee , 2/e – Cambridge University Press, 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – II SEMESTER
Elective – III

Subject Code	Title of the Subject	L	T	P	C
17A80407	Artificial Intelligence	3	-	-	3

COURSE OBJECTIVES	
1	To introduce the fundamental concepts of artificial intelligence
2	To equip students with the knowledge and skills in logic programming using Prolog
3	To explore the different paradigms in knowledge representation and reasoning
4	To explain the contemporary techniques in machine learning
5	To evaluate the effectiveness of hybridization of different artificial intelligence techniques.
COURSE OUTCOMES	
By the end of the course students shall be able to	
CO1	understand the history, development and various applications of artificial intelligence
CO2	familiarize with propositional and predicate logic and their roles in logic programming
C03	learn the knowledge representation and reasoning techniques in rule-based systems, case-based systems, and model-based systems
CO4	understand how uncertainty is being tackled in the knowledge representation and reasoning process, in particular, techniques based on probability theory and possibility theory (fuzzy logic)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														
CO5														

UNIT I INTRODUCTION
Intelligent Agents, Agents and environments, Good behavior, The nature of environments, structure of agents, Problem Solving, problem solving agents, example problems, searching for solutions, uniformed search strategies, avoiding repeated states, searching with partial information.

UNIT II SEARCHING
Search and exploration, Informed search strategies, heuristic function, local search algorithms and optimistic problems, local search in continuous spaces, online search agents and unknown environments, Constraint satisfaction problems (CSP), Backtracking search and Local search for CSP, Structure of problems, Adversarial Search, Games: Optimal decisions in games, Alpha - Beta Pruning, imperfect real-time decision, games that include an element of chance.

UNIT III KNOWLEDGE REPRESENTATION
First order logic, representation revisited, Syntax and semantics for first order logic, Using first order logic, Knowledge engineering in first order logic, Inference in First order logic,

prepositional versus first order logic, unification and lifting, forward chaining, backward chaining, Resolution, Knowledge representation, Ontological Engineering, Categories and objects, Actions - Simulation and events, Mental events and mental objects.

UNIT IV LEARNING

Learning from observations: forms of learning, Inductive learning, Learning decision \trees, Ensemble learning, Knowledge in learning, Logical formulation of learning, Explanation based learning, Learning using relevant information, Inductive logic programming, Statistical learning methods, Learning with complete data, Learning with hidden variable, EM algorithm, Instance based learning, Neural networks - Reinforcement learning, Passive reinforcement learning, Active reinforcement learning, Generalization in reinforcement learning.

UNIT V PERCEPTION AND EXPERT SYSTEM

Visual perception -Waltz's algorithm, Introduction to Expert System, Architecture and functionality, Example Expert system.

Text Book:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence, A Modern Approach", 2nd Edition, Pearson Education / Prentice Hall of India, 2004.

References:

1. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill,
3. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education / PHI, 2002.
4. Eugene charniak, "Introduction to Artificial Intelligence", Pearson Education.
5. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :: ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – II SEMESTER
Elective - III

Subject Code	Title of the Subject	L	T	P	C
17A80408	Data Compression & Encryption	3	-	-	3

COURSE OBJECTIVES	
1	To understand the different text compression technique
2	To study the various audio compression scheme.
3	To verify different video compression & image compression methods.
4	To have the knowledge of various encryption techniques
5	To acquire the information about different authentication technique.
COURSE OUTCOMES	
By the end of the course, the students shall be able to	
CO1	implement various text, audio, video, compression technique.
CO2	provide various authentication using digital commu
CO3	gain the knowledge of encryption techniques application to digital communication

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2														
CO3														
CO4														
CO5														

UNIT I
TEXT COMPRESSION: Shannon Fano Coding, Huffmann coding, Arithmetic coding and dictionary techniques LZW, family algorithms, Entropy measures of performance and Quality measures.

UNIT II
AUDIO COMPRESSION: Digital Audio, Lossy sound compression, μ-law and A-law companding, DPCM and ADPCM audio compression, MPEG audio standard, frequency domain coding, format of compressed data.

UNIT III
IMAGE AND VIDEO COMPRESSION: Lossless techniques of image compression, gray codes, Two dimensional image transforms, JPEG, JPEG 2000, Predictive Techniques PCM and DPCM. Video compression and MPEG industry standard.

UNIT IV
CONVENTIONAL ENCRYPTION: Introduction, Types of attacks, Steganography, Data Encryption Standards, Block Cipher Principle, S-box design, triple DES with two three keys.

UNIT V
PUBLIC KEY ENCRYPTION AND NUMBER THEORY: Euler's theorems, Chinese remainder theorem, Principles of public key cryptography, RSA algorithm, Diffie-Hellman Key Exchange.

Elliptic curve cryptology, message authentification and Hash functions, Hash and Mac al gorithms, Digital signatures.

Text Books:

1. Data Compression – David Salomon, Springer Publication, 4th Edition.
2. Introduction to Data Compression – Khalid Sayood, Morgan Kaufmann Series, 3rd Edition
3. Cryptography and Network Security – William Stallings, Pearson Education Asia Publication,
4. Cryptography and Network Security – Behrouz Forouzan, McGraw-Hill, 1st Edition.

References:

1. The Data Compression Book – Mark Nelson, BPB publication, 2nd Edition
2. Applied Cryptography – Bruce Schnerer, John Willey & Sons Inc. Publication, 2nd Edition
3. Cryptography & Network Security – Atul Kahate, Tata McGraw Hill, 2nd Edition
4. Cryptography and Network Security – Behrouz A. Forouzan , Special Indian Addition, SIE
5. Network Security & Cryptography – Bernard Menezes, Cenage Learning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – II SEMESTER
Elective - V

Subject Code	Title of the Subject	L	T	P	C
17A80409	Cellular & Mobile Communications	3	-	-	3

COURSE OBJECTIVES	
1	To provide the student with an understanding of the Cellular concept, Frequency reuse, Hand-off strategies.
2	To enable the student to analyze and understand wireless and mobile cellular communication systems over a stochastic fading channel.
3	To provide the student with an understanding of Co-channel and Non-Co-channel interferences.
4	To give the student an understanding of cell coverage for signal and traffic, diversity techniques and mobile antennas.
5	To give the student an understanding of frequency management, Channel assignment and types of handoff.

COURSE OUTCOMES	
By the end of the course,	
CO1	The student will be able to analyze and design wireless and mobile cellular systems.
CO2	The student will be able to understand impairments due to multipath fading channel.
CO3	The student will be able understand the fundamental techniques to overcome the different fading effects.
CO4	The student will be able to understand Co-channel and Non Co-channel interferences
CO5	The student will be able to familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas
C06	The student will have an understanding of frequency management, Channel assignment and types of handoff.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2
CO1	3	2			2				1				2	3
CO2	3	2			2				1				2	3
CO3	3	2	1		2				1				2	2
CO4	3	2	1		2				1				2	2
CO5	2	2	1		1				1				2	2
CO6	3	2	1		2				1				2	2

UNIT I

Introduction to Cellular Mobile Radio Systems:

Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Uniqueness of Mobile Radio Environment- Fading -Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

Fundamentals of Cellular Radio System Design:

Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni Directional Antenna System, System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept.

UNIT II

Co-Channel Interference:

Measurement Of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and Their Effects, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.

Non-Co-Channel Interference:

Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

UNIT III

Cell Coverage for Signal and Traffic:

Signal Reflections in Flat And Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope, General Formula for Mobile Propagation Over Water and Flat Open Area, Near and Long Distance Propagation, Path Loss From a Point to Point Prediction Model in Different Conditions, Merits of Lee Model.

Cell Site and Mobile Antennas:

Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site An tennas, Mobile Antennas.

UNIT IV

Frequency Management and Channel Assignment:

Numbering And Grouping, Setup Access And Paging Channels, Channel Assignments to Cell Sites and Mobile Units, Channel Sharing and Borrowing, Sectorization, Overlaid Cells, Non F ixed Channel Assignment.

UNIT V

Handoffs and Dropped Calls:

Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

Text Books:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Mc Graw Hill, 2nd Edn., 1989.
2. Wireless Communications - Theodore. S. Rapport, Pearson Education, 2nd Edn., 2002.
3. Mobile Cellular Communication - Gottapu sashibhushana Rao, Pearson, 2012.

References:

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International, 2nd Edn., 2001.
2. Modern Wireless Communications-Simon Haykin, Michael Moher, Pearson Eduction, 2005.
3. Wireless Communications Theory and Techniques, Asrar U. H .Sheikh, Springer, 2004.
4. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
5. Wireless Communications – Andrea Goldsmith, Cambridge University Press, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous) :; ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING
IV B.TECH – II SEMESTER

Project Work

COURSE OUTCOMES	
By the end of the course,	
CO1	Demonstrate a sound technical knowledge of their selected project topic
CO2	Undertake problem identification and formulation
CO3	Design engineering solutions to complex problems utilizing the systems available
CO4	Conduct experimental/simulation work of the project
CO5	Communicate with fellow members and the community at large in written or oral form
C06	Demonstrate the skills & attitudes in a professional way
CO7	Manage the financial budget incurred in an optimal manner
CO8	Use modern tools (software/hardware) while doing the project

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	***PSO1**	***PSO2**
CO1	3	1	2	2	1	1				2		1		
CO2	2	3	2	2	1	1				2		1		
CO3	2	2	3	2	1	1		1		2		1		
CO4	2	2	2	3		1	1		2	2		1		
CO5	1	1			1	1				3		1		
CO6	1	1					3					1		
CO7					1					2	3	1		
CO8	2	1	1	1	3	1	1	2	1	2	1	1		

*Based on the project the appropriate PSOs are given weightage

Ananthapuramu–515 002 (A.P) India

B.Tech
Course Structure and Syllabi under R19 Regulations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

Semester - 0 (Theory - 8, Lab -7) Common for All Branches of Engineering				
S.No	**Course No**	**Course Name**	**Category**	**L-T-P-C**
1		Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2		Career Counseling	MC	2-0-2-0
3		Orientation to all branches -- career options, tools, etc.	MC	3-0-0-0
4		Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-3-0
5		Proficiency Modules & Productivity Tools	ES	2-1-2-0
6		Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7		Remedial Training in Foundation Courses	MC	2-1-2-0
8		Human Values & Professional Ethics	MC	3-0-0-0
9		Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10		Concepts of Programming	ES	2-0-2-0

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

Semester – 1 (Theory - 4, Lab –4)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A15101	Linear Algebra And Calculus	BS	3-1-0	4
2.	19A15201	Applied Physics	BS	2-1-0	3
3.	19A10501	Problem Solving & Programming	ES	3-1-0	4
4.	19A15501	Communicative English 1	HS	2-0-0	2
5.	19A10401	Electronics & Communication Engineering Workshp	LC	0-0-2	1
6.	19A15202	Applied Physics Lab	BS	0-0-3	1.5
7.	19A10506	Problem Solving & Programming Lab	ES	0-0-3	1.5
8.	19A15502	Communicative English Lab-1	HS	0-0-2	1
				Total	**18**

Semester – 2 (Theory - 5, Lab –5)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A10402	Network Theroy	DC	3-0-0	3
2.	19A10403	Electronic Devices	DC	2-0-0	2
3.	19A15102	Differential Equation and Vector Calculus	BS	3-0-0	3
4.	19A15303	Engineering Chemistry	BS	2-1-0	3
5.	19A10503	Data Structures	ES	2-1-0	3
6.	19A10303	Engineering Workshop	LC	0-0-2	1
7.	19A10304	Engineering Graphics	ES	1-0-3	2.5
8.	19A10404	Passive Circuits & Electronic Devices Lab	DC	0-0-2	1
9.	19A15304	Engineering Chemistry Lab	BS	0-0-3	1.5
10.	19A10507	Data Structures Lab	ES	0-0-3	1.5
				Total	**21.5**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

Semester – 3 (Theory - 6, Lab –3)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A20604	Complex Variables & Transforms	BSC	3-0-0	3
2.	19A24201	Signals & Systems	PCC	3-0-0	3
3.	19A20401	Electronic Circuits -I	PCC	3-0-0	3
4.	19A20402	Probability Theory and Stochastic Processes	PCC	3-0-0	3
5.	19A24204	Digital Electronics and Logic Design	PCC	3-0-0	3
6.	19A22401	Electrical Technology	ESC	3-0-0	3
7.	19A20901	Universal Human Values	HE	2-0-0	2
8.	19A20403	Electronic Circuits -I Lab	PCC	0-0-3	1.5
9.	19A20404	Simulation Lab	PCC	0-0-2	1
10.	19A22402	Electrical Technology Lab	PCC	0-0-2	1
11.	19A28801	Biology For Engineers	MC	3-0-0	0
				Total	**23.5**

Semester – 4 (Theory - 6, Lab –3)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A20405	Electromagnetic Waves and Transmission lines	PCC	3-0-0	3
2.	19A20406	Electronic Circuits – II	PCC	3-0-0	3
3.	19A20407	Analog Communications	PCC	3-0-0	3
4.	19A20209	Control Systems	PCC	3-0-0	3
5.	19A25501	Fundamentals of Python Programming	ESC	2-0-0	2
6.	19A20408	Computer Architecture and Organization	PCC	3-0-0	3
8.	19A20409	Electronic Circuits – II Lab	PCC	0-0-3	1.5
9.	19A20410	Analog Communications Lab	PCC	0-0-3	1.5
10.	19A25503	Fundamentals of Python Programming Lab	ESC	0-0-2	1
11.	19A10804	Environmental Science	MC	3-0-0	0
				Total	**21**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

Semester – 5 (Theory - 6, Lab –3)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A50401	Integrated Circuits and Applications	PCC	2-0-0	2
2.	19A50402	Antennas and Wave Propagation	PCC	3-0-0	3
3.	19A50403	Digital Communications	PCC	3-0-0	3
4.	19A55501	English Language Skills	HSMC	3-0-0	3
5.	Professional Elective-I		PEC-1	3-0-0	3
	19A50404	a)Electronic Measurements & Instrumentation			
	19A50405	b) Machine Lerning			
	19A50406	c) sensors and Actuators			
6.	Open Elective-I/ Skill Oriented Course*		OEC-1	3-0-0/	3
	19A50407	Anlog Electronics			
	19A50408	Digitial Electronics			
	19A50513T	Introduction to Java Programming /Lab 19A50513L			
7.	19A50409	Integrated Circuits and Applications Lab	PCC	0-0-2	1
8.	19A55502	English Language Skills Lab	HSMC	0-0-3	1.5
9.	19A50410	Digital Communications Lab	PCC	0-0-3	1.5
10.	19A50411	Socially Relevant Project	PR	0-0-1	0.5
11.	19A55404	Constitution of India	MC	3-0-0	0
				Total	**21.5**

Semester – 6 (Theory - 6, Lab –2)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A60401	Microprocessors and Micontrollers	PCC	3-0-0	3
2.	19A60402	Digital Signal Processing	PCC	3-0-0	3
3.	19A60403	Digital Design through VHDL	PCC	3-0-0	3
4.	Professional Elective-II		PEC-2	3-0-0	3
	19A60404	a) Speech Processing			
	19A60405	b) Advanced Machine Learning			
	19A60406	c) Data communications and Networks			
5.	Open Elective-II		OEC-2	3-0-0	3
	19A60407	a)Principals of Commmunications			
	19A60408	b) Principalsof Digitial Signal Processing			
6.	Humanities Elective-I		HSMC	3-0-0	3
	19A65401	Managerial Economics and Financial Analysis			
	19A65402	Business Ethics and Corporate Governance			
	19A65403	Entrepreneurship & Incubation			
7.	19A60409	Microprocessors & Microcontrollers Lab	PCC	0-0-2	1
8.	19A60410	Digital Design through VHDL Lab	PCC	0-0-2	1
9.	19A60411	Digital Signal Processing Lab	PCC	0-0-2	1
10.	19A60412	Socially Relevant Project	PR	0-0-1	0.5
11.	19A65404	Research Methodology	MC	3-0-0	0
				Total	**21.5**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

Semester –7 (Theory - 5, Labs -2 ,Seminar &Project–I)

S.No	Course No	Course Name	Category	L-T-P	Credits
1.	19A70401	Microwave Engineering and Optical Communications	PCC	3-0-0	3
2.	19A70402	VLSI Design	PCC	3-0-0	3
3.	Professional Elective-III		PEC-3	3-0-0	3
	19A70403	a)Digital Image processing			
	19A0404	b)Data Science			
	19A760405	c)Embedded Systems			
4.	Open Elective-III		OEC-3	3-0-0	3
	19A70406	Industrial Electronics			
	19A70407	Microcontroller & Applications			
5.	Humanities Elective-II		HSMC	3-0-0	3
	19A75401	1. Management Science			
	19A75402	2. Organizational Behavior			
	19A75403	3. Business Environment			
6.	19A70408	Microwave and Optical Communications Lab	PCC	0-0-3	1.5
7.	19A70409	VLSI Design Lab	PCC	0-0-3	1.5
8.	19A70410	Technical Seminar	----	0-0-1	0.5
9.	19A70411	Project Phase – I	PR	0-0-3	1.5
10.	19A70412	Industrial Training/Skill Development/Research Project/MOOC Subjects*	PR	------	2
				Total	**22**

Semester –8 (Theory - 2, Project–1)

S.No	Course No	Course Name	Category	L-T-P	Credits
1.	Professional Elective-IV		PEC-4	3-0-0	3
	19A80401	a)Advanced 3Gand 4GWireless Mobile Communication			
	19A80402	b)Introduction to Internet of Things			
	19A80403	c)System Verilog			
2.		Open Elective-IV	OEC-4	3-0-0	3
	19A80404	a)Electronic Instrumentation			
	19A80405	b)Fundamentals of Integrated Circits Applications			
3.	19A80406	Project Phase - II	PR	0-0-14	7
				Total	**13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

List of Professional Electives

Professional Elective-I

a) Electronic Measurements & Instrumentation
b) Machine Learning
c) Sensors and Actuators

Professional Elective-II

a) Speech Processing
b) Advanced Machine Learning
c) Data Communications and Networks

Professional Elective-III

a) Digital Image Processing
b) Data Science
c) Embedded Systems

Professional Elective-IV

a) Advanced 3G and 4G Wireless Mobile Communications
b) Introduction to Internet of Things
c) System Verilog

List of Open Electives

Open Elective-I

a) Skill Oriented Course*
b) Analog Electronics
c) Digital Electronics

Open Elective-II

a) Principles of Communications
b) Principles of Digital Signal Processing

Open Elective-III

a) Industrial Electronics
b) Microcontrollers & Applications

Open Elective-IV

a) Electronic Instrumentation
b) Fundamentals of Integrated Circuits Applications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – I SEMESTER

		L	T	P	C
19A15101	**Linear Algebra and Calculus** (Common to all branches o Engineering)	**3**	**1**	**0**	**4**

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linearalgebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and theirapplications.

Bridge Course: Limits, continuity, Types of matrices

Unit1:Matrices

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

Learning Outcomes:

At the end of this unit, the student will be able to

- solving systems of linear equations, using technology to facilitate row reduction determine the rank, eigenvalues and eigenvectors, diagonal form and different factorizations of a matrix;(L3)
- identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics;(L3)

Unit 2: MeanValueTheorems

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);

Learning Outcomes:

At the end of this unit, the student will be able to

- Translate the given function as series of Taylor's and Maclaurin's with remainders(L3)
- Analyzethebehaviourof functions by using mean value theorems(L3)

Unit 3:Multivariablecalculus

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies.(L3)
- Acquire the Knowledge maxima and minima of functions of several variable(L1)
- Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (L3)

Unit4:MultipleIntegrals

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves. Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates.

Learning Outcomes:

- At the end of this unit, the student will be ableto
- Evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates(L5)
- Apply double integration techniques in evaluating areas bounded by region(L4)
- Evaluate multiple integrals in Cartesian, cylindrical and spherical geometries(L5)

Unit5:SpecialFunctions

Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of definite integrals using beta and gamma functions.

Learning Outcomes:

At the end of this unit, the student will be able to

- understand beta and gamma functions and its relations(L2)
- Conclude the use of special function in evaluating definite integrals(L4)

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons,2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers,2017.

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd.,2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers,2013.

3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers,201.
4. Micheael Greenberg, Advanced Engineering Mathematics, 9^{th} edition, Pearsonedn
5. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRCPress
6. Peter O'neil, Advanced Engineering Mathematics, CengageLearning.
7. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, PearsonEducation
8. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education
9. H. k Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand.
10. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

Course Outcomes:

At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- Utilize mean value theorems to real life problems(L3)
- familiarize with functions of several variables which is useful in optimization(L3)
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems(L5)
- Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of specialfunctions

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – I SEMESTER

		L	T	P	C
19A15201	**Applied Physics (Common to ECE, CSE, EEE)**	3	0	0	3

Course Objectives:

- To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineeringapplications.
- To explain the significant concepts of dielectric and magnetic materials this leads to potential applications in the emerging microdevices.
- To impart knowledge in basic concepts of electromagnetic waves and its propagation in optical fibers along with its Engineeringapplications.
- To identify the importance of semiconductors in the functioning of electronicdevices.
- To teach the concepts related to superconductivity which lead to their fascinating applications.
- To familiarize the applications of nanomaterials relevant to engineeringbranches.

Unit-I:WaveOptics

Interference-Principle of Superposition-Interference of light-Conditions for sustained Interference -Interference in thin films (reflected light)-Newton's Rings-Determination of Wavelength- Engineering applications ofInterference

Diffraction-Fraunhofer Diffraction-Single and Double slits - Diffraction Grating – Grating Spectrum -Determination of Wavelength - Engineering applications of diffraction

Polarization-Polarization by double refraction-Nicol's Prism--Half wave and Quarter wave plate- Engineering applications of Polarization.

Unit Outcomes:

The students will be able to

- **explain** the need of coherent sources and the conditions for sustained interference(L2)
- **identify** engineering applications of interference including homodyne and heterodyne detection(L3)
- **analyze**the differences between interference and diffraction with applications(L4)
- **illustrate** the concept of polarization of light and its applications(L2)
- **classify** ordinary polarized light and extraordinary polarized light(L2)

Unit-II : Dielectric andMagneticMaterials

Introduction--Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations: Electronic and Ionic, (Quantitative), Orientation Polarizations (Qualitative)- Frequency dependence of polarization- Lorentz (internal) field-Claussius - Mosotti equation-Applications of Dielectrics:Ferroelectricity.

Introduction-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials-Weiss theory of ferromagnetism (qualitative)-Hysteresis-soft and hard magnetic materials-Magnetic device applications (Magnetic bubble memory).

Unit Outcomes:

The students will be able to

- **explain** the concept of dielectric constant and polarization in dielectric materials(L2)
- **summarize** various types of polarization of dielectrics(L2)
- **interpret** Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- **classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **explain** the applications of dielectric and magnetic materials(L2)
- **Apply** the concept of magnetism to magnetic devices(L3)

Unit – III: Electromagnetic Waves andFiberOptics

Divergence and Curl of Electric and Magnetic Fields- Gauss' theorem for divergence and Stokes' theorem for curl- Maxwell's Equations (Quantitative)- Electromagnetic wave propagation (Non-conducting medium) - Poynting'sTheorem.

Introduction to Optical Fibers-Total Internal Reflection-Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile– Propagation of electromagnetic wave through optical fiber – modes -importance of V-number- Attenuation, Block Diagram of Fiber optic Communication -Medical Applications-Fiber optic Sensors.

Unit Outcomes:

The students will be able to

- **apply** the Gauss' theorem for divergence and Stokes' theorem for curl(L3)
- **evaluate** the Maxwell's equations, Maxwell's displacement current and correction in Ampere's law(L5)
- **asses** the electromagnetic wave propagation and its power in non-conducting medium(L5)
- **explain** the working principle of optical fibers(L2)
- **classify** optical fibers based on refractive index profile and mode of propagation(L2)
- **identify** the applications of optical fibers in medical, communication and other fields(L2)

- **Apply** the fiber optic concepts in various fields(L3).

Unit–IV:Semiconductors

Origin of energy bands - Classification of solids based on energy bands – Intrinsic semiconductors - density of charge carriers-Fermi energy – Electrical conductivity - extrinsic semiconductors - P-type & N-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature- Direct and Indirect band gap semiconductors-Hall effect- Hallcoefficient- ApplicationsofHalleffect-DriftandDiffusioncurrents-Continuityequation - Applications ofSemiconductors.

Unit Outcomes:

The students will be able to

- **classify** the energy bands of semiconductors(L2)
- **outline** the properties of n-type and p-type semiconductors and charge carriers(L2)
- **interpret** the direct and indirect band gap semiconductors(L2)
- **identify** the type of semiconductor using Hall effect(L2)
- **identify** applications of semiconductors in electronic devices(L2)

Unit – V: SuperconductorsandNanomaterials

Superconductors-Properties- Meissner's effect-BCS Theory-Josephson effect (AC &DC)-Types of Super conductors-Applications ofsuperconductors.Nano materials – Significance of nanoscale – Properties of nanomaterials: Physical, Mechanical, Magnetic, Optical – Synthesis of nanomaterials: Top-down-Ball Milling, Bottom-up -Chemical vapour deposition – characterization of nanomaterials: X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM) - Applications of Nano materials.

Unit Outcomes:

The students will be able to

- **explain** how electrical resistivity of solids changes with temperature(L2)
- **classify** superconductors based on Meissner's effect(L2)
- **explain** Meissner's effect, BCS theory & Josephson effect in superconductors(L2)
- **identify** the nano size dependent properties of nanomaterials(L2)
- **illustrate** the methods for the synthesis and characterization of nanomaterials(L2)
- **Apply** the basic properties of nanomaterials in various Engineering branches(L3).

TextBooks:

1. M. N. Avadhanulu, P.G. Kshirsagar&TVS ArunMurthy" AText book of Engineering Physics"- S. Chand Publications, 11th Edition2019.

2. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning,2012.

Reference Books:

1. Shatendra Sharma, Jyotsna Sharma, “ Engineering Physics”, PearsonEducation,2018
2. David J.Griffiths, “Introduction to Electrodynamics”- 4/e, PearsonEducation

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – I SEMESTER

		L	T	P	C
19A10501	Problem Solving & Programming	2	1	0	3

Course Objectives:

1. Introduce the internal parts of a computer, and peripherals.
2. Introduce the Concept of Algorithm anduse it to solve computational problems
3. Identify the computational and non-computational problems
4. Teach the syntax and semantics of a C Programming language
5. Demonstrate the use of Control structures of C Programming language
6. Illustrate the methodology for solving Computational problems

Unit 1:

Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited, Introduction to Operating systems, Operational overview of a CPU.

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Fourth generation languages, Fifth generation languages, Classification of Programming languages, Structured programming concept, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, the analysis of algorithms.

Unit Outcomes:

Student should be able to

1. Identify the different peripherals, ports and connecting cables in a PC (L2)
2. Illustrate the working of a Computer (L3)
3. Select the components of a Computer in the market and assemble a computer (L4)
4. Solve complex problems using language independent notations (L3)

Unit 2:

Types, Operators, and Expressions: Variable names, data types and sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

Input and output: standard input and output, formatted output-Printf, formatted input-Scanf.

Control Flow: Statements and blocks, if-else, else-if, switch, Loops-while and for, Loops-Do-while, break and continue, Goto and labels.

Learning Outcomes: Student should be able to

1. Solve Computational problems (L3)
2. Apply Algorithmic approach to solving problems (L3)
3. Analyze the algorithms (L4)

Unit 3:
Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.
Functions and Program Structure: Basics of functions, functions returning non-integers, external variables, scope variables, header variables, register variables, block structure, initialization, recursion, the C processor.
Learning Outcomes: Student should be able to

1. Recognize the programming elements of C Programming language (L1)
2. Select the control structure for solving the problem (L4)
3. Apply modular approach for solving the problem (L3)

Unit 4:
Factoring methods: Finding the square root of a number, the smallest divisor of a number, the greatest common divisor of two integers, generating prime numbers.
Pointers and arrays: Pointers and addresses, pointers and function arguments, pointers and arrays, address arithmetic, character pointers and functions, pointer array; pointers to pointers, Multi-dimensional arrays, initialization of arrays, pointer vs. multi-dimensional arrays, command line arguments, pointers to functions, complicated declarations.
Array Techniques: Array order reversal, finding the maximum number in a set, removal of duplicates from an order array, finding the k^{th} smallest element
Learning Outcomes: Student should be able to

1. Solve mathematical problems using C Programming language (L3)
2. Structure the individual data elements to simplify the solutions (L6)
3. Facilitate efficient memory utilization (L6)

Unit 5:
Sorting and Searching: Sorting by selection, sorting by exchange, sorting by insertion, sorting by partitioning, binary search.
Structures: Basics of structures, structures and functions, arrays of structures, pointers to structures, self-referential structures, table lookup, typedef, unions, bit-fields.
Some other Features: Variable-length argument lists, formatted input-Scanf, file access, Error handling-stderr and exit, Line Input and Output, Miscellaneous Functions.
Learning Outcomes: Student should be able to

1. Select sorting algorithm based on the type of the data (L4)
2. Organize heterogeneous data (L6)
3. Design a sorting algorithm (L6)

Text Books:

1. Pradip Dey, and Manas Ghosh, “Programming in C”, 2018, Oxford University Press.
2. R.G. Dromey, “How to Solve it by Computer”. 2014, Pearson.

3. Brian W. Kernighan, and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, Pearson.

Reference Books:

1. P.Chenna Reddy, “ Computer Fundamentals and C Programming” 2018, BS Publications
2. RS Bichkar“ Programming with C”, 2012, Universities Press.
3. Pelin Aksoy, and Laura Denardis, “Information Technology in Theory”, 2017, Cengage Learning.

Course Outcomes:

1. Construct his own computer using parts (L6).
2. Recognize the importance of programming language independent constructs (L2)
3. Solve computational problems (L3)
4. Select the features of C language appropriate for solving a problem (L4)
5. Design computer programs for real world problems (L6)
6. Organize the data which is more appropriated for solving a problem (L6)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – I SEMESTER

		L	T	P	C
19A15501	Communicative English	2	0	0	2

Introduction
The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- ➢ Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- ➢ Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- ➢ Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- ➢ Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- ➢ Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Unit 1
Lesson: On the Conduct of Life: William Hazlitt

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. Speaking:Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information. Reading for Writing :Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Learning Outcomes
At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce one self/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

Unit 2

Lesson: The Brook: Alfred Tennyson

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.Speaking:Discussion in pairs/small groups on specific topics followed by short structured talks. Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters. Grammar and Vocabulary: Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.

Learning Outcomes

At the end of the module, the learners will be able to

- comprehend short talks on general topics
- participate in informal discussions and speak clearly on a specific topic using suitable discourse markers
- understand the use of cohesive devices for better reading comprehension
- write well structured paragraphs on specific topics
- identify basic errors of grammar/ usage and make necessary corrections in short texts

Unit 3

Lesson: The Death Trap: Saki Listening: Listening for global comprehension and summarizing what is listened to. Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Learning Outcomes

At the end of the module, the learners will be able to

- comprehend short talks and summarize the content with clarity and precision
- participate in informal discussions and report what is discussed
- infer meanings of unfamiliar words using contextual clues
- write summaries based on global comprehension of reading/listening texts
- use correct tense forms, appropriate structures and a range of reporting verbs in speech and writing

Unit4

Lesson: Innovation: Muhammad Yunus

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. Speaking: Role plays for practice of conversational English inacademic contexts (formal and informal) - asking for and giving information/directions. Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. Writing:Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Learning Outcomes

At the end of the module, the learners will be able to

- infer and predict about content of spoken discourse
- understand verbal and non-verbal features of communication and hold formal/informal conversations
- interpret graphic elements used in academic texts
- produce a coherent paragraph interpreting a figure/graph/chart/table
- use language appropriate for description and interpretation of graphical elements

Unit 5

Lesson: Politics and the English Language: George Orwell

Listening: Identifying key terms, understanding concepts and answering a series of relevantquestions that test comprehension.**Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides.**Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences. **Grammar and Vocabulary:**Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Learning Outcomes

At the end of the module, the learners will be able to

- take notes while listening to a talk/lecture and make use of them to answer questions
- make formal oral presentations using effective strategies
- comprehend, discuss and respond to academic texts orally and in writing
- produce a well-organized essay with adequate support and detail
- edit short texts by correcting common errors

Prescribed Text:

Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.

- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
- Oxford Learners Dictionary, 12th Edition, 2011

Course Outcomes

At the end of the course, the learners will be able to

- Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
- Apply grammatical structures to formulate sentences and correct word forms
- Analyze discourse markers to speak clearly on a specific topic in informal discussions
- Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
- Create a coherent paragraph interpreting a figure/graph/chart/table

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – I SEMESTER

	Title of the Lab	L	T	P	C
19A10401	**Electronics & Communication Engineering Workshop**	0	0	2	1

List of Exercises / Experiments:

1. Familiarization of commonly used Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that electronics hardware tools and instruments are learned to be used by the students

2. Familiarization of Electronic Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that electronic measuring instruments are learned to be used by the students

3. Electronic Components: Familiarization/Identification of electronic components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, color coding, package, symbol, cost etc.

4. Testing of electronic components like Resistor, Capacitor, Diode, Transistor, ICs etc.
   - Compare values of components like resistors, inductors, capacitors etc with the measured values by using electronic instruments

5. Study of Cathode Ray Oscilloscope (CRO)
   - Find the Amplitude and Frequency of a signal
   - Measure the Unknown Frequency & Phase difference of signals using Lissajous figures

6. Interpret data sheets of discrete components and IC's.
   - Write important specifications/ratings of components & ICs and submit it in the form of a report

7. Introduction to EDA Tools: MULTISIM/PSPICE/TINA schematic capture tool, Learning of basic functions of creating a new project, getting and placing parts, connecting placed parts, simulating the schematic, plotting and analyzing the results.
Provide some exercises so that students are familiarized in using EDA tools

8. Assembling and Testing of simple electronic circuits on breadboards; identifying the components and its location on the PCB, soldering of the components, testing the assembled circuit for correct functionality.

9. Familiarization with Computer Hardware & Operating System:

- Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.
- Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps).

Students should record the process of assembling and troubleshooting a computer.

- Install Operating system on the computer. Students should record the entire installation process.

10. Familiarization with Office Tools

- Word Processor: Able to create documents using the word processor tool. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied.
- Spreadsheet: Able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells.
- Presentations: creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyper-linking, running the slide show, setting the timing for slide show.

11. Familiarization of PA system with different microphones, loud speakers, mixer etc. Represent the same in the form of diagrams, write specifications and submit it in the form of a report.

12. Understand working of various Communication Systems like Television, Satellite Transmitter & Receiver, Radio Receiver, Mobile Phone. Prepare demo boards/charts of various communication systems.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – I SEMESTER

		L	T	P	C
19A15202	**Applied Physics Lab**	0	0	3	1.5

COURSE OBJECTIVES	
1	To make the students gain practical knowledge to co-relate with the theoretical studies. To develop practical applications of engineering materials and use of principle in the right way to implement the modern technology.

COURSE OUTCOMES	
CO1	**Operate** optical instruments like microscope and spectrometer (L2)
CO2	**Estimate** the desired physical parameters by performing the concerned experiments (L2)
CO3	**Plot** the concerned physical parameter to know their related variations (L3)
CO4	**Identify** the role of various physical phenomenon in relation with the experimental concepts (L3)

List of Physics Experiments

1. Determination of thickness of thin object by wedge method
2. Determination of radius of curvature of lens by Newton's rings
3. Determination of wavelengths of various colours of mercury spectrum using diffraction grating in normal incidence method
4. Determination of dispersive power of the prism
5. Determination of dielectric constant and Curie temperature of a ferroelectric material
6. B-H curve
7. Determination of numerical aperture of an optical fiber
8. Laser: Determination of wavelength using diffraction grating
9. Laser: Determination of particle size
10. To determine the resistivity of semiconductor by four probe method
11. Energy gap of a material using p-n junction diode
12. Magnetic field along the axis of a current carrying coil – Stewart-Gee's Method
13. Hall effect : Determination of mobility of charge carriers in semiconductor
14. Measurement of resistance of a semiconductor with varying temperature
15. To determine the self inductance of the coil (L) using Anderson's bridge

Note: Out of twelve experiments, two experiments will be performed using virtual laboratory.
Data Books Required: Nil

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – I SEMESTER

		L	T	P	C
19A10506	**Problem Solving & Programming Lab**	0	0	3	1.5

Laboratory Experiments

1. Basic DOS Commands/Unix Commands
2. Familiarize with windows/Linux Environment.
3. Familiarize with development environment of C Language
4. Design a C program which reverses the number
5. Design a C program which finds the second maximum number among the given list of numbers.
6. Construct a program which finds the kth smallest number among the given list of numbers.
7. Design an algorithm and implement using C language the following exchanges
   a b c d

6. Develop a C Program which counts the number of positive and negative numbers separately and also compute the sum of them.
7. Implement the C program which computes the sum of the first n terms of the series
   Sum = 1 – 3 + 5 -7 + 9
8. Design a C program which determines the numbers whose factorial values are between 5000 and 32565.
9. Design an algorithm and implement using a C program which finds the sum of the infinite series
   $1 – x^2/2! + x^4/4! – x^6/6! + ...$

10 Design a C program to print the sequence of numbers in which each number is the sum of the three most recent predecessors. Assume first three numbers as 0, 1, and 1.

11. Implement a C program which converts a hexadecimal, octal and binary number to decimal number and vice versa.
12. Develop an algorithm which computes the all the factors between 1 to 100 for a given number and implement it using C.
13. Construct an algorithm which computes the sum of the factorials of numbers between m and n.
14. Design a C program which reverses the elements of the array.
15. Given a list of n numbers, Design an algorithm which prints the number of stars equivalent to the value of the number. The starts for each number should be printed horizontally.
16. Implement the sorting algorithms a. Insertion sort b. Exchange sort c. Selection sort
    d.. Partitioning sort.
17. Illustrate the use of auto, static, register and external variables.
18. Designalgorithm and implement the operations creation, insertion, deletion, traversing on a singly linked list.
19. Develop a C program which takes two numbers as command line arguments and finds all the common factors of those two numbers.

20. Design a C program which sorts the strings using array of pointers.

Course outcomes: Student should be able to

1. Construct a Computer given its parts (L6)
2. Select the right control structure for solving the problem (L6)
3. Analyze different sorting algorithms (L4)
4. Design solutions for computational problems (L6)
5. Develop C programs which utilize the memory efficiently using programming constructs like pointers.

References:

1. B. Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance", Tata McGraw-Hill, 2nd edition, 2002.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.
3. P.Chenna Reddy, " Computer Fundamentals and C Programming" 2018, BS Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – I SEMESTER

		L	T	P	C
19A15502	**Communicative English Lab-1**	0	0	3	1.5

Course Objectives

- ➢ students will be exposed to a variety of self instructional, learner friendly modes of language learning
- ➢ students will cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc.
- ➢ students will learn better pronunciation through stress, intonation and rhythm
- ➢ students will be trained to use language effectively to face interviews, group discussions, public speaking
- ➢ students will be initiated into greater use of the computer in resume preparation, report writing, format making etc

Course Outcomes

- ➢ CO1: Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
- ➢ CO2: Apply communication skills through various language learning activities
- ➢ CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- ➢ CO4: Evaluate and exhibit acceptable etiquette essential in social and professional settings
- ➢ CO5: Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

Unit 1

1. Phonetics for listening comprehension of various accents
2. Reading comprehension
3. Describing objects/places/persons

Learning Outcomes

At the end of the module, the learners will be able to

- ➢ understand different accents spoken by native speakers of English
- ➢ employ suitable strategies for skimming and scanning on monitor to get the general idea of a text and locate specific information
- ➢ learn different professional registers and specific vocabulary to describe different persons, places and objects

Unit 2

1. JAM
2. Small talks on general topics
3. Debates

Learning Outcomes
At the end of the module, the learners will be able to
- produce a structured talk extemporarily
- comprehend and produce short talks on general topics
- participate in debates and speak clearly on a specific topic using suitable discourse markers

Unit 3
1. Situational dialogues – Greeting and Introduction
2. Summarizing andNote making
3. Vocabulary Building

Learning Outcomes
At the end of the module, the learners will be able to
- Learn different ways of greeting and introducing oneself/others
- summarize the content with clarity and precision and take notes while listening to a talk/lecture and make use of them to answer questions
- replenish vocabulary with one word substitutes, homonyms, homophones, homographs to reduce errors in speech and writing

Unit4
1. Asking for Information and Giving Directions
2. Information Transfer
3. Non-verbal Communication – Dumb Charade

Learning Outcomes
At the end of the module, the learners will be able to
- Learn different ways of asking information and giving directions
- Able to transfer information effectively
- understand non-verbal features of communication

Unit 5
1. Oral Presentations
2. Précis Writing and Paraphrasing
3. Reading Comprehension and spotting errors

Learning Outcomes
At the end of the module, the learners will be able to
- make formal oral presentations using effective strategies
- learn different techniques of précis writing and paraphrasing strategies
- comprehend while reading different texts and edit short texts by correcting common errors

Suggested Software
- Young India Films
- Walden Infotech
- Orell

Reference Books

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.

- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
- A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – II SEMESTER

		L	T	P	C
19A10402	**Network Theory**	3	0	0	3

UNIT I
Basic Circuit Analysis:
R-L-C Parameters, Voltage and Current, Independent and Dependent Sources, Kirchoff's Laws, Loop and Nodal methods of analysis of Networks with dependent and independent voltage and current sources.
Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, f-circuit matrix and f-cutset matrix, Tie set and Cutset Matrices for planar networks.

UNIT II
Network reduction techniques: series, parallel, series-parallel, star-to-delta, delta-to-star transformation, source transformation.
Network Theorems: Superposition, Maximum power transfer, Thevenin's, Norton's, Reciprocity, Milliman, Miller and Tellegan's Theorems.

UNIT III
Transient Analysis:
Transient analysis of RC, RL and RLC Circuits, Circuits with switches, step response, 2^{nd} order series and parallel RLC Circuits. Network Analysis using Laplace transform techniques, step, impulse and exponential excitation.

UNIT IV
Single Phase AC Circuits: R.M.S. and Average values, Form Factor, steady state analysis of series, parallel and series-parallel combinations of R, L and C with sinusoidal excitation, concept of reactance, impedance, susceptance and admittance – phase and phase difference, Concept of power factor, Series and Parallel resonances.
Coupled Circuits: Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

UNIT V
Two Port Networks: Two port network parameters, Z, Y, ABCD, h and g parameters, Relationship between parameter sets, Interconnection of two port networks. Characteristic impedance, Image transfer constant, image and iterative impedance.
Network functions: Driving point and transfer functions – using transformed (S) variables, Poles and Zeros, Foster and Cauer forms of RL/RC/LC circuits.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – I SEMESTER

		L	T	P	C
19A10403	**Electronic Devices**	2	0	0	2

Unit- I
Review of semiconductor physics:
Energy band in solids (metal, semiconductor and insulators), donors, acceptors, concepts of Carrier Concentration and Fermi level in intrinsic and extrinsic semiconductors, majority carriers (electrons and holes).
Carrier Transport Phenomena: Carrier Drift, Mobility, Resistivity, Hall Effect, Diffusion Process, Einstein Relation, Current Density Equation, Carrier Injection, Generation and Recombination Processes, Continuity Equation.

UNIT II
P-N Junction Diode: Formation of Depletion Layer, Space Charge at a Junction, Derivation of Electrostatic Potential Difference at Thermal Equilibrium, Depletion Width and Depletion and Diffusion Capacitance of an Abrupt Junction, Concept of Linearly Graded Junction, Derivation of Diode Equation and V-I Characteristics, Zener and Avalanche Junction Breakdown Mechanism, Basic construction, working and characteristics of Zener diode, -Problem solving.

UNIT III
Bipolar Junction Transistors (BJT): PNP and NPN Transistors, Basic Transistor Action, Emitter Efficiency, Base Transport Factor, Current Gain, Energy Band Diagram of Transistor in Thermal Equilibrium, Quantitative Analysis of Static Characteristics, Base Width Modulation, Regions of operation, Input and Output Characteristics of CB, CE and CC Configurations-Problem solving.

UNIT IV
Field Effect Transistors: JFET, Construction, Idea of Channel Formation, Pinch-Off and Saturation Voltage, Current-Voltage Output Characteristics. MOSFET, types of MOSFETs, Circuit symbols, Working and Characteristic curves of Depletion type MOSFET (both N channel and P Channel) and Enhancement type MOSFET (both N channel and P channel), Input and Output Characteristics of CS,CD and CG Configurations, Complimentary MOS (CMOS).

UNIT V
Special Purpose Devices:
Tunnel diode, Varactor diode, UJT, SCR, Diac, Triac, IGBT, LED, LCD, Photo transistor, Opto Coupler, Solar cell, CCD.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – I SEMESTER

		L	T	P	C
19A53201	**Differential Equations and Vector Calculus**	3	0	-	3

Course Objectives:

1) To enlighten the students in the techniques to solve differential equations.
2) To enable the students to use differential equations in various real world applications ofengineering.

Course Outcomes:

At the end of the course, the student will be able to

- solve the differential equations related to various engineering fields (L6)
- Identify solution methods for partial differential equations that model physical processes (L3)
- interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- estimate the work done against a field, circulation and flux using vector calculus (L6)

UNIT 1: Linear differential equations of higher order

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator,rules for finding particular integral, method of variation of parameters.

Learning Outcomes:

At the end of this unit, the student will be able to

- identify the essential characteristics of linear differential equations with constant coefficients(L3)
- solve the linear differential equations with constant coefficients by appropriate method (L3)

UNIT 2: Applications of Linear Differential Equations

Cauchy’s and Legendre’s linear equations, simultaneous linear equations with constant coefficients,Applications to L-C-R Circuit problems and Mass spring system.

Learning Outcomes:

At the end of this unit, the student will be able to

- classify and interpret the solutions of linear differential equations (L3)

- formulate and solve the higher order differential equation by analyzing physical situations (L3)

UNIT 3: Partial Differential Equations

First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential equations.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply a range of techniques to find solutions of standard PDEs (L3)
- outline the basic properties of standard PDEs (L2)

UNIT4: Vector differentiation

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient,del applied to vector point functions-Divergence and Curl, vector identities.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply del to Scalar and vector point functions (L3)
- illustrate the physical interpretation of Gradient, Divergence and Curl (L3)

UNIT 5: Vector integration

Line integral-circulation-work done, surface integral-flux, Green’s theorem in the plane (without proof), Stoke’s theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

Learning Outcomes:

At the end of this unit, the student will be able to

- find the work done in moving a particle along the path over a force field (L4)
- evaluate the rates of fluid flow along and across curves (L4)
- apply Green’s, Stokes and Divergence theorem in evaluation of double and triple integrals (L3)

Textbooks:

3. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
4. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

References:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett,2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3. George B.Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers,2013.
4. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 3/e, Alpha ScienceInternational Ltd., 2002.
5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
6. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
7. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
8. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
9. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, Pearson Education
10. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
11. H. k Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand.
12. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – II SEMESTER

		L	T	P	C
19A15303	**Chemistry (Common to EEE, ECE & CSE**	2	1	0	3

COURSE OBJECTIVES	
1	To familiarize engineering chemistry and its applications
2	To train the students on the principles and applications of electrochemistry and polymers
3	To introduce instrumental methods, molecular machines and switches

COURSE OUTCOMES	
CO1	**Apply**Schrodinger wave equation to hydrogen and particle in a box, **illustrate** the molecular orbital energy level diagram of different molecular species, **explain** the band theory of solids for conductors, semiconductors and insulators **discuss** the magnetic behaviour and colour of complexes.
CO2	**apply** Nernst equation for calculating electrode and cell potentials, **differentiate** between pH metry, potentiometric and conductometric titrations, **explain** the theory of construction of battery and fuel cells, **solve** problems based on cell potential
CO3	**explain** the different types of polymers and their applications, **explain** the preparation, properties and applications of Bakelite, Nylon-66, and carbon fibres, **describe** the mechanism of conduction in conducting polymers, **discuss** Buna-S and Buna-N elastomers and their applications
CO4	**explain** the different types of spectral series in electromagnetic spectrum, **understand** the principles of different analytical instruments, **explain** the different applications of analytical instruments
CO5	**explain** the band theory of solids for conductors, semiconductors and insulators, **explain**supramolecular chemistry and self assembly, **demonstrate** the application of Rotaxanes and Catenanes as artificial molecular machines

Unit 1: Structure and Bonding Models:
Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2 , applications to hydrogen, particle in a box and their applications for conjugated molecules, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order, crystal field theory – salient features – splitting in octahedral and tetrahedral geometry, magnetic properties and colour, band theory of solids – band diagrams for conductors, semiconductors and insulators, role of doping on band structures.

Unit 2: Electrochemistry and Applications:
Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working

and applications, photogalvanic cells with specific examples. Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.
Primary cells – Zinc- MnO_2battery(Laclanche cell), Secondary cells – lead acid and lithium ion batteries- working of the batteries including cell reactions.Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

Unit 3: Polymer Chemistry
Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.
Plastics - Thermoplastics and Thermosettings, Preparation, properties and applications of – Bakelite, urea-formaldehyde, Nylon-6,6, carbon fibres, Elastomers–Buna-S, Buna-N–preparation, properties and applications.
Conducting polymers – polyacetylene, polyaniline, mechanism of conduction and applications.

Unit 4: Instrumental Methods and Applications:
Electromagnetic spectrum. Absorption of radiation: Principle and applications of pH metry, potentiometry, conductometry, UV-Visible**,** IR and Basic concepts of Chromatography techniques and their applications

Unit 5: Advanced Engineering Materials:
(i) Concepts and terms of supra molecular chemistry, complementarity, Basic Lock and Key principle, examples of Supramolecules, Applications of Supra molecules(sensors, catalysts, medical and molecular switches)
ii) Semiconducting and Super Conducting materials-Principles and some examples
iii) Electrical Insulators or Dielectric materials: Definition and classification, Characteristics of electrical insulators and applications of electrical insulating materials
(iv) Nanochemistry: Introduction, classification of nanomaterials properties and applications of Fullerenes, Carbon nano tubes and Graphines nanoparticles.

Text Books:

1. Engineering Chemistry by KNJayaveera, GVSubba Reddy and C. Ramachandraiah, McGraw Hill Higher Education, Foruth Edition, New Delhi
2. A Text Book of Enigneering Chemistry, Jain and Jain, Dhanapathi Rai Publications, New Delhi

References:

1.A Text book of Engineering Chemistry by SS Dhara, S. Chand Publications, New Delhi
2. Engineering Chemistry by K.B.Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH
Pubblications India Pvt Limited.
3. Concepts of Engineering Chemistry- Ashima Srivastavaf and N.N. Janhavi
4. Text Book of Engineering Chemistry – C. Parameswara Murthy, C.V.Agarwal and Andra Naidu
5. Chemistry of Engineering Materials, C.V.Agarwal, C.Parameswaramurthy and Andranaidu
6. Text Book of Engineering Chemistry, Shashichawla, Dhanapathirai Publications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – II SEMESTER

		L	T	P	C
19A10503	**Data Structures**	2	1	0	3

Course Objectives:
1. To teach the representation of solution to the problem using algorithm
2. To explain the approach to algorithmanalysis
3. To introduce different data structures for solving the problems
4. To demonstrate modeling of the given problem as a graph
5. To elucidate the existing hashing techniques

Unit – 1: Introduction
Algorithm Specification, Performance analysis, Performance Measurement. Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions. Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort
Learning Outcomes:
Student should be able to
1. Analyze the given algorithm to find the time and space complexities.(L4)
2. Select appropriate sorting algorithm (L4)
3. Designa sorting algorithm (L6)

Unit – 2: Stack, Queue and Linked lists
Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.
Learning outcomes:
Student should be able to
1. Evaluate expressions (L5)
2. Develop the applications using stacks and queues (L3)
3. Construct the linked lists for various applications (L6)

Unit – 3 :Trees
Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, AVL Trees.
Learning outcomes
1. Explain the concept of a tree (L2)
2. Compare different tree structures (L4)
3. Apply trees for indexing (L3)

Unit – 4 :Graphs and Hashing

The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure

Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.

Learning outcomes:
Student should be able to
1. Recognize the importance of Graphs in solving real world problems (L2)
2. Apply various graph traversal methods to applications (L3)
3. Design a minimum cost solution for a problem using spanning trees (L6)
4. Select the appropriate hashing technique for a given application (L5)
5. Design a hashing technique (L6)

Unit – 5: Files and Advanced sorting

File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization.
Advanced sorting: Sorting on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.

Learning outcomes:
Student should be able to
1. Organize data in the form of Files (L6)
2. Apply sorting on large amount of data (L3)

Text Books:
1. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures in C”, 2^{nd} Edition, University Press, 2007.
2. Alan L. Tharp, “File Organization and Processing”, Wiley and Sons, 1988.

Reference Text Books:
1. D. Samanta, “Classic Data Structures”, 2^{nd} Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Peter Bras, “Advanced Data Structures”, Cambridge University Press, 2016
3. Richard F.Gilberg, Behrouz A.Forouzan, “Data Structures A Pseudo code Approach with C”, Second Edition, Cengage Learning 2005.

Course Outcomes:

Students should be able to
1. Select Appropriate Data Structure for solving a real world problem (L4)
2. Select appropriate file organization technique depending on the processing to be done (L4)
3. Construct Indexes for Databases (L6)
4. Analyse the Algorithms (L4)
5. Develop Algorithm for Sorting large files of data (L3)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – II SEMESTER

		L	T	P	C
19A10303	**Engineering Workshop**	0	0	2	1

Course Objective:
To familiarize students with wood working, sheet metal operations, fitting and electrical house
Wiring skills

Wood Working:
Familiarity with different types of woods and tools used in wood working and make following
joints

a) Half – Lap joint*
b) Mortise and Tenon joint*
c) Corner Dovetail joint or Bridle joint

Sheet Metal Working:
Familiarity with different types of tools used in sheet metal working, Developments of following
sheet metal job from GI sheets

a) Tapered tray *
b) Conical funnel *
c) Elbow pipe *
d) Brazing

Fitting:
Familiarity with different types of tools used in fitting and do the following fitting exercises

a) V-fit*
b) Dovetail fit *
c) Semi-circular fit
d) Wheel balancing, tubeless tyre puncture and change of two wheelertyre.

Electrical Wiring:
Familiarities with different types of basic electrical circuits and make the following connections

a) Parallel and series*
b) Two way switch*
c) Godown lighting
d) Tube light*
e) Three phase motor
f) Soldering of wires

Note:* Students exercise. Remaining all for demonstration.

Course Outcomes:
After completion of this labthe student will be able to
1. Apply wood working skills in real world applications.
2. Build different parts with metal sheets in real world applications.
3. Apply fitting operations in various applications.
4. Apply different types of basic electric circuit connections.
5. Demonstrate soldering and brazing.
6.Understanding the principle of automobile wheel balancing and alignment.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – II SEMESTER

		L	T	P	C
19A10304	**Engineering Graphics**	1	0	3	2.5

UNIT-I

Introduction to EngineeringDrawing, Principles of Engineering Graphics and their significance.

Curves used in practice:

Conic sections – Ellipse, Parabola, Hyperbola & Rectangular Hyperbola(general method)

Cycloid, Epicycloid and Hypocycloid – Normal and Tangent

Involutes – Normal and Tangents

UNIT –II

Principles of orthographic projections – First and Third angle projections Projection of points. Projections of lines inclined to one plane and inclined to both planes – True length, true angles of projected lines- Projection of regular planes inclined to one plane and both planes.

UNIT –III

Projection of solids inclined to one plane and inclined to both planes by rotational method – Prism, Cylinder, Pyramid, Cone.

UNIT –IV

Sections of solids: Sections and Sectional views of Regular solids – Prism, Cylinder, Pyramid, Cone – True shapes. Development of Regular solids- Prism, Cylinder, Pyramid, Cone.

UNIT –V

Orthographic projections: Conversion of Pictorial views to orthographic views – Conventions.

Isometric projection: Isometric views of lines, plane figures, simple solids – orthographic views into isometric views.

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhat, Charotar Publishers
2. Engineering Drawing, K.L. Narayana & P. Kannaih, Scitech Publishers, Chennai.

REFERENCES:

3. Engineering Drawing, Johle, Tata McGraw-Hill Publishers.
4. Engineering Drawing, Shah and Rana,2/e, Pearson Education
5. Engineering Drawing and Graphics, Venugopal/New age Publishers
6. Engineering Graphics, John&john.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – II SEMESTER

	Title of the Lab	L	T	P	C
19A10404	**Passive Circuits & Electronic Devices Lab**	0	0	2	1

LIST OF EXPERIMENTS

Part A: Experiments using Passive Circuits

- Any 8 of the following experiments are to be conducted in Hardware/Simulation (Multisim/Open source software):

1. Verification of Kirchhoff's Laws
2. Verification of Superposition Theorem
3. Verification of Maximum Power Transfer Theorem
4. Verification of Thevenin's Theorem
5. Verification of Milliman's Theorem
6. Measure and calculate RC/RL time constant for a given RC/RL circuit
7. Measure and analyze (settling time, overshoot, undershoot, etc.) step response of for a given series RLC circuit for following cases:
   (i) $\zeta = 1$ (critically damped system)
   (ii) $\zeta > 1$(over damped system)
   (iii) $\zeta < 1$ (under damped system)
   Choose appropriate values of R, L, and C to obtain each of above cases one at a time.
8. Design a series RLC resonance circuit. Plot frequency response and find resonance frequency, Bandwidth, Q – factor.
9. Design a parallel RLC resonance circuit. Plot frequency response and find resonance frequency, Bandwidth, Q – factor.
10. Measure and calculate h-parameters of two-port network by making use of a transistor.

Part B: List of Experiments

- Any 8 of the following experiments are to be conducted.

1. P-N Junction Diode Characteristics.
2. Zener Diode as voltage regulator.
3. Common Emitter input-output Characteristics
4. Common Base input-output Characteristics
5. Common Collector input – output characteristics
6. FET Characteristics (CS Configuration)
7. MOSFET Characteristics
8. SCR Characteristics
9. UJT Characteristics

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – II SEMESTER

	Title of the Lab	L	T	P	C
19A15304	Chemistry lab	-	-	3	1.5

COURSE OBJECTIVES	
1	Verify the fundamental concepts with experiments

COURSE OUTCOMES	
CO1	**determine** the cell constant and conductance of solutions
CO2	**prepare** advanced polymer materials
CO3	**measure** the strength of an acid present in secondary batteries
CO4	**analyse** the IR and NMR of some organic compounds

LIST OF EXPERIMENTS

1. Conductometrictitration of strong acid vs strong base
2. Conductometrictitration of weak acid vs. strong base
3. Determination of cell constant and conductance of solutions
4. Potentiometry - determination of redox potentials and emfs
5. Estimation of Ferrous Iron by Dichrometry.
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a polymer
8. Verify Lambert-Beer's law
9. Thin layer chromatography
10. Identification of simple organic compounds by IR
11. Separation of Organic mixtures by paper chromatography.
12. Preparation of Nano materials

TEXT BOOKS:

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – J. Mendham et al, PearsonEducation.
2. Chemistry Practical – Lab Manual by Chandra Sekhar, GV Subba Reddy and Jayaveera

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

I B.TECH – II SEMESTER

		L	T	P	C
19A10507	**Data Structures Lab**	0	0	3	1.5

Course Objectives:
1. To introduce to the different data structures
2. To elucidate how the data structure selection influences the algorithm complexity
3. To explain the different operations that can be performed on different data structures
4. To introduce to the different search and sorting algorithms.

Course Outcome:at the end of the course students should be able to

1. Select the data structure appropriate for solving the problem (L5)
2. Implement searching and sorting algorithms (L3)
3. Design new data types (L6)
4. Illustrate the working of stack and queue (L4)
5. Organize the data in the form of files (L6)

Laboratory Experiments

1. String operations using array of pointers
2. Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.
3. Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time.
4. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List
5. Stack implementation using arrays
6. Stack implementation using linked lists
7. Queue implementation using arrays. Implement different forms of queue. While implementing you should be able to store elements equal to the size of the queue. No positions should be left blank.

8. Queue implementation using linked lists
9. Creation of binary search tree, performing operations insertion, deletion, andtraversal.
10. Breadth first search
11. Depth first search
12. Travelling sales person problem
13. File operations
14. Indexing of a file
15. Reversing the links (not just displaying) of a linked list.
16. Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using 'Ladies first' principle. You may create new linked lists if necessary.
17. An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form.
18. A table can be defined as a collection of rows and columns. Each row and column may have a label. Different values are stored in the cells of the table. The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table. User may like to remove row/column. Create table data type and support different operations on it.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – I SEMESTER

		L	T	P	C
19A20604	**Complex Variables and Transforms**	3	0	0	3

Course Objective:

This course aims at providing the student to acquire the knowledge on the calculus of functions ofcomplex variables. The student develops the idea of using continuous/discrete transforms.

Course Outcomes:

After the completion of course, students will be able to

1. understand the analyticity of complex functions and conformal mappings.
2. apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improperintegrals along contours.
3. understand the usage of Laplace Transforms, Fourier Transforms and Z transforms.
4. evaluate the Fourier series expansion of periodic functions.

Unit-I: Laplace Transforms

Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function. Differentiation and integration of transform – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

Learning Outcomes:

Studentswill be able to

1. understand the concept of Laplace transforms and find the Laplace transforms of elementaryfunctions.
2. find the Laplace transforms of general functions using its properties.
3. understand Laplace transforms of special functions(Unit step function, Unit Impulse &Periodic).
4. apply Laplace transforms to solve Differential Equations.

Unit-II: Fourier series

Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions-typical wave forms - Parseval's formula- Complex form of Fourier series.

Learning Outcomes:

Students will be able to

1. understand finding Fourier series expression of the given function.
2. determine Fourier coefficients (Euler's) and identify existence of fourier series of the givenfunction.
3. expand the given function in Fourier series given in Half range interval.
4. apply Fourier series to establish Identities among Euler coefficients.
5. find Fourier series of wave forms.

Unit-III: Fourier transforms& Z Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem .

Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

Learning Outcomes:

Students will be able to

1. find Fourier Sine and cosine integrals.
2. understand Fourier transforms.
3. apply properties of Fourier transforms.
4. understand Z transforms.
5. apply properties of Z transforms.
6. apply Z transforms to solve difference equations.

Unit-IV:Complex Variable – Differentiation:

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy- Riemann equations, analytic functions(exponential, trigonometric, logarithm), harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method-Conformal mappings-standard and special transformations(sin z, e^z, cos z, z^2) Mobius transformations (bilinear) and their properties.

Learning Outcomes:

Students will be able to

1. understand functions of Complex variable and its properties.
2. find derivatives of complex functions.
3. understand the analyticity of complex functions .
4. understand the conformal mappings of complex functions.

Unit-V: Complex Variable – Integration:

Line integral-Contour integration, Cauchy's integral theorem, Cauchy Integral formula, Liouville's theorem (without proof) and Maximum-Modulus theorem (without proof);power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (around unit circle, semi circle with f(z) not having poles on real axis).

Learning Outcomes:

Students will be able to

1. understand the integration of complex functions.
2. apply Cauchy's integral theorem and Cauchy's integral formula.
3. understand singularities of complex functions.
4. evaluate improper integrals of complex functions using Residue theorem.

Text Books:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Advanced Engineering Mathematics, by
Erwin Kreyszig, Wiley IndiaReference Books:
1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – I SEMESTER

Course Code		L	T	P	C
19A24201	**Signals and Systems**	3	0	0	3

Course Objectives:

1. To introduce students to the basic idea of signal and system analysis and its characterization in time and frequency domains.
2. To present Fourier tools through the analogy between vectors and signals.
3. To teach concept of sampling and reconstruction of signals.
4. To analyze characteristics of linear systems in time and frequency domains.
5. To understand Laplace and z-transforms as mathematical tool to analyze continuous and discrete-time signals and systems.

Unit I

Signals & Systems: Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Concepts of Convolution and Correlation of signals, Analogy between vectors and signals-Orthogonality, mean square error, Fourier series: Trigonometric & Exponential, Properties of Fourier series, concept of discrete spectrum, Illustrative Problems.

Unit II

Continuous Time Fourier Transform: Definition, Computation and properties of Fourier transform for different types of signals and systems, Inverse Fourier transform. Statement and proof of sampling theorem of low pass signals, Illustrative Problems.

Unit III

Discrete Time Fourier Transform: Definition, Computation and properties of Discrete Time Fourier transform for different types of signals and systems, Illustrative Problems.

Unit IV

Signal Transmission Through Linear Systems: Linear system, impulse response, Response of a linear system for different input signals, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time, Energy and Power spectral densities, Illustrative Problems.

Unit V

Laplace Transform: Definition, ROC, Properties, Inverse Laplace transforms, the S-plane and BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions.

Z–Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z-Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions, Illustrative Problems.

Course Outcomes:

After completion of the course, student will be able to

CO1: Understand the mathematical description and representation of continuous-time and discrete-time signals and systems. Also understand the concepts of various transform techniques. (L1)

CO2: Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems. (L2)

CO3: Analyze the frequency spectra of various continuous-time and discrete-time signals using different transform methods. (L3)

CO4: Classify the systems based on their properties and determine the response of them. (L4)

Text Books:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, “Signals and Systems”, PHI, 2^{nd} Edition, 2009.
2. Simon Haykin and Van Veen, “Signals & Systems”, Wiley, 2^{nd} Edition, 2005.

References:

1. BP Lathi, “Principles of Linear Systems and Signals”, Oxford University Press, 2^{nd} Edition, 2015.
2. Matthew N.O. Sadiku and Warsame H. Ali, “Signals and Systems A primer with MATLAB”, CRC Press, 2016.
3. Hwei Hsu, “Schaum's Outline of Signals and Systems”, Fourth Edition, TMH, 2019.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – I SEMESTER

Course Code		L	T	P	C
19A20401	**Electronic Circuits –I**	3	0	0	3

Prerequisites: Semiconductor Devices and their characteristics

Course Objectives:

1. To understand the applications of diodes as rectifiers, clippers, clampers and voltage regulators.
2. To analyze rectifier circuits with and without filters.
3. To design the circuits such as power supplies, voltage regulators.
4. To analyze the various biasing circuits using BJTs & MOSFETs.
5. To understand the operation and analyze the single-stage amplifiers using BJT & MOSFETs at low frequencies.
6. Design of small signal amplifier circuits using MOSFETs and BJTs.

Unit I

Diodes and applications: Introduction, Review of diode characteristics – The ideal diode and its equivalent circuit – Terminal characteristics of junction diode – Modeling the diode forward characteristics – Operation in the reverse break down region – Zener diodes, Rectifier circuits – Half wave rectifier – Full wave Rectifier – Bridge Rectifier, Rectifier with filter – C, L, LC, PI filters, Diodes in digital circuits, Limiting and Clamping Circuits, Problem solving.

Unit II

Bipolar Junction Transistors (BJTs): Review of device structure and physical operation, Current–Voltage Characteristics - Early effect, BJT Circuits at DC, Applying the BJT in Amplifier Design – voltage amplifier – voltage transfer characteristics – small signal voltage gain – Graphical analysis, Biasing in BJT amplifier circuits – fixed bias – emitter bias – self bias – voltage divider bias, biasing using constant current source, Problem solving.

Unit III

Small Signal Analysis of BJTs: Small-Signal Operation and Models – Transconductance – Input resistance at the base – Input resistance at the emitter – voltage gain - Separating the DC Analysis and the Signal Analysis – the hybrid-π model – the T-model – Application of small signal equivalent circuits, Basic BJT Amplifier Configurations - characterizing the amplifiers – Common Emitter (CE) amplifier – CE with emitter resistance – CC amplifier – CB amplifier, Biasing in BJT amplifiers - Discrete-Circuit BJT Amplifiers, Transistor Breakdown and Temperature Effects, Problem solving.

Unit IV

MOS Field Effect Transistors (MOSFETs): Introduction, Review of device structure and physical operation, voltage – current characteristics (n-channel, & p-channel MOSFETs), MOSFET circuits at DC, MOSFETs in amplifier design – voltage amplifier – voltage transfer characteristics - biasing MOSFET to obtain linear amplification – Graphical analysis,– Small signal operation and models – DC bias point – Biasing MOSFET amplifier circuits – biasing by fixing V_G – biasing through source resistance, biasing through drain to gate resistance – biasing using constant current source, signal current in drain terminal, Problem solving.

Unit V
Small Signal Analysis of MOSFETs: Voltage gain - Separating the DC Analysis and the Signal Analysis – Small Signal Equivalent Models - The Tranconductance g_m - T-equivalent circuit model, Basic amplifier configurations - Characterizing Amplifiers – Common Source amplifier (CS) – CS amplifier with source resistance – Common Gate amplifier – Common Drain amplifier, Frequency response, Body effect – modeling the body effect, Temperature effects, Depletion type MOSFET, Problem solving.

Text Books:

1. Adel S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press International 6th edition, 2013.
2. Donald A Neamen, "Electronic Circuits – analysis and design", 3rd Edition, McGraw Hill (India), 2019.

References:

1. J. Milliman and C Halkias, "Integrated electronics", 2nd Edition, Tata McGraw Hill, 1991.
2. Behzad Razavi, "Microelectronics", Second edition, Wiley, 2013.
3. R.L. Boylestead and Louis Nashelsky, "Electronic Devices and Circuits," 9th Edition, Pearson, 2006.
4. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

COURSE OUTCOMES:

After the completion of the course students will able to

CO1: Understand the working principle of rectifier circuits, single stage amplifiers (L1)
CO2: Explain the operation of different biasing circuits using MOSFETs and BJTs to stabilize the operating point.(L2)
CO3: Analyze diode circuits for different applications such as rectifiers, clippers and clampers also analyze low frequency models of BJT and MOSFET. (L3)
CO4: Design circuits for dc power supply with and without filters. Also design biasing circuits using BJTs and MOSFETs. (L4)
CO5: Compare the performance of amplifier circuits involving MOSFETs and BJTs. (L5)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – I SEMESTER

Course Code		L	T	P	C
19A20402	**Probability Theory and Stochastic Processes**	3	0	0	3

Course Objectives:

1. To gain the knowledge of the basic probability concepts and acquire skills in handling situations involving more than one random variable and functions of random variables.
2. To understand the principles of random signals and random processes.
3. To be acquainted with systems involving random signals.
4. To gain knowledge of standard distributions that can describe real life phenomena.

Unit I

Probability Introduced Through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events, Problem Solving.

Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties, Problem Solving.

Unit II

Operations on Single Random Variable: Introduction, Expectation of a random variable, moments-moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, moment generating function, characteristic function, transformations of random variable.

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected), Unequal Distribution, Equal Distributions.

Unit III

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties of Gaussian random variables, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

Unit IV

Random Processes-Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence, First-Order

Stationary Processes, Second-Order and Wide-Sense Stationarity, N-Order and Strict-Sense Stationarity. Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

Random Processes-Spectral Characteristics: The Power Density Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum and its Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

Unit V
Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band Limited and Narrowband Processes, Properties.
Noise Definitions: White Noise, colored noise and their statistical characteristics, Ideal low pass filtered white noise, RC filtered white noise.

Course Outcomes:
After completion of the course, student will be able to

CO1: Understanding the concepts of Probability, Random Variables, Random Processes and their characteristics learn how to deal with multiple random variables, conditional probability, joint distribution and statistical independence. (L1)
CO2: Formulate and solve the engineering problems involving random variables and random processes. (L2)
CO3: Analyze various probability density functions of random variables. (L3)
CO4: Derive the response of linear system for Gaussian noise and random signals as inputs. (L3)

TEXT BOOKS:

1. Peyton Z. Peebles, “Probability, Random Variables & Random Signal Principles”, TMH, 4th Edition, 2002.
2. Athanasios Papoulis and S. Unnikrishna Pillai, “Probability, Random Variables and Stochastic Processes”, PHI, 4th Edition, 2002.

REFERENCES:

1. Simon Haykin, “Communication Systems”, Wiley, 3rd Edition, 2010.
2. Henry Stark and John W.Woods, “Probability and Random Processes with Application to Signal Processing,” Pearson Education, 3rd Edition, 2002.
3. George R. Cooper, Clave D. MC Gillem, “Probability Methods of Signal and System Analysis,” Oxford, 3rd Edition, 1999.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – I SEMESTER

Course Code		**L**	**T**	**P**	**C**
19A24204	**Digital Electronics and Logic Design**	3	0	0	3

Course Objectives:

1. To teach significance of number systems, conversions, binary codes and functionality of logic gates.
2. To discuss different simplification methods for minimizing Boolean functions.
3. To impart knowledge on operation, characteristics and various configurations of TTL and CMOS logic families.
4. To outline procedures for the analysis and design of combinational and sequential logic circuits.
5. To introduce programmable logic devices.

Unit I

Number Systems and Codes: Decimal, Binary, Octal, and Hexa-decimal number systems and their conversions, ASCII code, Excess -3 codes, Gray code.
Binary codes Classification, Error detection and correction – Parity generators and checkers – Fixed point and floating-point arithmetic.

Boolean Algebra& Logic Gates: Boolean operations, Boolean functions, Algebraic manipulations, Min-terms and Maxterms, Sum-of-products and Product-of-sum representations, Two-input logic gates, NAND /NOR implementations.

Unit II

Minimization of Boolean Functions: Karnaughmap, Don't-care conditions, Prime implicants, Minimization of functions using Quine-McClusky method.
Combinational Circuits: Introduction, Analysis of combinational circuits, Design Procedure–Adders, Subtractors, Comparators, Code Converters, Encoders, Decoders, Multiplexers, Demultiplexers

Unit III

Sequential Circuits: Introduction, Latches –RS latch and JK latch, Flip-flops-RS, JK, T and D flip flops, Master-slave flip flops, Edge-triggered flip-flops, Flip-flop conversions.

Registers and Counters: Registers, shift registers, Ripple counters, Synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter.

Unit IV

Sequential Machines

Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N – Counters, Finite state machine-capabilities and limitations, Mealy and Moore models

Programmable Logic Devices (PLDs): Basic concepts, Programmable Array Logic (PAL) and Programmable Logic Array (PLA), Design of combinational circuits using PLDs.

Unit V

Digital Logic Families: Unipolar and Bipolar Logic Families, Transistor-Transistor Logic (TTL): Operation of TTL, Current sink logic, TTL with active pull up, TTL with open collector output, Shockley TTL, TTL characteristics, I^2L, ECL logic Families.

CMOS: CMOS Inverter, CMOS characteristics, CMOS configurations - Wired Logic, Open drain outputs, Interfacing: TTL to CMOS and CMOS to TTL, Tristate Logic, Characteristics of Digital ICs: Speed, power dissipation, figure of merit, fan-out, Current and voltage parameters, Noise immunity, operating temperature range, power supply requirements.

COURSE OUTCOMES:

After completion of the course, student will be able to

CO1: Understand various number systems, error detecting, correcting binary codes, logic families, combinational and sequential circuits. (L1)

CO2: Apply Boolean laws, k-map and Q-M methods to minimize switching functions. Also describe the various performance metrics for logic families. (L2)

CO3: Design combinational and sequential logic circuits. (L4)

CO4: Compare different types of programmable logic devices and logic families. (L5)

TEXTBOOKS:

1. M. Morris Mano and Michael D. Ciletti, “Digital Design", Pearson Education, 4th Edition 2013.
2. Z. Kohavi and N. K. Jha, “Switching and Finite Automata Theory”, Third Edition, Tata McGraw Hill, 2010.
3. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education (India Private Limited), 4th edition, 2012.

REFERENCES:

1. Wakerly J.F., “Digital Design: Principles and Practices”, Pearson India, 4th Edition 2008.
2. Charles H Roth (Jr), Larry L. Kinney, “Fundamentals of Logic Design”, Cengage Learning India Edition, 5th Edition, 2010.
3. John.M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2006.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – I SEMESTER

		L	T	P	C
19A22401	**Electrical Technology**	3	0	0	3

Course Objectives: Student can be able to know

1	The constructional features of DC machines, different types of DC machines and their characteristic.
2	The constructional details of single phase transformer and their performance characteristics by conducting suitable tests.
3	The analysis of three phase balanced and unbalanced circuits, Three phase induction motors and their characteristics.
4	The constructional feature and operation of synchronous machines.

UNIT- I DC GENERATORS

D.C. Generators – Principle of Operation – Constructional Features – E. M.F Equation– Numerical Problems – Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of
E.M.F - Critical Field Resistance and Critical Speed - Load Characteristics of Shunt, Series and Compound Generators- Applications

Learning Outcomes:

- To know about principle of operation of a DC machine working as a generator
- To distinguish between self and separately excited generators and classification
- To know how emf is developed
- To distinguish between critical field resistance and critical speed
- To know about various characteristics of different types of generators

UNIT – II D.C. MOTORS

D.C Motors – Principle of Operation – Back E.M.F. –Torque Equation – Characteristics and Application of Shunt, Series and Compound Motors-Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods. Three Point Starter-Losses – Constant & Variable Losses
– Calculation of Efficiency - Swinburne's Test.

Learning Outcomes:

- To know about principle of operation of DC machine working as a motor
- To know about torque developed

- To know about how to control speed of DC shunt motor
- To know about necessity of starter
- To know about various load characteristics of various types of DC motors

UNIT-III SINGLE PHASE TRANSFORMERS & THREE PHASE A.C. CIRCUITS

Introduction - Single Phase Transformers- Constructional Details- Emf Equation - Operation on No Load and on Load - Phasor Diagrams-Equivalent Circuit - Losses and Efficiency- Regulation-OC and SC Tests - Predetermination of Efficiency and Regulation. Analysis of Balanced Three Phase Circuits – Phase Sequence- Star and Delta Connection - Relation between Line and Phase Voltages and Currents in Balanced Systems - Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems.

Learning Outcomes:

- To understand the principle of operation of 1-ϕ transformer
- To understand computation and predetermination of regulation of a 1-ϕ transformer
- To know about basics of three phase circuits
- To distinguish between phase voltages, currents, line values and phase values
- To distinguish between balanced and unbalanced three phase circuits and power measurement

UNIT-IV 3-PHASE INDUCTION MOTORS

Polyphase Induction Motors-Construction Details of Cage and Wound Rotor Machines- - Principle of Operation – Slip- Rotor Emf and Rotor Frequency - Torque Equation- Torque Slip Characteristics – Losses and efficiency.

Learning Outcomes:

- To know about principle of operation of three phase induction motor
- To distinguish between squirrel cage and slip ring induction motors
- To know about various losses and computation of efficiency of induction motor
- To know about the torque developed by the induction motor
- To understand various characteristics of induction motor

UNIT – V SYNCHRONOUS MACHINES

Principle and Constructional Features of Salient Pole and Round Rotor Machines – E.M.F Equation- Voltage Regulation by Synchronous Impedance Method- Theory of Operation of Synchronous Motor.

Learning Outcomes:

- To know about principle of working of alternator
- To distinguish between salient pole and cylindrical rotor machines
- To know about emf equation
- To know about predetermination of regulation of alternator by synchronous impedance method
- To know about principle of operation of synchronous motor

TEXT BOOKS:

1. Electric Machines by I.J.Nagrath & D.P.Kothari,Tata Mc Graw Hill, 7th Edition.2005
2. Basic Electrical Engineering by T.K.Nagsarkar and M.S. Sukhija Oxford University Press, 3rd Edition, 2017.

REFERENCE BOOKS:

1. Fundamentals of Electric Machines by B. R. Gupta, Vandana Singhal, 3rd Edition, New age International Publishers, 2005.
2. Electromachanics – III by S. Kamakashiah, overseas publishers Pvt. Ltd.
3. Principles of Electrical Engineering by V.K. Mehta and Rohit Mehta, S.Chand Publications, 2005.

Course Outcomes:

After completing the course, the student should be able to do the following:

CO1	Able to calculate the e.m.f. generated on DC Generator also able to control speed of different DC motors.
CO2	Able to conduct open circuit and short circuit tests on single phase transformer for knowing their characteristics.
CO3	Able to analyse three phase circuits, three induction motor operating principle and know their torque slip characteristics.
CO4	Able to have knowledge on synchronous machine with which he/she can able to apply the above conceptual things to real-world problems and applications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – I SEMESTER

		L	T	P	C
19A20901	**Universal Human Values**	2	0	0	2

Course Objectives:

- Exposure to the value of life, society and harmony
- Leading towards holistic perspective based on self-exploration about themselves (human being), family, and society and nature/existence.
- Bringing transition from the present state to Universal Human Order
- Instill commitment and courage to act.
- Know about appropriate technologies and management patterns

Course Outcomes:

CO1: Analyze the terms like Natural Acceptance, Happiness and Prosperity
CO2: Understand awareness of oneself, and one's surroundings (family, society nature)
CO3: Apply what they have learnt to their own self in different day-to-day settings in real life
CO4: Relate human values with human relationship and human society.
CO5: Justify the need for universal human values and harmonious existence
CO6: Develop as socially and ecologically responsible engineers

UNIT – I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Universal Human Values-I – Self-Exploration- content and process; 'Natural Acceptance' and Experiential Validation – self-exploration - Continuous Happiness and Prosperity - Human Aspirations - current scenario - Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT – II: Understanding Harmony among Human Beings & Self Harmony!

Human being as a co-existence of the sentient 'I' and the material' Body' - the needs - happiness and physical facility -the Body as an instrument of 'I' - the characteristics and activity of 'I' and harmony in 'I' - the harmony of I with the Body

UNIT – III:Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Values in human relationship; meaning of Justice; Trust and Respect; Difference between intention and competence; the other salient values in relationship - the harmony in the society: Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals – Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

UNIT – IV: **Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**

The harmony in the Nature - Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature - Understanding Existence as Co-existence of mutually interacting units in all- pervasive space - Holistic perception of harmony at all levels of existence.

UNIT – V: Implications of the above Holistic Understanding of Harmony on Professional Ethics

Humanistic Education - Competence in professional ethics: professional competence - people friendly and eco-friendly production systems - appropriate technologies and management patterns for above production systems. Individuals as socially and ecologically responsible engineers, technologists and managers.

Textbooks:

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999
2. HumanValues, A.N.Tripathi, NewAgeIntl.Publishers, NewDelhi,2004.
3. The Story of Stuff (Book).
4. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj - PanditSunderlal 9. Rediscovering India - byDharampal
5. Hind Swaraj or Indian Home Rule - by Mohandas K.Gandhi
6. India Wins Freedom - Maulana Abdul Kalam Azad 12. Vivekananda - Romain Rolland (English)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – I SEMESTER

Course Code		L	T	P	C
19A20403	**Electronic Circuits - I Lab**	0	0	3	1.5

COURSE OBJECTIVES:

1. To verify the theoretical concepts practically from all the experiments.
2. To analyze the characteristics of diodes, BJT, MOSFET.
3. To provide a practical exposure for design& analysis of electronic circuits for generation and amplification input signal.
4. To learn the frequency response and finding gain, input & output impedance of single stage amplifiers.
5. To model the electronic circuits using tools such as PSPICE/Multisim.

LIST OF EXPERIMENTS:

Note: Conduct all the experiments in the laboratory.

1. Design a full wave rectifier for the given specifications with and without filters, and verify the given specifications experimentally.
2. Analyze various clipping and clamping circuits using PN junction diode
3. Design a Zener diode-based ***voltage regulator*** against variations of supply and load. Verify the same experimentally.
4. Design and analysis of voltage- divider bias/self bias circuit using BJT and conduct the experiment to verify theoretical and practical results.
5. Design and analysis of self bias circuit using MOSFET. Verify the same experimentally.
6. Design and implement experimentally suitable circuit for switch using CMOSFET//BJT.
7. Design common source amplifier using MOSFET for the given specifications. Conduct the experiment and verify the same.
8. Design and simulate common gate amplifier using MOSFET (Depletion mode) either in PSPICE or Multisim environment, and study the Gain and Bandwidth of amplifier.
9. Design common drain amplifier using MOSFET (Enhance mode) for the given specifications and calculate the bandwidth of amplifier from its frequency response.
10. Design common emitter amplifier for the given specifications. Conduct the experiment and verify the same.
11. Design and simulate common base amplifier either in PSPICE or Multisim environment, and study the Gain and bandwidth of amplifier.
12. Design common collector amplifier for the given specifications and calculate the bandwidth of amplifier from its frequency response.

Tools / Equipment Required: Software Tool kit Multisim/ Pspice or Equivalent,
DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

COURSE OUTCOMES:

CO1: Understand the basic characteristics and applications of basic electronic devices, frequency response of various amplifiers. (L1)

CO3: Analyze all the amplifier circuits and verify the results with theoretical ones.

CO4: Design MOSFET based amplifier circuits/BJT based amplifiers for the given specifications. Also simulate all circuits in PSPICE /Multisim. (L4).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – I SEMESTER

Course Code		L	T	P	C
19A20404	**Simulation Lab**	0	0	2	1

Course Objectives:

1. To provide practical exposure with generation and simulation of basic signals using standardized tools.
2. To teach analysing signals and sequences using Fourier, Laplace and Z-transforms.
3. To enable to write programs for signal processing applications.

List of Experiments:

1. Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc function.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings- Plot the discrete spectrum of the signal.
4. Write a program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.
5. Write a program to convolve two discrete time sequences. Plot all the sequences.
6. Write a program to find autocorrelation and cross correlation of given sequences.
7. Write a program to verify Linearity and Time Invariance properties of a given Continuous/Discrete System.
8. Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
9. Write a program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
10. Write a program to find response of a low pass filter and high pass filter, when a speech signal is passed through these filters.
11. Write a program to generate Complex Gaussian noise and find its mean, variance, Probability Density Function (PDF) and Power Spectral Density (PSD).
12. Generate a Random data (with bipolar) for a given data rate (say 10kbps). Plot the same for a time period of 0.2 sec.
13. To plot pole-zero diagram in S-plane/Z-plane of given signal/sequence and verify its stability.

Note:

- All the experiments are to be simulated using MATLAB or equivalent software.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

Course Outcomes:

CO1: Understand the basic concepts of programming in MATLAB and explain use of built-in functions to perform assigned task. (L1)
CO2: Generate signals and sequences, input signals to the systems to perform various operations (L2)
CO3: Analyze signals using Fourier, Laplace and Z-transforms. (L3)
CO4: Compute Fourier transform of a given signal and plot its magnitude and phase spectrum. (L3)
CO5: Verify Sampling theorem, Determine Convolution and Correlation between signals and sequences. (L5)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – I SEMESTER

		L	T	P	C
19A22402	**Electrical Technology Lab**	0	0	2	1

Course Objectives: To make the student learn about:

1	Experimental verification of theorems and Experimental verification of Resonance phenomenon.
2	Drawing current locus diagrams and Practical determination of two port network parameters.
3	The DC motors, DC Generators and know various characteristics, performance analysis of DC machines and speed control techniques of DC machines.
4	Various test conditions of single phase transformers.

Course Outcomes:

After completing the course, the student should be able to do the following:

CO1	Apply suitable theorems for circuit analysis and verify the results theoretically.
CO2	Experimental determination of two port network parameters, verify with theoretical , and knowing the performance of RLC circuits with help of locus diagrams.
CO3	Learn about DC motors, DC Generators and know various characteristics, performance analysis of DC machines and speed control techniques of DC machines.
CO4	Various test conditions of single phase transformers.

From the following list experiments minimum five experiments from Part-A and minimum three experiments from Part-B are required to be conducted:

PART-A

1. Verification of KVL and KCL.
2. Two Port Network Parameters – Z-Y Parameters.
3. Two Port Network Parameters – ABCD and H-Parameters.
4. Verification of Superposition and Reciprocity Theorems.
5. Verification of Maximum Power Transfer Theorem.
6. Verification of Thevenin's and Norton's Theorem.

PART-B

1. Magnetization Characteristics of D.C.Shunt Generator. Determination of Critical Field Resistance.
2. Swinburne's Test on DC Shunt Machine (Predetermination of Efficiency of a Given DC Shunt Machine Working as Motor and Generator).
3. Brake Test on DC Shunt Motor. Determination of Performance Characteristics.
4. OC & SC Tests on Single-Phase Transformer (Predetermination of Efficiency and Regulation at Given Power Factors and Determination of Equivalent Circuit).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – I SEMESTER

		L	T	P	C
19A28801	**Biology for Engineers**	3	0	0	0

Course Objectives: To provide basic understanding about life and life Process. Animal an plant systems. To understand what bimolecules, are, their structures are functions. Application of certain bimolecules in Industry.

- Brief introduction about human physiology and bioengineering.
- To understand hereditary units,i.e. DNA (genes) and RNA and their synthesis in living organism.
- How biology Principles can be applied in our daily life using different technologies.
- Brief introduction to the production of transgenic microbes, Plants and animals.

UnitI: Introduction to Basic Biology

Cell as Basic unit of life, cell theory, Cell shapes, Cell structure, Cell cycle. Chromosomes.Prokaryotic and eukaryotic Cell. Plant Cell, Animal Cell, Plant tissues and Animal tissues, Briefintroductiontofivekingdomsofclassification.

UnitOutcomes:

After completingthisunit,thestudentwillbeableto

- Summarize the basis of life.(L1)
- Understand the difference between lower organisms (prokaryotes) from higher organisms (eukaryotes).(L2)
- Understand how organisms are classified.(L3)

UnitII:IntroductiontoBiomolecules

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA)and theirtypes.Enzymes,EnzymeapplicationinIndustry.Largescaleproductionofenzymesb yFermentation.

UnitOutcomes:

After completingthisunit,thestudentwillbeableto

- Understandwhatarebiomolecules?theirroleinlivingcells,theirstructure,functio nandhowtheyareproduced.(L1)
- Interprettherelationshipbetweenthestructureandfunctionofnucleicacids.(L2)
- Summarizetheapplicationsofenzymesinindustry.(L3)
- Understandwhatisfermentationanditsapplicationsoffermentationinindustry.(L4)

UnitIII:HumanPhysiology

Nutrition:Nutrientsorfoodsubstances.Digestivesystem,Respiratorysystem,(aerobican danaerobicRespiration).Respiratoryorgans,respiratorycycle.Excretorysystem.

UnitOutcomes:

Aftercompletingthisunit,thestudentwillbeableto

- Understandwhatnutrientsare(L1)
- Understandthemechanismandprocessofimportanthumanfunctions(L2&L3)

UnitIV:IntroductiontoMolecularBiologyandrecombinantDNATechnology

ProkaryoticgeneandEukaryoticgenestructure.DNAreplication,TranscriptionandTranslation.rDNAtechnology. Introductiontogenecloning.

UnitOutcomes:

After completingthisunit,thestudentwillbeableto

- Understandandexplainaboutgenestructureandreplicationinprokaryotes andEukaryotes
- Howgeneticmaterial isreplicatedandalsounderstandshowRNAandproteinsaresynthesized.(L2)
- UnderstandaboutrecombinantDNAtechnologyanditsapplicationindifferentfields.(L3)
- Explainwhatiscloning.(L4)

UnitV:ApplicationofBiology

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins,Vaccines andantibodies. Basics of biosensors, biochips, Biofuels, andBioEngineering. BasicsofProductionofTransgenicplants andanimals.

UnitOutcomes:

Aftercompletingthisunit,thestudentwillbeabletoUnderstand.

- Howbiologyisappliedforproductionofusefulproductsformankind.(L1)
- Whatarebiosensors,biochipsetc.(L2)
- Understandtransgenicplantsandanimalsandtheirproduction(L3)

CourseOutcomes:

After studyingthecourse,thestudentwillbeableto:

- Explainaboutcellsandtheir structureandfunction. Differenttypesofcellsandbasicsforclassificationoflivingorganisms.
- Explainaboutbiomolecules, theirstructureandfunctionandtheirroleinthelivingorganisms.Howbiomoleculesareusefulinindustry.
- Brieflyabouthumanphysiology.
- Explainaboutgeneticmaterial,DNA,genesandRNAhowtheyreplicate, passandpreservevitalinformationinlivingOrganisms.
- Know aboutapplicationofbiologicalPrinciplesindifferenttechnologiesforthepro

ductionofmedicinesandPharmaceuticalmoleculesthroughtransgenicmicr obes,plantsandanimals.

Textbooks:

1. P.K.Gupta,CellandMolecularBiology,5thEdition,RastogiPublications-
2. U.Satyanarayana.Biotechnology,Books&AlliedLtd2017

ReferenceBooks:

1. N.A.Campbell,J.B.Reece,L.Urry,M.L.CainandS.A.Wasserman,“Biology:A GlobalApproach”, PearsonEducationLtd,2018.
2. TJohnson,BiologyforEngineers,CRCpress,2011
3. J.M.WalkerandE.B.Gingold,MolecularBiologyandBiotechnology2nded..Pa nimaPublications.PP434.
4. DavidHames,InstantNotesinBiochemistry–2016
5. PhilTunner,A.Mctennan,A.Bates&M.White,InstantNotes– MolecularBiology –-2014

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – II SEMESTER

Course Code		**L**	**T**	**P**	**C**
19A20405	**Electromagnetic Waves and Transmission Lines**	3	0	0	3

Course Objectives:

1. To introduce fundamentals of static and time varying electromagnetic fields.
2. To teach problem solving in Electromagnetic fields using vector calculus.
3. To demonstrate wave concept with the help of Maxwell's equations.
4. To introduce concepts of polarization and fundamental theory of electromagnetic waves in transmission lines and their practical applications.
5. To analyze reflection and refraction of electromagnetic waves propagated in normal and oblique incidences.

Unit I

Vector Analysis: Coordinate systems and transformation-Cartesian, Cylindrical and Spherical coordinates

Vector Calculus: Differential length area and volume, line surface and volume integrals, del operator, gradient, divergent and curl operations.

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, DivergenceTheorem, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

Unit II

Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Magnetic dipole, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems.

Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's equations for time varying fields, Maxwell's Equations in Different Final Forms and Word Statements, Illustrative Problems

Unit III

Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

Unit IV

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal

Reflection, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

Unit V
Transmission Lines: Introduction, Transmission line parameters, Transmission line equivalent circuit, Transmission line equations and their solutions in their phasor form, input impedance, standing wave ratio, Transmission of finite length- half wave, quarter wave transmission line, Smith chart, graphical analysis of transmission lines using Smith chart, stub matching- single and double stub matching, Illustrative Problems.

COURSE OUTCOMES:
After completion of the course, student will be able to
CO1: Explain basic laws of electromagnetic fields and know the wave concept. (L2)
CO2: Solve problems related to electromagnetic fields. (L3)
CO3: Analyze electric and magnetic fields at the interface of different media. (L3)
CO4: Derive Maxwell's equations for static and time varying fields. (L3)
CO5: Analogy between electric and magnetic fields. (L5)
C06: Describes the transmission lines with equivalent circuit and explain their characteristic with various lengths. (L2)

TEXT BOOKS:
1. Matthew N.O. Sadiku, "Elements of Electromagnetics", Oxford Univ. Press, 4th ed., 2008.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", TMH, 7th ed., 2006.

REFERENCES:
1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2nd Edition, 2000.
2. John D. Krauss, "Electromagnetics", McGraw- Hill publication, 4th Edition,1999.
3. Electromagnetics, Schaum's outline series, 2nd Edition, Tata McGraw-Hill publications, 2006.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A20406	**Electronic Circuits –II**	3	0	0	3

Course Objectives:

1. To design and analyze multi-stage amplifiers using BJT & MOSFET at high frequencies.
2. To explain effect of negative feedback on amplifier characteristics.
3. To teach basic principles for analysing RC & LC oscillator circuits.
4. To introduce different types of large signal amplifiers and tuned amplifiers.

Unit I
Differential and Multistage Amplifiers:
The MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT Differential Pair, Other Nonideal Characteristics of the Differential Amplifier, The Differential Amplifier with Active Load, Multistage Amplifiers – RC coupled amplifier – Darlington pair – Cascode amplifier, Problem solving.

Unit II
Frequency Response:
Introduction, Low-Frequency Response of the CS and CE Amplifiers, Internal Capacitive Effects and the High-Frequency Model of the MOSFET and the BJT, High-Frequency Response of the CS and CE Amplifiers, Useful Tools for the Analysis of the High-Frequency Response of Amplifiers, A Closer Look at the High-Frequency Response of the CS and CE Amplifiers, High-Frequency Response of the CG and Cascode Amplifiers, High-Frequency Response of the Source and Emitter Followers, High-Frequency Response of Differential Amplifiers, Other Wideband Amplifier Configurations, Multistage Amplifier Examples, Problem solving.

Unit III
Feedback Amplifiers:
Introduction, The General Feedback Structure, Some Properties of Negative Feedback, The Four Basic Feedback Topologies, The Feedback Voltage Amplifier (Series—Shunt), The Feedback Transconductance Amplifier, The Feedback Transresistance Amplifier (Shunt—Shunt), The Feedback Current Amplifier (Shunt—Series), Summary of the Feedback Analysis Method, Determining the Loop Gain, Problem solving.

Unit IV
Power Amplifiers:
Introduction, Classification of Output Stages, Class A Output Stage, Class B Output Stage, Class AB Output Stage, Biasing the Class AB Circuit, CMOS Class AB Output Stages, Power BJTs, Variations on the Class AB Configuration, IC Power Amplifiers, MOS Power Transistors, Problem solving.

Unit V
Tuned Amplifiers and Oscillators:

Basic principle, Inductor losses, use of transformers, Amplifiers with multiple tuned circuits, Synchronous tuning, Stagger tuning.
Basic Principles of sinusoidal oscillators, Op Amp–RC oscillator circuits, LC and crystal oscillators.

COURSE OUTCOMES:

CO1: Understand the working principle of Feedback amplifiers, power amplifiers and tuned amplifiers. (L1)
CO2: Apply appropriate feedback topology to employ with each of the four amplifier types: voltage, current, transconductance, and transresistance amplifiers. (L2)

CO3: Analyze feedback amplifiers, power amplifiers, and tuned amplifier. Evaluate efficiency of large signal (power) amplifiers and voltage regulators (L3)

CO4: Design feedback amplifiers, oscillators, power amplifiers and tuned amplifiers for given specifications. (L4)

Text Books:

1. Adel S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press International 6th edition, 2013.
2. Donald A Neamen, "Electronic Circuits – analysis and design", 3rd Edition, McGraw Hill (India), 2019.

References:

1. J. Milliman and C Halkias, "Integrated electronics", 2nd Edition, Tata McGraw Hill, 1991.
2. Behzad Razavi, "Microelectronics", Second edition, Wiley, 2013.
3. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits," 9th Edition, Pearson, 2006.
4. Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A20407	**Analog Communications**	3	0	0	3

Course Objectives

1. To introduce various modulation and demodulation techniques of analog communication system.
2. To analyze different parameters of analog communication techniques.
3. Know Noise Figure in AM & FM receiver systems.
4. Understand Function of various stages of AM, FM transmitters and Know Characteristics of AM &FM receivers.
5. Understand the concepts of information theory.

Unit – I

Introduction: Elements of communication systems, Information, Messages and Signals, Modulation, Modulation Methods, Modulation Benefits and Applications.

Amplitude Modulation & Demodulation: Baseband and carrier communication, Amplitude Modulation (AM), Rectifier detector, Envelope detector, Double sideband suppressed carrier (DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Frequency mixer, sideband and carrier power of AM, Generation of AM signals, Single sideband (SSB) transmission, Time domain representation of SSB signals & their demodulation schemes (with carrier, and suppressed carrier), Generation of SSB signals, Vestigial sideband (VSB) modulator & demodulator, Frequency division multiplexing (FDM), Illustrative Problems.

Unit – II

Angle Modulation & Demodulation: Concept of instantaneous frequency, Generalized concept of angle modulation- Frequency Modulation & Phase modulation : Bandwidth of angle modulated waves, Narrow band frequency modulation (NBFM) and Wide band FM (WBFM), Verification of Frequency modulation bandwidth relationship, Features of angle modulation, Generation of FM waves-Indirect method, Direct generation; Demodulation of FM, Band pass limiter, Practical frequency demodulators, Small error analysis, Pre-emphasis, & De-emphasis filters, FM Capture Effect, Illustrative Problems.

Unit – III

Noise in Communication Systems: Thermal noise, Time domain representation of narrowband noise, filtered white noise, Quadrature representation of narrowband noise, Envelope of narrowband noise plus sine wave, Signal to noise ratio & probability of error, Noise equivalent bandwidth, Effective noise temperature, and Noise figure, Baseband systems with channel noise, Performance analysis (i.e. finding SNR expression) of AM, DSB-SC, SSB-SC, FM, PM in the presence of noise, Illustrative Problems.

Unit – IV

Radio Receivers: Working principle of Super heterodyne AM and FM Receivers along with suitable block diagrams, Sensitivity, Selectivity and fidelity.

Analog Pulse Modulation Schemes: Pulse amplitude modulation – Natural sampling, flat top sampling and Pulse amplitude modulation (PAM) & demodulation, Pulse-Time Modulation – Pulse Duration and Pulse Position modulations, and demodulation schemes, PPM spectral analysis, Illustrative Problems.

Unit – V

Information Theory: Introduction, Information and Entropy, and its properties, source coding Theorem, Data Compaction – Prefix coding, Huffman coding, Discrete Memory less channels, Mutual Information, and its properties, Channel capacity, Channel coding Theorem, Application to binary symmetric channels, differential entropy and mutual information, Information capacity theorem, implication of information capacity theorem, Rate Distortion, Illustrative problems.

TEXT BOOKS:

1. B. P. Lathi, "Modern Digital and Analog Communication Systems," Oxford Univ. press, 3rd Edition, 2006.
2. Simon Haykin, "Communication Systems," by John Wiley & Sons,3rdEdition, 2010.
3. Sham Shanmugam, "Digital and Analog Communication Systems", Wiley-India edition, 2006.

REFERENCES:

1. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5th Edition, 2010.
2. Herbert Taub&Donald L Schilling, "Principles of Communication Systems", Tata McGraw- Hill, 3rd Edition, 2009.
3. R.E. Ziemer& W.H. Tranter, "Principles of Communication-Systems Modulation & Noise", Jaico Publishing House, 5thedition, 2001.
4. George Kennedy and Bernard Davis, "Electronics & Communication System", TMH,2004.

Course Outcomes

After completion of the course, student will be able to

CO1: Understand the concepts of various Amplitude, Angle and Pulse Modulation schemes. Understand the concepts of information theory with random processes. (L1)
CO2: Apply the concepts to solve problems in analog and pulse modulation schemes. (L2)
CO3: Analysis of analog communication system in the presence of noise. (L3)
CO4: Compare and contrast design issues, advantages, disadvantages and limitations of various modulation schemes in analog communication systems. (L4)
CO5: Solve basic communication problems & calculate information rate and channel capacity of a discrete communication channel. (L5)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.Tech – II SEM

		L	T	P	C
19A20209	**Control Systems**	3	0	0	3

Course Objectives:

To make the students learn about:

1	Merits and demerits of open loop and closed loop systems; the effect of feedback
2	The use of block diagram algebra and Mason's gain formula to find the overall transfer function
3	Transient and steady state response, time domain specifications and the concept of Root loci
4	Frequency domain specifications, Bode diagrams and Nyquist plots
5	State space modelling of Control system

Course Outcomes:

After completing the course, the student should be able to:

CO1	Understand the concepts of control systems classification, feedback effect, mathematical modelling, time response and frequency response characteristics, state space analysis
CO2	Apply the concepts of Block diagram reduction, Signal flow graph method and state space formulation for obtaining mathematical and Root locus, Bode, Nyquist, Polar plots for stability calculations, controllability and observability and demonstrate the use of these techniques.
CO3	Analyse time response analysis, error constants, and stability characteristics of a given mathematical model using different methods.
CO4	Design and develop different compensators, controllers and their performance evaluation for various conditions. Implement them in solving various engineering applications.

UNIT – I CONTROL SYSTEMS CONCEPTS

Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Principle of operation of DC and AC Servo motor, Transfer function of DC servo motor - AC servo motor, Synchros.

Learning Outcomes: At the end of the unit, the student will be able to

- Write the differential equations for mechanical and electrical systems
- Obtain the transfer function from block diagrams, servo motors and signal flow graphs

UNIT-II TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants, P, PI, PID Controllers.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze the time domain specifications
- Calculate the steady state errors
- Understand about Proportional, Integral and Derivative controllers along with combinations

UNIT – III STABILITY ANALYSIS IN TIME DOMAIN

The concept of stability – Routh's stability criterion – Stability and conditional stability – limitations of Routh's stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

Learning Outcomes: At the end of the unit, the student will be able to

- Analyze the concept of stability in time domain
- Apply the concept of Routh's stability and Root locus in time domain

UNIT – IV FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain margin-Stability Analysis.
Compensation techniques – Lag, Lead, Lag-Lead Compensator design in frequency Domain.

Learning Outcomes: At the end of the unit, the student will be able to

- Evaluate the frequency domain specifications from Bode, Polar and Nyquist plots
- Design Compensators for various systems
- Deducing transfer functions from Bode Plots
- Understand difference between Phase and Gain margins

UNIT – V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, state models - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models. The concepts of controllability and observability, Duality between controllability and observability.

Learning Outcomes: At the end of the unit, the student will be able to

- Understand the concept of state space, controllability and observability
- Obtain the transfer function from sate space and vice versa
- Understand the state transition method of solving time invariant state equations

TEXT BOOKS:

1. "Modern Control Engineering" by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. "Control Systems Engineering" by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition, 2007.

REFERENCE BOOKS:

1. "Control Systems Principles & Design" by M.Gopal, 4th Edition, Mc Graw Hill Education, 2012.
2. "Automatic Control Systems" by B. C. Kuo and FaridGolnaraghi, John wiley and sons, 8th edition, 2003.
3. "Feedback and Control Systems", Joseph J Distefano III, Allen R Stubberud& Ivan J Williams, 2nd Edition, Schaum's outlines, Mc Graw Hill Education, 2013.
4. "Control System Design" by Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, Pearson, 2000.
5. "Feedback Control of Dynamic Systems" by Gene F. Franklin, J.D. Powell and Abbas Emami-Naeini, 6th Edition, Pearson, 2010. \
6. NPTEL Lectures on Control Systems by Prof.C.S.Shankar Ram, IIT Madras.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A25501	**Fundamentals of Python Programming** Common to EEE and ECE	2	0	0	2

Course Objectives:
- To teach the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To train in the development of solutions using modular concepts
- To introduce the programming constructs of python

Course Outcomes: After completion of the course a successful student is able to
- List the basic constructs of Python
- Design programs for data structure list and manipulating strings
- Apply object orientation concepts, use data structure dictionaries
- Organize data in the form of files

Unit – I
Introduction: What is a program, Running python, Arithmetic operators, Value and Types. Variables, Assignments and Statements: Assignment statements, Script mode, Order of operations, string operations, comments.
Functions: Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

Learning Outcomes: Student should be able to

- List the basic constructs of Python (L1)
- Solve the problems by applying modularity principle (L3)

Unit – II
Conditionals and Recursion: floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.
Fruitful Functions: Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types,

Learning Outcomes: Student should be able to
- Apply the conditional execution of the program (L3)
- Apply the principle of recursion to solve the problems (L3)

Unit - III
Iteration: Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.

Strings: A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.

Learning Outcomes: Student should be able to

- Design programs for manipulating strings (L6)

Unit – IV

Lists: List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

Learning Outcomes: Student should be able to

- Apply object orientation concepts (L3)
- Use data structure lists and tuples (L3)

Unit – V

Files: Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.

Classes and Objects: Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying.

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus planning.

Learning Outcomes: Student should be able to

- Organize data in the form of files (L6)
- Plan programs using object orientation approach (L6)

Text books:

- Allen B. Downey, “Think Python”, 2nd edition, SPD/O’Reilly, 2016.

Reference Books:

- Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
- Kenneth A. Lambert, B.L. Juneja, “Fundamentals of Python”, CENGAGE, 2015.
- R. NageswaraRao, “Core Python Programming”, 2nd edition, Dreamtech Press, 2019

Course Outcomes: Student should be able to

- Explain the features of Python language (L2)
- Select appropriate data structure for solving a problem (L4)
- Design object oriented programs for solving real-world problems (L6)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A20408	**Computer Architecture and Organization**	3	0	0	3

Course Objectives:

1. To discuss organization and design of a digital computer.
2. To explain how to use RTL to represent memory and Arithmetic/ Logic/ Shift operations.
3. To introduce computer languages, machine, symbolic and assembly levels.
4. To present organization of central processing unit and concepts of micro-programmed control.
5. To explain how input-output devices communicate with the other components and methods of data transfer.
6. To teach different types of addressing modes and memory organization.

Unit I

Data Representation: Data Types, Complements, Fixed-Point Representation, Conversion of Fractions, Floating-Point Representation, Other Binary Codes

Register Transfer and Micro-operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit

Unit II

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description, Design and Accumulator Logic.

Programming the Basic Computer: Machine Language, Assembly Language, the Assembler, Program Loops, programming arithmetic and logic operations

Unit III

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).

Unit IV

Micro-programmed Control: Control Memory, Address Sequencing, Micro-program example, Design of Control Unit.

Computer Arithmetic: Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-Point Arithmetic Operations.

UNIT V

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

TEXT BOOKS:

1. M. Morris Mano, Computer System Architecture, Pearson Education, Third edition, 2017.

REFERENCES:

1. Carl Hamacher, ZvonkoVranesic and SafwatZaky, Computer Organization, McGraw Hill, 5th Edition
2. John D. Carpinelli, Computer Systems Organization and Architecture, Pearson Education, 2018, Fifteenth reprint
3. William Stallings, “Computer Organization and Architecture: Designing for Performance”, Eighth Edition, Pearson

Course Outcomes:

CO1: Conceptualize basics of organizational and architectural issues of a digital computer (L4)
CO2: Emphasize representation of data types, numbers employed in arithmetic operations and binary coding of symbols used in data processing (L5)
CO3: Develop low-level programs to perform different basic instructions (L5)
CO4: Evaluate various modes of data transfer between CPU and I/O devices (L5)
CO5: Analyze various issues related to memory hierarchy (L3)
CO6: Design basic computer system using the major components (L4)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A20409	Electronic Circuits– II Lab	0	0	3	1.5

Course Objectives:

1. To learn the frequency response and finding gain, input &output impedance of multistage amplifiers.
2. To design negative feedback amplifier circuits and verify the effect of negative feedback on amplifier parameters.
3. To understand the application of positive feedback circuits& generation of signals.
4. To understand the concept of design and analysis of power amplifiers and tuned amplifiers.

LIST OF EXPERIMENTS:

Note: (a) Make use of MOSFETs and BJTs in conducting experiments which are given below. (b) At least four experiments shall be conducted using PSPICE/Multisim from the following list.

1. Design a differential amplifier and find (i) CMRR, (ii) input resistance, (iii) output resistances experimentally.
2. Design a two stage RC coupled amplifier for the given specifications. Determine Gain and Bandwidth from its frequency response curve.
3. Design Darlington amplifier. Determine Gain and Bandwidth from its frequency response curve.
4. Design CE – CB Cascode amplifier. Determine Gain and Bandwidth from its frequency response curve.
5. Design a voltage series feedback amplifier for the given specifications. Determine the effect of feedback on the frequency response of a voltage series feedback amplifier.
6. Design a current shunt feedback for the given specifications. Determine the effect of feedback on the frequency response of a current shunt feedback amplifier.
7. Design and simulate RC Phase shift oscillator and Wien bridge oscillator for the given specification. Determine the frequency of oscillation.
8. Design either Hartley or Colpitts oscillator for the given specifications. Determine the frequency of oscillation.
9. Design a class A power amplifier and find its conversion efficiency.
10. Design a class B push-pull amplifier and find out the efficiency.
11. Design single tuned amplifier. Determine the resonant frequency and bandwidth of a tuned amplifier.
12. Design a double tuned amplifier. Determine the resonant frequency and bandwidth of a tuned amplifier.

Course Out Comes:

After completion of the course, student will be able to

CO2: Analyze negative feedback amplifier circuits, oscillators, Power amplifiers, Tuned amplifiers. (L3)

CO3: Determine the efficiencies of power amplifiers (L2)
CO4: Design RC and LC oscillators using transistors. (L4)
CO3: Simulate all the circuits and compare the performance. (

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A20410	**Analog Communications Lab**	0	0	3	1.5

Course Objectives

- To familiarize the students with basic analog communication systems. Integrate theory with experiments so that the students appreciate the knowledge gained from the theory course.
- Understand all types of analog modulation / demodulation principles.
- Substantiate pulse modulation techniques.
- To design and implement different modulation and demodulation techniques.
- To write and execute programs in MATLAB to implement various modulation techniques.

LIST OF EXPERIMENTS

Conduct any twelve Experiments to be conducted

1. (a) Develop an Amplitude modulation circuit to get modulated signal for various modulation indices. Verify the Spectrum of the modulated signal experimentally and find its Bandwidth.
   (b) Design a suitable demodulated circuit to recover original information signal.
2. Generate a DSB - SC signal using suitable circuit diagram. Extract information bearing signal from DSB-SC signal. Calculate the power of the DSB-SC signal.
3. (a) Develop a Frequency modulation circuit to get modulated signal for various modulation depths. Verify the Spectrum of the modulated signal experimentally and find its Bandwidth.
   (b) Design a suitable demodulated circuit to recover original information signal.
4. (a)Design a Mixer circuit to verify the principle of operation of Mixer experimentally.
   (b)Design a Pre-emphasis & de-emphasis circuit and verify its importance experimentally and plot necessary graph.
5. Construct Pulse Amplitude Modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
6. Construct Pulse Width Modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
7. Construct Pulse Position modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
8. Radio receiver measurements – Sensitivity Selectivity and Fidelity.

Conduct the following experiments using MATLAB software

9. Simulate AM and FM signals and find power spectrum of each signal. Plot the graphs.
10. Simulate PAM and PWM signals and find power spectrum of each signal. Plot the graphs.

11. Generate a complex Gaussian noise (with zero mean unit variance). And pass through an LTI system. Find the power spectrum density of the noise signal available at the output of LTI system.
12. Make use of AM signal from experiment no. 9 add Gaussian noise (with zero mean and unity variance) to the signal. Extract the information bearing signal using suitable system.
13. Simulate Huffman coding.

EQUIPMENT & SOFTWARE REQUIRED:

SOFTWARE:

1. Computer Systems with latest specifications
2. Connected in LAN (Optional)
3. Operating system (Windows XP)
4. Simulations software (MATLAB)

EQUIPMENT:

1. Regulated Power Supply (0-30) V
2. CROs (0-20)MHz
3. Function Generators (0-3) MHz
4. RF Signal Generators (0-1000) MHz
5. Multimeters
6. Required Electronic components (active and passive) for the design of experiments from 1 -7
7. Radio Receiver Demo kits or Trainers.
8. RF power meter frequency range 0 – 1000MHz
9. Spectrum Analyzer

Course Outcomes:

After the completion of the course students able to:

CO1: Understand different analog modulation techniques &Radio receiver characteristics. (L1)

CO2: Analyze different analog modulation techniques. (L3)

CO3: Design and implement different modulation and demodulation techniques. (L4)

CO4: Observe the performance of system by plotting graphs & Measure radio receiver characteristics. (L2)

CO5: Simulate all digital modulation and demodulation techniques. (L5)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – II SEMESTER

Course Code		L	T	P	C
19A25503	**Fundamentals of Python Programming Lab**	0	0	2	1

Course Objectives:

1. To train solving computational problems
2. To elucidate solving mathematical problems using Python programming language
3. To illustrate the features of Python language

Laboratory Experiments

1. Install Python Interpreter and use it to perform different Mathematical Computations. Try to do all the operations present in a Scientific Calculator
2. Write a function that draws a grid like the following:

```
+ - - - -  + - - - - +
|          |         |
|          |         |
|          |         |
|          |         |
+ - - - -  + - - - - +
|          |         |
|          |         |
|          |         |
|          |         |
+ - - - - + - - - - +
```

3. Write a function that draws a Pyramid with # symbols

```
      #
    # # #
  # # # # #
# # # # # # #
      .
      .
      .
```

Up to 15 hashes at the bottom

4. The letters of the alphabet can be constructed from a moderate number of basic elemlents, like vertical and horizontal lines and a few curves. Design an alphabet that can be drawn with a minimal number of basic elements and then write functions that draw the letters. The alphabet can belong to any Natural language excluding English. You should consider at least Ten letters of the alphabet.

5. The time module provides a function, also named time that returns the current Greenwich Mean Time in "the epoch", which is an arbitrary time used as a reference point. On UNIX systems, the epoch is 1 January 1970.

```
>>> import time
>>>time.time()
1437746094.5735958
```

   Write a script that reads the current time and converts it to a time of day in hours, minutes, and seconds, plus the number of days since the epoch.

6. Given n+r+1 <= 2^r .n is the input and r is to be determined. Write a program which computes minimum value of r that satisfies the above.

7. Write a program that evaluates Ackermann function

8. The mathematician SrinivasaRamanujan found an infinite series that can be used to generate a numerical approximation of 1/ **π** :
9. Write a function called estimate_pi that uses this formula to compute and return an estimate of **π.**

$$\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{(k!)^4 396^{4k}}$$

   It should use a while loop to compute terms of the summation until the last term is smaller than 1e-15 (which is Python notation for 10^{-15}). You can check the result by comparing it to math.pi.
10. Choose any five built-in string functions of C language. Implement them on your own in Python. You should not use string related Python built-in functions.
11. Given a text of characters. Write a program which counts number of vowels, consonants and special characters.
12. Given a word which is a string of characters. Given an integer say 'n'. Rotate each character by 'n' positions and print it. Note that 'n' can be positive or negative.
13. Write program which performs the following operations on list's. Don't use built-in functions
    a) Updating elements of a list
    b) Concatenation of list's
    c) Check for member in the list
    d) Insert into the list
    e) Sum the elements of the list
    f) Push and pop element of list

g) Sorting of list
h) Finding biggest and smallest elements in the list
i) Finding common elements in the list

14. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.
15. Write a program that takes a string and prints the letters in decreasing order of frequency.
16. Write a program that reads a word list from a file (see Section 9.1) and prints all the sets of words that are anagrams.
    Here is an example of what the output might look like:
    ['deltas', 'desalt', 'lasted', 'salted', 'slated', 'staled']
    ['retainers', 'ternaries'] ['generating', 'greatening']
    ['resmelts', 'smelters', 'termless']
17. Consider all the files on your PC. Write a program which checks for duplicate files in
    your PC and displays their location. Hint: If two files have the same checksum, they probably have the same contents.
18. Write a program illustrating the object oriented features supported by Python.
19. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format(0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31) following the leap year rules.
20. Design a Python Script to determine the time difference between two given times in HH:MM:SS format.(0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59)

Course outcomes: Student should be able to

1. Design solutions to mathematical problems (L6)
2. Organize the data for solving the problem (L6)
3. Develop Python programs for numerical and text based problems (L3)
4. Select appropriate programming construct for solving the problem (L5)
5. Illustrate object oriented concepts (L3)

Reference Books:

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, “How to Think Like a Computer Scientist: Learning with Python 3”, 3rd edition, Available at http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
2. Paul Barry, “Head First Python a Brain Friendly Guide” 2nd Edition, O’Reilly, 2016
3. DainelY.Chen “Pandas for Everyone Python Data Analysis” Pearson Education, 2019

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

II B.TECH – II SEMESTER

		L	T	P	C
19A10804	**Environmental Science**	3	0	0	3

OBJECTIVE: To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

UNIT – I:
MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: – Definition, Scope and Importance – Need for Public Awareness.
NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – II:
ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III:
ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution

e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT : Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV:
SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V:
HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health –

FIELD WORK : Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

TEXT BOOKS :
(1) Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
(2) Environmental Studies by Palani Swamy – Pearson education
(3) Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

REFERENCES :
(1) Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Pubilications.
(2) Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
(3) Comprehensive Environmental studies byJ.P.Sharma, Laxmi publications.
(4) Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
(5) A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Pubilishing House

(6) Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

III B.Tech I Sem	**L**	**T**	**P**	**C**
	2	**0**	**0**	**2**

19A50401 **INTEGRATED CIRCUITS AND APPLICATIONS**

Course Objectives:

- To introduce basic building blocks of Op-Amps & specialized ICs.
- To explain DC and AC performance characteristics of Op-Amps.
- To impart knowledge on linear and non-linear applications of Op-Amps.
- To describe operation & characteristics of data converters.
- To design various circuits using Op-Amps and 555 timer.
- To familiarise specialised ICs such as VCO, PLL, voltage regulators.

UNIT- I

Operational Amplifier: Introduction, Block diagram, Characteristics and Equivalent circuits of an ideal op-amp, Various types of Operational Amplifiers and their applications, Inverting and non-inverting amplifier configurations. The Practical op-amp: Introduction, Input offset voltage, Offset current, Thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and Gain – bandwidth product.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand different Offsets present in Op amp & nullification circuits.
- Examine performance of Op-Amp in open loop and closed configurations.
- Analyse emitter-coupled differential amplifier.
- Compare ideal and practical Op-Amps.

UNIT- II

Applications of Operational Amplifier: Amplifiers: Adder, Integrator, Differentiator, Difference amplifier and Instrumentation amplifier, Converters: Current to voltage and voltage to current converters, Active Filters: First order filters, second order active finite and infinite gain low pass, high pass, band pass and band reject filters, Sine Wave Oscillators: RC phase shift oscillator, Wien bridge oscillator.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe operation of Op-Amp based Linear application circuits, converters, amplifiers and non-linear circuits.
- Examine different types of oscillators & active filters with detailed mathematical analysis and illustrations.
- Design circuits such as amplifiers, comparator, differentiators and integrators using operational amplifiers for various applications, Design active filters and oscillators using Op amp for given specifications.

UNIT- III

Non-Linear Applications of Operational Amplifier: Comparators: Inverting comparator, non-inverting comparator, Schmitt Trigger.

Waveform Generators: Square wave and triangular wave generator with duty cycle modulation, Half and full wave precision rectifiers, log and antilog amplifiers, voltage to frequency converter, frequency to voltage converter.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe operation of Op-Amp based comparators, converters, detectors, rectifiers, sample & hold circuits and waveform generators.
- Analyse Op-Amp based Comparators, converters, detectors, rectifiers, sample & hold circuits and waveform generators.
- Design Wave form generators, voltage to frequency converters & frequency to voltage converters for given specification.

UNIT- IV

Data Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC. Dual Slope ADC, DAC and ADC Specifications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain operation principles of different A/D & D/A converters.
- Compare different types of A/D & D/A converter circuits.
- Inspect ADC & DAC specifications to select the right converter for an application.

UNIT -V

Special Purpose Integrated Circuits: Functional block diagram, working, design and applications of Timer 555 (Monostable&Astable), Functional block diagram, working and applications of VCO 566, PLL 565, voltage regulators.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe internal circuit operation of 555 timer, IC voltage regulators
- Describe functionality of special purpose ICs such as VCO, PLL.
- Design multi-vibrator circuits using timer.

Course Outcomes:

- Understand DC and AC characteristics of operational amplifiers & Op amp parameters and functionality of specialized ICs such as 555 TIMER, VCO, PLL & Voltage regulators.
- Make use of Op-Amps and specialized ICs to design circuits for various applications.
- Analyze Op-Amp based Comparators, Waveform generators, Active filters, Converters.
- Design of Op amp based Comparators, Waveform Generators, Active filters, Converters, design various multi-vibrator circuits using IC 555 timer
- Compare different types of A/D and D/A Converter circuits.

Textbooks:

1. Ramakanth A. Gayakwad, “Op-Amps and Linear Integrated Circuits”, 4thEdition, Pearson, 2017.

2. D. Roy Choudhury,"Linear Integrated Circuits", 2nd Edition, New Age International (p) Ltd., 2003.

Reference Books:

1. Sergio Franco, "Design with Operational Amplifiers &Analog Integrated Circuits", 3rd edition, McGraw Hill, 1988.
2. Jacob Millman, Christos C. Halkias, "Integrated Electronics - Analog and Digital circuits system", Tata McGraw Hill, 2003.
3. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", 5th edition Wiley International, 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A50402 **ANTENNAS AND WAVE PROPAGATION**

Course Objectives:

- To introduce radiation mechanisms and basic characteristics of antennas.
- To derive mathematical expressions and their application for complete design of antennas.
- To demonstrate various modes of EM wave propagation.
- To explain measurement of antenna parameters
- To introduce design concepts of various types of antennas including micro strip antenna.

UNIT- I

Antenna Characteristics: Radiation mechanism and current distribution, radiation pattern, directivity, gain, Input impedance, polarization, bandwidth, HPBW. Reciprocity, equivalence of radiation and receive patterns, equivalence of impedances, effective aperture, vector effective length, antenna temperature, Friis transmission formula, problem solving.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand radiation mechanism and basic antenna characteristics.
- Compute radiation intensity, gain and directivity of antennas.

UNIT- II

Wire and Antenna Arrays: Wire and antenna arrays: Radiation resistance and directivity and other characteristics of short dipole, monopole, half-wave dipole, small loop antenna.
Linear array and pattern multiplication, two-element array, uniform array, binomial array, broadside and end-fire arrays.
Rhombic antennas, Yagi-Uda array, Turnstile Antenna, Helical antenna - axial and normal modes, log-periodic Array, spiral antenna.

Learning Outcomes:

At the end of this unit, the student will be able to

- Derive expressions for radiation resistance, directivity of wire antennas.
- Obtain radiation pattern of various array antennas using pattern multiplication.
- Compare radiation pattern and other antenna parameters of broadside and endfire array antennas.
- To know the design aspects of antenna arrays.

UNIT- III

Aperture Antennas and Lens Antennas: Aperture Antennas and Lens Antennas: Slot antenna, pyramidal and conical horn antennas, reflector Antenna: flat plate, corner and parabolic reflectors - common curved reflector shapes, Feed mechanisms.
Lens Antennas - Introduction, Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications.

Learning Outcomes:
At the end of this unit, the student will be able to
- Understand basic principles of aperture and lens antennas.
- Design aperture and lens antennas.

UNIT- IV
Micro-Strip Antennas And Antenna Measurements: Micro-strip Antennas and Antenna Measurements: Basic characteristics, feeding methods, methods of analysis - Design of Rectangular and Circular Patch Antennas, Introduction to Smart Antennas - Concept of adaptive beam forming, Measurement of Antenna Parameters, basic setup, radiation pattern measurement, gain, directivity.

Learning Outcomes:
At the end of this unit, the student will be able to
- Describe feeding methods for micro-strip antennas.
- Apply the concepts to measure antenna parameters.
- Design rectangular and circular patch antennas for given specifications.

UNIT- V
Wave Propagation - I: Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Quantitative Treatment) - Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections, Space Wave Propagation - Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super retraction, M- Curves and Duct Propagation, Scattering Phenomena, Tropospheric Propagation.
Wave Propagation - II: Sky Wave Propagation - Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and skip Distance, Multi-hop Propagation, illustrative problems.

Learning Outcomes:
At the end of this unit, the student will be able to
- Understand effects of earth’s magnetic field on wave propagation
- Apply the concepts to solve problems related to wave propagation
- Analyze tropospheric propagation and derive the expression for received field strength
- Identify layers in ionosphere and their ionization densities

Course Outcomes:
- Understand various antenna parameters, principle of operation of various antennas viz. wired, aperture, micro strip antennas.
- Discuss various EM wave propagation methods in ionosphere and troposphere
- Analyze mathematical aspects of wave propagation, Derive expressions related to radiation mechanisms for antennas

- Design various antennas namely array, micro strip, horn, lens and aperture antennas, etc., for a given application.
- Compare performance of various antennas.

Textbooks:

1. John D. Kraus, Ronald J. Marhefka, Ahmad S. Khan, “Antennas and Wave Propagation”, 4th Edition, TMH, 2010.
2. Jordan, E.C. and Balmain. K. G., “Electromagnetic Waves and Radiating Systems”, Prentice Hall Publications.

Reference Books:

1. Constantine A. Balanis, “Antenna Theory-Analysis and Design”, Wiley Publication, 2016.
2. K.D. Prasad, “Antenna & Wave Propagation”, Satya Prakash Publications, 2009.
3. Matthew N.O.Sadiku, “Principle of Electromagnetics”, 4th edition, Oxford (International), 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A50403 **DIGITAL COMMUNICATIONS**

Course Objectives:

- To understand the key modules of digital communication systems with emphasis on digital modulation techniques.
- To get introduced to the concept and basics of information theory and the basics of source and channel coding/decoding.
- To prepare mathematical background for communication signal analysis.
- To study signal flow in a digital communication system.
- To analyze error performance of a digital communication system in presence of noise and other interferences.

UNIT- I

Source Coding Systems: Introduction, sampling process, quantization, quantization noise, conditions for optimality of quantizer, encoding, Pulse-Code Modulation (PCM), Line codes, Differential encoding, Regeneration, Decoding & Filtering, Noise considerations in PCM systems, Time-Division Multiplexing (TDM), Synchronization, Delta modulation (DM)-Granular noise Slope over distortion, Differential PCM (DPCM), Processing gain, Adaptive DPCM (ADPCM), Comparison of the above systems, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand source coding techniques & pulse modulation techniques.
- Describe and determine the performance of line codes.
- Analyze different pulse modulation techniques &Distortions.
- Compare the performance different pulse modulation Schemes.

UNIT- II

Baseband Pulse Transmission: Introduction, Matched filter, Properties of Matched filter, Matched filter for rectangular pulse, Error rate due to noise, Inter-symbol Interference (ISI), Nyquist's criterion for distortion less baseband binary transmission, ideal Nyquist channel, raised cosine filter & its spectrum, Correlative coding – Duo binary & Modified duo binary signalling schemes, Partial response signalling, Baseband M-ary PAM transmission, Eye diagrams, Illustrative Problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze the performance of baseband pulse transmission system.
- Describe the generation & detection of pass band modulated signals.
- Analyze probability of error for various pass band data transmission schemes.
- Compare the power bandwidth required for various pass band data transmission scheme.

UNIT- III
Signal Space Analysis: Introduction, Geometric representation of signals, Gram-Schmidt orthogonalization procedure, Response of bank of correlators to noisy input, Coherent detection of signals in noise - maximum likelihood decoder, Probability of error, Correlation receiver, detection of signals with unknown phase, Illustrative Problems.

Learning Outcomes:
At the end of this unit, the student will be able to
- Understand the concepts of signal space analysis.
- Examine the characteristics of maximum likelihood decoder.
- Analyze correlation receiver.

UNIT- IV
Passband Data Transmission: INTRODUCTION, Passband transmission model, Coherent modulation schemes- Generation and detection of binary phase shift keying (BPSK), Quadrature shift keying (QPSK), and Binary Frequency shift keying (BFSK). Analysis of probability of error for BPSK, QPSK, BFSK, Power spectra of above mentioned modulated signals. M-ary PSK, M-ary quadrature amplitude modulation (M-ary QAM), Non-coherent orthogonal modulation schemes - Generation and detection of non-coherent BFSK, DPSK - analysis of probability of error and Comparison of power bandwidth requirements for all the above schemes, Illustrative Problems.

Learning Outcomes:
At the end of this unit, the student will be able to
- Analyse the different digital modulation techniques, generation and detection, power spectra and their probability of error performance.
- Compare the power bandwidth, bit error probability for various modulation schemes.

UNIT- V
Channel Coding: Discrete memory less channels, Linear Block Codes-Repetition codes, Syndrome decoding, minimum distance considerations, Cyclic codes- generator polynomial, parity check polynomial, encoder for cyclic code, calculation of syndrome, Convolutional Codes – generator polynomials, state diagrams, Viterbi algorithm, Illustrative problems.

Learning Outcomes:
At the end of this unit, the student will be able to
- Understand various error control encoding and decoding techniques.
- Apply information theory and linear algebra in source coding and channel coding.
- Analyse the performance of error control codes.

Course Outcomes:
- Understand the elements of digital communication system, baseband pulse transmission, pass band digital modulation, geometric representation of signals, basics of information theory and error correcting codes.

- Apply the knowledge of signals and system & statistical theory to evaluate the performance of digital communication systems.
- Analyze the different coding, modulation techniques, Probability of error performance of digital system.
- Compare the performance of different modulation schemes& error correcting codes.

Textbooks:

1. Simon Haykin, "Communication Systems", Wiley India Edition, 4th Edition, 2011.
2. B.P. Lathi, &Zhi Ding, "Modern Digital &Analog Communication Systems", 4^{th}edition, Oxford University Press, International 2010.

Reference Books:

1. Sam Shanmugam, "Digital and Analog Communication Systems", 3^{rd} Edition, John Wiley, 2005.
2. Bruce Carlson, and Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", 5^{th} Edition, McGraw-Hill International Edition, 2010.
3. Bernard Sklar, "Digital Communications", 2^{nd} edition, Prentice-Hall PTR, 2001.
4. Herbert Taub and Donald L Schilling, "Principles of Communication Systems", 3^{rd}Edition, Tata McGraw-Hill, 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.TECH III–I SEM

		L	T	P	C
19A55501	**English Language Skills**	3	0	0	3

Course Description:
English Language Skills aims to enable the engineering students to meet the demands of the modern job market through thorough training in LSRW skills, presentation skills, interview skills, academic writing etc. Students of our region have knowledge of their respective subjects, but the surveys make it clear that they are lagging behind in expressing themselves effectively in a professional setting. So this course will enable them to hone these skills and excel in their respective fields.

Course Objectives:
- To develop awareness in students of the relevance and importance of technical communication and presentation skills.
- To prepare the students for placements
- To sensitize the students to the appropriate use of non-verbal communication
- To train students to use language appropriately for presentations and interviews
- To enhance the documentation skills of the students with emphasis on formal and informal writing

Course Outcomes:
CO1: To recall and memorize the basic concepts of effective communication
CO2: To understand the various components of effective communication.
CO3: To apply writing skills in order to meet the demands of work place environment.
CO4: To analyze verbal and non-verbal interpretations in multicultural context.
CO5: To evaluate different aspects of verbal and linguistic competence to become effective presenters.
CO6: To design and develop an effective written document in technical domain.

UNIT 1: LSRW SKILLS
Introduction to LSRW Skills – Definition – Importance of LSRW Skills - Advantages and Disadvantages of Oral and Written Skills – Advantages and disadvantages of Written & Speaking skills - Barriers to effective communication
Learning Outcomes:
- To recall and memorize the basic concepts of LSRW skills
- To understand the various components of oral and written skills
- To apply English language skills to avoid barriers to effective communication

UNIT II: VERBAL & NON-VERBAL SKILLS
Informal and Formal Conversation - Non-verbal Skills–Kinesics, Proxemics, Chronemics, Haptics, Oculesics , Paralinguistic features – Body language for interviews
Learning Outcomes:
- To understand the basic components of non-verbal communication.
- To apply the knowledge of the difference between informal and formal conversation in order to meet the demands of work place environment.
- To analyze non-verbal interpretations in multicultural context.

UNIT III: ACADEMIC WRITING SKILLS
Writing Skills–Art of condensation- summarizing and paraphrasing - Abstract Writing, Synopsis Writing – Formal Letter Writing - Report Writing
Learning Outcomes:
- To understand the basic components of written communication.
- To apply knowledge of different formats of written communication needed in work place environment.
- To analyze the structure of letters, reports etc.

UNIT IV: CREATIVE WRITING SKILLS
Film Review Writing – Creative Writing- Short Story Writing – Speeches for academic settings – Writing Skits – Script for Short Films/Web Series
Learning Outcomes:
- To apply writing skills in creative writing to meet the demands of documentation in professional life
- To analyze different figures of speech in creative writing
- To evaluate different aspects creative and academic writing to become effective at written communication

UNIT V: PROFESSIONAL SPEAKING SKILLS
Job Interviews –Types of Job Interviews – Characteristics of a job interview - Interview Preparation Techniques –How to overcome Stage fright
Group Discussions(GD): Importance of Group Discussion- Characteristics of a GD - GD as a tool for selection – GD Strategies – Do's & Don't of GD - GD Vs Debates

Learning Outcomes:
- To analyze the different aspects of interviews and group discussions
- To evaluate the group dynamics to excel in group discussions
- To design and develop strategies to answer effectively in interviews

Text Books:

1. Effective Technical Communication, Ashrif Rizvi, TataMcGrahill, 2011
2. Technical Communication by Meenakshi Raman & Sangeeta Sharma,3rd Edition, O U Press 2015

References:
1. Communication Skills by Pushpalatha& Sanjay Kumar, Oxford Univsesity Press
2. Books on TOEFL/GRE/GMAT/CAT/IELTS by Barron's/DELTA/Cambridge University Press.2012.
3. Soft Skills for Everyone, Butterfield Jeff, Cengage Publications, 2011.
4. Management Shapers Series by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
5. Successful Presentations by John Hughes & Andrew Mallett, Oxford.
6. Winning at Interviews by Edgar Thorpe and Showick Thorpe, Pearson

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-I Sem	L	T	P	C
	3	0	0	3

19A50404 ELECTRONIC MEASUREMENTS & INSTRUMENTATION

Professional Elective-I

Course Objectives:

1 To provide an understanding of various measuring systems functioning and metrics for performance analysis.
2 Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3 Provides understanding of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes:

CO-1 Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
CO-2 Measure various physical parameters by appropriately Measuring equipments.
CO-3 Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
CO-4 Able to design various bridge models different classes of transducers.

UNIT I

Performance characteristics of Instruments: Static characteristics, Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC ammeters, DC voltmeters-multirange, range extension/solid state and differential voltmeters, AC voltmeters –multirange, range extension. Thermocouple type RF ammeter, ohm meters, series type, shunt type, multimeter for voltage, current and resistance measurements.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand various Performance characteristics of Instruments.
- Apply information in understanding Errors in Measurement, and their statistical analysis.
- Analyse the performance of various parameters of AC & DC Ammeters and Voltmenters.

UNIT II

Oscilloscopes: Standard specifications of CRO,CRT features, derivation of deflection sensitivity, vertical and horizontal amplifiers, horizontal and vertical deflection systems, sweep trigger pulse, delay line, sync selector circuits, probes for CRO – active, passive, and attenuator type, triggered sweep CRO, and Delayed sweep, dual trace/beam CRO, Measurement of amplitude, frequency and phase (Lissajous method).Principles of sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Digital frequency counters, time & Period measurements.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand concept of different types of Oscilloscopes.

- Apply information in understanding Measurement of amplitude, frequency and phase (Lissajous method).
- Analyse the performance of Principles of sampling, Digital frequency counters, time & Period measurements

UNIT III

Signal generators-fixed and variable, AF oscillators, function generators, pulse, random noise, sweep, and arbitrary waveform generators, their standards, specifications and principles of working (Block diagram approach).Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand concept of Signal generators-fixed and variable Oscillators.
- Understand concept of various Signals standards, specifications and principles of working
- Analyse the performance of Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers

UNIT IV

Review of DC Bridges: Wheatstone bridge, Wein Bridge, errors and precautions in using bridges, AC bridges: Measurement of inductance-Maxwell's bridge, Anderson Bridge. Measurement of capacitance- Schearing Bridge.Kelvin Bridge, Q-meter, EMI and EMC, Interference and noise reduction techniques.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand concept of DC Bridges.
- Understand concept of AC Bridges
- Analyse the performance of Measurement of capacitance for various bridge models

UNIT V

Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples, and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

Learning Outcomes:

At the end of this unit, the student will be able to

- Learn about the concept of Sensors and Transducers.
- Understand concept of Active and passive transducers
- Analyse the performance of Measurement of displacement

Textbooks:

1. A.D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 5th Edition, 2002.
2. H.S.Kalsi, "Electronic instrumentation", second edition, Tata McGraw Hill, 2004.

Reference Books:

1. Ernest O Doebelin and Dhanesh N Manik, "Measurement Systems Application and Design", TMH, 5th Edition, 2009.
2. Oliver and Cage, "Electronic Measurement and Instrumentation", TMH.
3. Robert A.Witte, "Electronic Test Instruments, Analog and Digital Measurements", Pearson Education, 2nd Ed., 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A50405 **MACHINE LEARNING**
Professional Elective-I

Course Objectives:
1 To provide an understanding of various Statistics and Statistical Hypothesis Testing methods
2 Provides understanding of principle supervised and Unsupervised Learning methods from Machine Learning basics.
3. Provides understanding of various machine learning algorithms and python libraries.
4. Able to unserstand concept of Neural networks and activation function.

COURSE OUTCOMES
CO-1 Identify the various statistical learning and statistical hypothesis testing methods.
CO-2 Understand concept of machine learning basics for supervised and unsupervised learning.
CO-3 Analyze various types of Machine learning algorithms and python libraries.
CO-4 Understand basics of Neural networks and activation functions.

Unit -I
Statistics
What is Statistics?, Statistics vs Machine Learning, Statistical Learning, Examples of Statistics in Machine Learning: overview,Gaussian distribution, Sample vs Population, Test Dataset, Central Tendencies, Variance, Describing a Gaussian, Simple Data Visualization.

Statistical Hypothesis Testing: Statistical Test Interpretation, Errors in Statistical Tests, Degrees of Freedom in Statistics, Statistical Distributions: Distributions, Gaussian distribution, Student's t-Distribution, Chi-Squared Distribution,Critical Values, Covariance and Correlation, Significance Tests.

Learning Outcomes:
- Discuss basics of statistics vs Machine learning.
- Explain different types of example in machine learning for data visualization
- Analyze different Statistical Test and Statistical Distribution methods

Unit -II
Machine Learning Basics
Supervised Learning,Classification and Regression, Generalization, Over fitting, and Under fitting, Supervised Machine Learning Algorithms, Some Sample Datasets,k-Nearest Neighbors,Linear Models, Naive Bayes,Classifiers,Decision Trees,Ensembles of Decision Trees, Kernelized Support Vector Machines,Neural Networks (Deep Learning),Uncertainty Estimates from Classifiers, The Decision Function, Predicting Probabilities, Uncertainty in Multiclass Classification.
Unsupervised Learning and Preprocessing.
Types of Unsupervised Learning,Challenges in Unsupervised Learning, Preprocessing and Scaling, Different Kinds of Preprocessing, Applying Data Transformations, Scaling Training and Test Data the Same Way,The Effect of Preprocessing on Supervised Learning, Dimensionality Reduction, Feature Extraction, and Manifold Learning, Principal Component

Analysis (PCA),Non-Negative Matrix Factorization (NMF),Manifold Learning with t-SNE,Clustering,k-Means Clustering, Agglomerative Clustering ,DBSCAN.

Learning Outcomes:

- Discuss basics of Machine learning basics for supervised and unsupervised processing.
- learn different types of linear models and preprocessing methods
- Analyze classifiers and data transformations

Unit – III

Machine Learning Algorithm Performance Metrics

Algorithm Evaluation Metrics, Classification Metrics, Regression Metrics, Spot-Check Classification Algorithms, Algorithm Spot-Checking, Linear Machine Learning Algorithms, Nonlinear Machine Learning Algorithms, Spot-Check Regression Algorithms.

Learning Outcomes:

- Discuss basics of Machine learning basics algorithm metrics
- learn different types of classification metrics and algorithms

Unit –IV

Python Libraries: Matplotlib, Numpy, pandas, requests, Scikit-learn, NuPIC, Ramp, Pipenv, TensorFlow, Bob, PyTorch, Pybrain, MILK, Keras, Dash, SQLAlchemy, BeautifulSoup, Pyglet, SciPy,Scrapy, PyGame, Python Twisted, Pillow, pywin32, wxPython, iPython, Nose, Flask, SymPy, Fabric, PyGTK, Theano, Sympy, Caffe2, Seaborn, Hebel, chainer, openCVPython, NLTK, SQLAlchemy, Bakeh.

Estimation with Cross-Validation: k-Fold Cross-Validation, Configuration of k, Cross-Validation in Python, Variations on Cross-Validation.

Learning Outcomes:

- learning basics python libraries
- Understand cross validation using python

Unit -V

Neural Networks Introduction

History of Neural Networks, Structure and functions of biological and artificial neuron, Neural network architectures, learning methods, evaluation of neural networks, Regularization, Normalization, Activation Function, loss functions, Gradient descent algorithm optimization.

Learning Outcomes:

- Discuss basics of Neural Networks functions and architecture
- Learn different learning methods and activation functions

Textbooks:

1. Jason brownlee “Statistical methods for machine learning – Discover how to transform data into knowledge with python”, Machine learning mastery, 2018.
2. José Unpingco, “Python for Probability, Statistics, and Machine Learning”, Springer, 2^{nd} Edition.

Reference Books:

1. Andreas C. Müller and Sarah Guido, “Introduction to Machine Learning with Python A Guide for Data Scientists”, O’Reilly, 1st Edition, 2016.
2. J.M. Zurada, “Introduction to Artificial Neural Systems” - Jaico Publishing House, 2001.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A50406 **SENSORS AND ACTUATORS**

Professional Elective-I

Course Objectives:

- To provide basic knowledge about sensors used in Process industry, manufacturing industry and Automated plants.
- To provide basic knowledge about various Actuation and Mechanical Actuation Systems, manufacturing industry and Automated plants

Course Outcomes:

- Students able to understand the various sensors and Actuators used in process Industry
- Knowledge about different types of mechanical and electromechanical sensor
- Analyze various designs of Thermal sensors – types, sensitivity and specifications
- Design the various types of Radiation sensors design and Electical Actuation Systems

UNIT-I

Definition, principle of sensing &transduction, classification, parameters-Characterstics: static and Dynamic, Characterization, performance characterstics of Instrumentation system.

Mechanical and Electromechanical sensor: Resistive (potentiometric type): Forms, material, resolution, accuracy, sensitivity. Strain gauge: Theory, type, materials, design consideration, sensitivity, gauge factor, variation with temperature, adhesive, rosettes. Inductive sensor: common types- Reluctance change type, Mutual inductance change type, transformer action type, Magnetostrictive type, brief discussion with respect to material, construction and input output variable, Ferromagnetic plunger type, short analysis. LVDT: Construction, material, output input relationship, I/O curve, discussion. Proximity sensor.

Learning Outcomes:

- Learn fundamentals of principle of sensing & transduction and Characterization
- Explain , Discuss different types of mechanical and electromechanical sensor
- Analyze construction , performance of sensitivity

UNIT-II

Capacitive sensors: variable distance-parallel plate type, variable area- parallel plate, serrated plate/teeth type and cylindrical type, variable dielectric constant type, calculation of sensitivity. Stretched diaphragm type: microphone, response characteristics.

Piezoelectric element: piezoelectric effect, charge and voltage co-efficient, crystal model, materials, natural & synthetic type, their comparison, force & stress sensing, ultrasonic sensors.

Learning Outcomes:

- Discuss design of Capacitive sensors – types, caluculations and its Characterization
- Explain , Discuss Piezoelectric element and ultrasonic sensors

UNIT-III

Thermal sensors: Material expansion type: solid, liquid, gas & vapor, Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermister material, shape, ranges and accuracy specification. Thermoemf sensor: types, thermoelectric power, general consideration, Junction semiconductor type IC and PTAT type. **Radiation sensors:** types, characteristics and comparison. Pyroelectric type.

Learning Outcomes: :

- Discuss design of Thermal sensors – types, sensitivity and specifications
- Explain Thermoemf sensor, Radiation sensors, –types, Pyroelectric type, characteristics and comparison

UNIT-IV

Magnetic sensors: Sensor based on Villari effect for assessment of force, torque, proximity, Wiedemann effect for yoke coil sensors, Thomson effect, Hall effect, and Hall drive, performance characteristics. Radiation sensors: LDR, Photovoltaic cells, photodiodes, photo emissive celltypes, materials, construction, response. Geiger counters, Scintillation detectors.

Learning Outcomes:

- Discuss effects of vilalri and wiedemann - for yoke coil magnetic sensors.
- Explain different types of Radiation sensors design

UNIT - V:

Actuators Pneumatic and Hydraulic Actuation Systems- Actuation systems – Pneumatic and hydraulic systems - Directional Control valves – Presure control valves – Cylinders - Servo and proportional control valves – Process control valves – Rotary actuators. Mechanical Actuation Systems- Types of motion – Kinematic chains – Cams – Gears – Ratchet and pawl – Belt and chain drives – Bearings – Mechanical aspects of motor selection. Electrical Actuation Systems-Electrical systems -Mechanical switches – Solid-state switches Solenoids – D.C. Motors – A.C. motors – Stepper motors.

Learning Outcomes:

- Discuss various types of actuation systems and measurement of control values.
- Explain different types of Electical Actuation Systems

Textbooks:

1. D. Patranabis – "Sensors and Transducers" –PHI Learning Private Limited.
2. Andrzeji M.Pawlak, "Sensors and Actuators design and applications", T&F group.

Reference Books:

1. Ramon Pallas- Areny, "Sensors and Signal Conditioning", John G.Webster, 2nd Edition.
2. Jon Wilson, "Sensor Technology Hand Book", Newnes, 2004.
3. Herman K.P.Neubrat, "Instrument Transducers – An Introduction to their Performance and design", Oxford University Press.
4. H.S.Kalsi, "Electronic Instrumentation", McGraw Hill Education, 3rd Edition, 2017.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A50407 **ANALOG ELECTRONICS**
Open Elective-I

Course Objectives:

- To understand the characteristics of various types of electronic devices and circuits .
- To apply various principles of electronic devices and circuits to solve complex Engineering problems .
- To analyze the functions of various types of electronic devices and circuits .
- To evaluate the functions of various types of electronic devices and circuits in real time applications .
- To design various types of electronic circuits for use in real time applications .

UNIT-I
Diodes and Applications
Characteristics of PN junction diode and Zener diode. Applications of PNdiode as a switch, rectifier and Zener diode as voltage regulator. Special purpose diodes: photodiode and LED.

Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the characteristics of various types of diodes .
- Apply the principles of diodes to solve complex Engineering problems .
- Analyze the functions of diodes in forward and reverse bias conditions .
- Evaluate the functions of diodes in real time applications .
- Design rectifiers and switches using diodes .

UNIT-II
BJT and its Applications
Construction, Operation, and Characteristics in CE, CB and CC configurations. Fixed-Bias and Voltage Divider-Bias. Applications as switch and amplifier.
Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the characteristics and biasing of BJT .
- Apply the principles of BJT to solve complex Engineering problems .
- Analyse the functions of BJT in various configurations .
- Evaluate the functions of BJT in real time applications .
- Design amplifiers and switches using BJT .

UNIT-III
FETs and Applications
JFETs: Construction, Operation, and Characteristics in CS configurations. Fixed-Bias and Voltage Divider -Bias. Applications as switch and amplifier.

MOSFETs: Construction, Operation, and Characteristics of Enhancement and Depletion modes in CS configurations. Biasing in Enhancement and Depletion modes. Applications as switch.

Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the characteristics and biasing of FETs .
- Apply the principles of FETsto solve complex Engineering problems .
- Analyze the functions of FETs in CS configuration .
- Evaluate the functions of FETs in real time applications .
- Design amplifiers and switches using FETs .

UNIT-IV
Feedback Amplifiers and Oscillators
Feedback Amplifiers: Concept of feedback, General characteristics of negative feedback amplifiers, Voltage-series, Current-series, Voltage-shunt, and Current-shunt feedback amplifiers.
Oscillators: Conditions for oscillations, Hartley and Colpitts oscillators, RC phase-shift and Wien-bridge oscillators.

Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the concept of negative & positive feedback and characteristics feedback amplifiers .
- Apply the principles of feedback amplifiers and oscillators to solve complex Engineering problems .
- Analyze the functions of feedback amplifiers and oscillators .
- Evaluate the functions of feedback amplifiers and oscillators in real time applications .
- Design feedback amplifiers and oscillators for specific applications .

UNIT-V
Wave Shaping and Linear Integrated Circuits
Wave Shaping: Introduction, Waveform Shaping Circuits –RC and RL Circuits. Clippers, Comparator and Clampers.
Linear Integrated Circuits: Operational Amplifier: Characteristics, Block diagram, Applications – Inverting, Non-inverting, Summing amplifier, Subtractor, Voltage Follower.
Learning Outcomes:
At the end of the unit, the student should be able to

- Understand the operation of Wave-Shaping and Linear Integrated Circuits .
- Apply the principles of Wave-Shaping and Linear Integrated Circuits to complex Engineering solve problems .
- Analyse the functions of Wave-Shaping and Linear Integrated Circuits .
- Evaluate the functions of Wave-Shaping and Linear Integrated Circuits in real time applications .
- Design Wave-Shaping and Linear Integrated Circuits for specific applications .

Note: In all the units, only qualitative treatment is required.

Course Outcomes:
At the end of the course, the student should be able to

- Understand the characteristics of various types of electronic devices and circuits
- Apply various principles of electronic devices and circuits to solve complex
- Engineering problems
- Analyse the functions of various types of electronic devices and circuits, Evaluate the functions of various types of electronic devices and circuits in real time applications
- Design various types of electronic circuits for use in real time applications.

Textbooks:

1. S. Salivahanan and N. Suresh Kumar, "Electronic Devices and Circuits", 4th Edition, McGraw Hill Education (India) Pvt Ltd., 2017.
2. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", 4thEdition, Pearson, 2017

Reference Books:

1. J. Milliman, Christos C Halkias, and Satyabrata Jit, "Electronics Devices and Circuits", 4th Edition, McGraw Hill Education (India) Pvt Ltd., 2015.
2. David A. Bell, "Electronics Devices and Circuits", 5th Edition, Oxford University Press, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A50408 **DIGITAL ELECTRONICS**
Open Elective-I

Course Objectives:

- To introduce different methods for simplifying Boolean expressions
- To analyze logic processes and implement logical operations using combinational logic circuits
- To understand characteristics of memory and their classification.
- To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines
- To understand concept of Programmable Devices

UNIT- I

Minimization Techniques: Boolean Laws**,** De-Morgan's Theorems- Boolean expressions - Minimization– Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions.
Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND– NOR implementations.
Learning Outcomes:

At the end of the unit, the student should be able to:
- Learn Boolean algebra and logical operations in Boolean algebra.
- Apply different logic gates to functions and simplify them.
- Analyze the redundant terms and minimize the expression using Kmaps

UNIT- II

Combinational Circuits: Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor- BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder – encoder.
Learning Outcomes:

At the end of the unit, the student should be able to:
- Apply the logic gates and design of combinational circuits
- Design of different combinational logic circuits

UNIT -III
Sequential Circuits:
Latches, Flip-flops - SR, JK, D, T, and Master-Slave –Truth table – Edge triggering – Level Triggering – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters

Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

Learning Outcomes:

At the end of the unit, the student should be able to:

- Understand the clock dependent circuits
- Identify the differences between clocked and clock less circuits, apply clock dependent circuits
- Design clock dependent circuits

UNIT -IV

Memory Devices Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization, Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

Learning Outcomes:

At the end of the unit, the student should be able to:

- Understand the principle of operation of basic memory devices, and programmable logic devices.
- Implement combinational logic circuits using memory and programmable logic devices

UNIT -V

CMOS LOGIC: : Introduction to logic families, CMOS logic, CMOS logic families; BIPOLAR LOGIC AND INTERFACING: Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families, Familiarity with standard 74-series and CMOS 40- series-ICs – Specifications

Learning Outcomes:

At the end of the unit, the student should be able to:

- Understand Various CMOS Logic familes
- Understand the concept of Bipolar Logic Interfacing.
- Analyze the procedure to perform logic operation to various CMOS logic operations
- Illustrate the various TTL familes , ECL familes and various standard series-ICs specifications.

Course Outcomes:

- Explain switching algebra theorems and apply them for logic functions, discuss about digital logic gates and their properties, Identify the importance of SOP and POS canonical forms in the minimization of digital circuits.
- Evaluate functions using various types of minimizing algorithms like Boolean algebra, Karnaugh map or tabulation method.
- Analyze the design procedures of Combinational & sequential logic circuits.

- Design of different combinational logic circuits, and compare different semiconductor memories.

Textbooks:

1. M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. ZviKohavi, "Switching and Finite Automata Theory", 3rd Edition, South Asian Edition, 2010,

Reference Books:

1. John F.Wakerly, "Digital Design", Fourth Edition, Pearson/PHI, 2008
2. John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
3. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2006.
5. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011
6. Donald D.Givone, "Digital Principles and Design", TMH, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

(Open Elective - 1)

Subject Code	Title of the Subject	L	T	P	C
19A50513T	**Introduction to Java Programming**	2	1	0	3

COURSE OBJECTIVES	
1	Study the computer basics , software engineering and network basics , HTML
2	Learn Java features to create applications & perform event handling .
3	Learn the Database and interconnection with java.

COURSE OUTCOMES	
1	Ability to know basics of computer and software engineering
2	Ability to write Efficient programs of HTML
3	Create Tables with the databases and retrieving by using queries.
4	Able to design java application and dynamic behavior of classes.
5	Developapplications using different types ofinheritance, polymorphism,overloading And overriding Database and interconnection with java

UNIT-1

Introduction to Computer Basics: Computer, Hardware, CPU, Monitor, Keyboard/mouse, Memory, -RAM, Storage, Software, OS,Application, Saving a file, Files and Folders.

Basics of Network: Home and Office Networks, Networking Types and Structures, Wired vs Wireless Networks,Networking Topologies, Networking Topology- Physical vs Logical, Peer to Peer, Client Server,Network Size.

Networking Levels and Layers and Protocols: Network Addressing, Classes of IPv4, Public and PrivateIP Addresses, What is a Protocol? What is a Protocol Suite?

Protocol Stacks, Networking and Internet Service: IP protocol, DHCP (Dynamic Host configurationProtocol), DNS (domain Name Service), General Networking Physical Component.

Software Engineering Fundamentals : Software Requirement, Problem Recognition, Evaluation and Synthesis, Modeling, Specification, Review, Objectives of Software Design, Software Design Concepts, Different levels of Software Design, Software Design Process, Architectural Design, Structured Programming, Functional Programming, Programming style, Software Documentation, Software Implementation Challenges , Software Validation, Software Verification, Manual Vs Automated Testing,

Testing Approaches, Testing Levels, Testing Documentation, Testing vs. Quality Control, QualityAssurance and Audit

Software Engineering Fundamentals & OOP: Overview of Software Maintenance Need forMaintenance, Categories of Software Maintenance.

Overview of Configuration management and version control : What is Software Configuration Management?, Why do we need Configuration management?, Tasks in SCM process, Configuration Identification, Baseline, Change Control, Configuration Status Accounting, Configuration Audits and Reviews, Participant of SCM process, Software Configuration Management Plan, Software ConfigurationManagement Tools.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

Agile Basics:

What is Agile?, What are Agile Methodologies?, What is the Agile Manifesto?, What is Agile projectmanagement?, Agile Scrum methodology.

OOP :

Object Oriented Concepts Problems in Functional Programming, What Is ObjectOriented Programming? ,Objects and Classes Declaration of Class, Declaring Objects, State of an Object, Behaviour of an Object Principles in ObjectOriented technology Abstraction, Encapsulation

OOP & HTML, CSS and JavaScript:

Principles in Object-Oriented technology, Inheritance, PolymorphismHTML,
CSS and JavaScript
Introduction to Web Technology
World Wide Web, IoT, Web Programming, Web Framework, HTML, CSS and JavaScript Introduction to HTML5:
HTML5 Elements, Semantic Elements HTML Overview, HTML Versions,
Semantic Web, Semantic Elements in HTML5, <header>, <nav>, <section>, <article>, <aside>, <footer>

Table, List, Working with Links, Image Handling

Define an HTML Table, <table>, <tr>, <td>, <th>, <caption>, Unordered List, Ordered List, DescriptionList, <ul>, <ol>, <li>, <dl>, <dt>, <dd>, Hyperlinks, The target Attribute, Absolute URLs vs. Relative URLs, Use an Image as a Link, Link to an Email Address, <a>, href Attribute, <img>, The src Attribute,The alt Attribute, Image Size - Width and Height, Image as a Link

Form-Input Elements, HTML5 Form elements

The <form> Element, The <input> Element, Text Fields, The <label> Element, Radio Buttons,Checkboxes,
The Submit Button

UNIT-II

HTML, CSS and JavaScript:

HTML5 Attributes, Video & Audio, iframes

Standard Attributes, align, background, bgcolor, class, height, hidden, id, style, tabindex, valign, width,Embedding Video, Embedding Audio, Handling Media Events, HTML <iframe> Tag

Introduction to CSS3, CSS Syntax, CSS Styling

What is CSS, Why use CSS, Inline Style, CSS Style Tags, Linking to CSS, Style Override Precedence

Text and Fonts properties, CSS Selectors, Different color schemes

Text Color and Background Color, CSS Text Alignment, Text Direction, Vertical Alignment, Generic FontFamilies, The CSS font-family Property, Font Style, Font Size

CSS Borders, CSS Margins, CSS Backgrounds

CSS Border Style, The border-style property, Border Width, Border Color, Border Sides, CSS RoundedBorders, margin-top, margin-right, margin-bottom, margin-left, CSS background-color, Opacity / Transparency, CSS background-image, CSS background-repeat

JavaScript basics

Introduction to Javascript, Execution of Javascript, Scripts in head and body of HTML, Internal andExternal Javascript, Javascript Variables, Comments

Functions in Javascript

JavaScript Function Syntax, Built in methods in Javascript, Function Invocation, Function Return, WhyFunctions?, The () Operator Invokes the Function, Functions Used as Variable Values, Local Variables

Javascript validation

Client-side form validation, Different types of client-side validation, Using built-in form validation,Validating forms using JavaScript, Validating forms without a built-in API

Events, Javascript event handling

Introduction to JavaScript events, Event flow, Event bubbling, Event capturing, Event object, addEventListener(), preventDefault(), stopPropagation()

JavaScript Strings

String Methods and Properties, String Length, Extracting String Parts, The substring() Method, ReplacingString Content, Converting Upper and Lower Case, The concat() Method

JavaScript Dates

JavaScript Date Output, Creating Date Objects, new Date(),new Date(year, month, ...), new Date(dateString), Date Methods, Displaying Dates

Array in Javascript

What is an Array, Creating an Array, Accessing Array Elements, Array Properties and Methods, LoopingArray Elements

Document Object Model (Window, Frame, Navigator Objects)

What is Document Object Model (DOM), Node Types, The nodeName and nodeValue properties, Nodeand Element, Node Relationships
Working with Document Object (Its Properties and methods, Cookie handling)Selecting Elements, Traversing Elements, Manipulating Elements

RDBMS Concepts and SQL Using Oracle:

Introduction to RDBMS Concepts
What is a Relational Database, The relational model, Benefits of relational database management system, ACID properties and RDBMS ,Introduction to SQL History of SQL, SQL Standards, How SQL Works Creating and Managing Tables , Guidelines for Managing Tables, Creating Tables, Altering Tables,Dropping Tables, Data Manipulation: INSERT, UPDATE, DELETE

UNIT-III

RDBMS Concepts and SQL Using Oracle:

Basic SQL SELECT Statements
SELECT, FROM Clause, Comparison Operators, WHERE Clause, ORDER BY, AND, OR, DISTINCT,IN, IS NULL, IS NOT NULL, LIKE, REGEXP_LIKE, NOT, ALIASES

Scalar & Aggregate Functions

String Functions, Numeric Functions, Date Functions, Conversion Functions, NULL-related Functions,AVG, COUNT, MAX, MIN, LISTAGG, SUM
Joins & Subqueries
Oracle INNER JOIN, Oracle LEFT JOIN, Oracle RIGHT JOIN,
Introduction to the Oracle Subquery: Advantages of Oracle Subqueries, Oracle Subquery in the SELECT clause, Oracle Subquery in the FROM clause, Oracle Subquery with comparison operators, Oracle Subquery with IN and NOT IN operators, Oracle correlated Subquery, Oracle correlated Subquery in the WHERE clause, Oracle correlated Subquery in the SELECT clause,
Oracle correlated Subquery with the EXISTS operator

Views & Index

What is a VIEW in Oracle, Create VIEW, Update VIEW, DROP VIEW, What is an Index in Oracle,Create an Index, Create a Function-Based Index, Rename an Index, Drop an Index

RDBMS Concepts and SQL & Introduction to Java:

Sequence, Synonym

About Sequences, Creating Sequences, Altering Sequences, Using Sequences, Dropping Sequences About Synonyms, Creating Synonyms, Using Synonyms in DML Statements, Dropping Synonyms Data Control Language Statements , GRANT, REVOKE

Introduction to Java

Features of Java, Java Runtime Environment, Developing software in Java

UNIT-IV

Introduction to Java ProgrammingLanguage Fundamentals: Keywords, Primitive Data Types, Operators and Assignments, Flow Control:Java's Control Statements.

Classes and Objects: Access Specifiers, Constructors - Default and Parameterized, Method & ConstructorOverloading, this reference, using static keyword, Wrapper Classes, Using Scanner Class

Strings, String Handling functions. Array: One dimensional array, Array of Objects, Using varargs, UsingArrays class.

UNIT-VCollections: Collection basics, Set, HashSet, Map, HashMap, List, Array List.

JDBC: JDBC Basics, JDBC architecture, JDBC Drivers. Process SQL with JDBC, JDBC IntroductionJDBC Driver, Create Connection, Query, Update.

Text books:

1. https://www.geeksforgeeks.org
2. https://www.w3schools.com
3. https://www.oracletutorial.com
4. https://www.tutorialspoint.com
5. https://www.javatpoint.com

References:https://www.pcmag.com/encyclopedia

1. https://www.computerhope.com
2. https://courses.lumenlearning.com

https://docs.microsoft.com/en-us/windows-server/networking/technologies

ubject Code	Title of the Subject	L	T	P	C

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

19A50513L	**Java Programming Lab**		-	-	-

COURSE OBJECTIVES	
1	Study the computer basics , software engineering and network basics , HTML
2	Learn Java features to create applications & perform event handling .
3	Learn the Database and interconnection with java.

COURSE OUTCOMES	
1	Ability to know basics of computer and software engineering
2	Ability to write Efficient programs of HTML
3	Create Tables with the databases and retrieving by using queries.
4	Able to design java application and dynamic behavior of classes.
5	Develop applications using different types of inheritance,polymorphism,overloading and overriding and Database and interconnection with java

Week-1:

1. Problem Title: BankAccount Class:
   - Create a Java class called BankAccount which represents a bank account, having as attributes: accountNumber (numeric type), name (name of the account owner as string type), balance.
   - Create a constructor with parameters: accountNumber, name, balance.
   - Create a deposit() method which manages the deposit actions.
   - Create a withdrawal() method which manages withdrawals actions.
   - Create a bankFees() method to apply the bank fees with a percentage of 5% of the balance account.
   - Create a display() method to display account details.
   - Give the complete code for the BankAccount class.

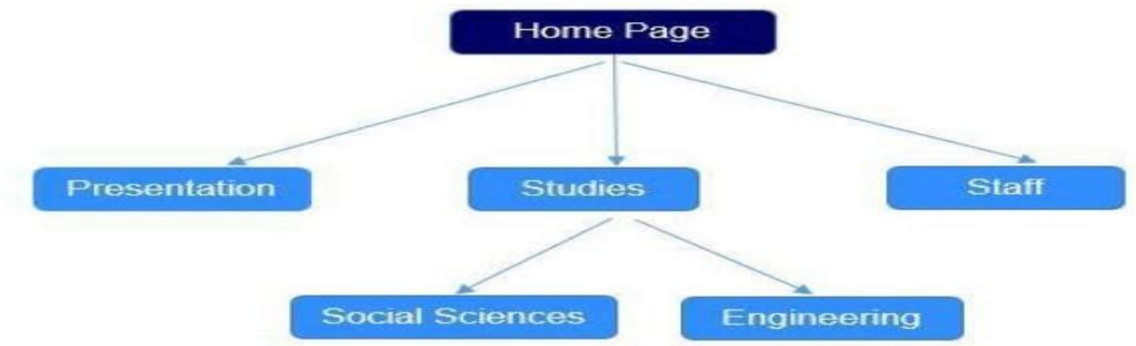
Week-2:

2. **Problem Title: Person Class**
   - Create a Java class Person with attributes: name and age of type string.
   - Create a display() method that displays the name and age of an object created via the Person class.
   - Create a child class Student which inherits from the Person class and which also has a sectionattribute.
   - Create a method displayStudent() that displays the name, age and section of an object created viathe Student class.

- Create a student object via an instantiation on the Student class and then test the displayStudentmethod.

Week-3:

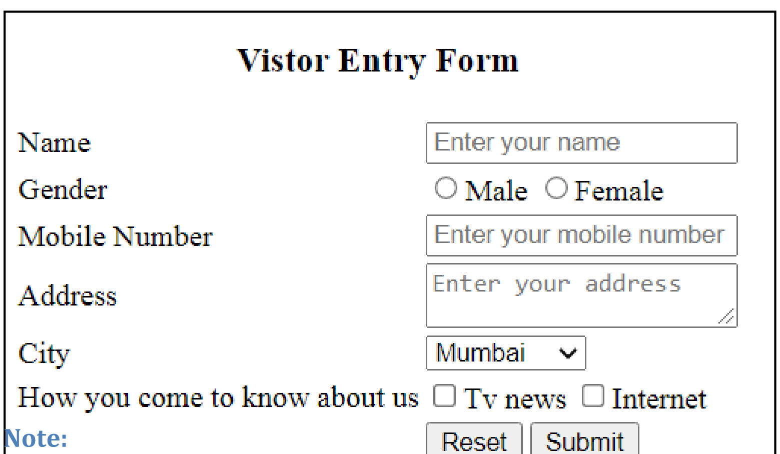
3. Create a website with the following information and structure using HTML5:



The contents of the home page should be:

- Logo and title of the website
- Navigation bar: links to presentation, studies and staff
- News (aside/article/section)
- Announcements (aside/article/section)
- Footer: contact information and copyright
- Use these tags: <header>, <nav>, <aside>, <article>, <section>, <time>, <footer>.
- Here logo image, news, announcements used can be any suitable dataDesign

below form using HTML5:



Note:

-City is drop down list with multiple city names
-Name, mobile number, address are mandatory fields. If any of these field is empty, after clickingsubmit button, it should show like this.

Week-4:

4. Problem Description:

1. To Create this a HTML Application create a folder called TestCSS.
2. create a file called TableWithCSS.html
3. In the body tag, create a table with header, table rows and table data.
4. Use Internal CSS and provide styles as in sample output
5. Use any png image as background to table header with border radius of 6px.Refer to output forcolor, height, width and font-size.
6. For the table, provide collapse to border-collapse attribute
7. For table data provide border of 1 px dotted and padding of 15px, width 100px, refer to otherproperties and background color as in output
8. Run the Application in Live Server as http://127.0.0.1:5500/TableWithCSS.htmlOr open

the Application in browser

Week-5:

5. Problem Description:

1. To Create this HTML Application, create a folder called Telephone.
2. create a file called TelephoneComplaint.html
3. In the body tag create a form and table as shown in sample output with the labels and input typesas shown.
4. Include the following options under Nature Of Complaint
5. 1.Disconnection Problem 2.Phone Dead

3.Other

6. Create a TelephoneComplaint.css file and define the CSS properties here as per sample outputLink CSS file

to HTML file.

Sample output:

Week-6:

6. Problem Description:

1. To Create this HTML Application, create a folder called pyramid.
2. Create a file called pyramid.html
3. Use internal JS and define a function called buildPyramid with the number of rows as parameter
4. Write the logic to construct a pyramid in the function.
5. Invoke the function with any value as row argument.

Open the application in browser or run in Live Server with URL as http://127.0.0.1:5500/pyramid.html

Sample output:

```
    *
   * *
  * * *
 * * * *
* * * * *
```

```
     *
    * *
   * * *
  * * * *
 * * * * *
* * * * * *
```

Week-7:

7. Problem Description:

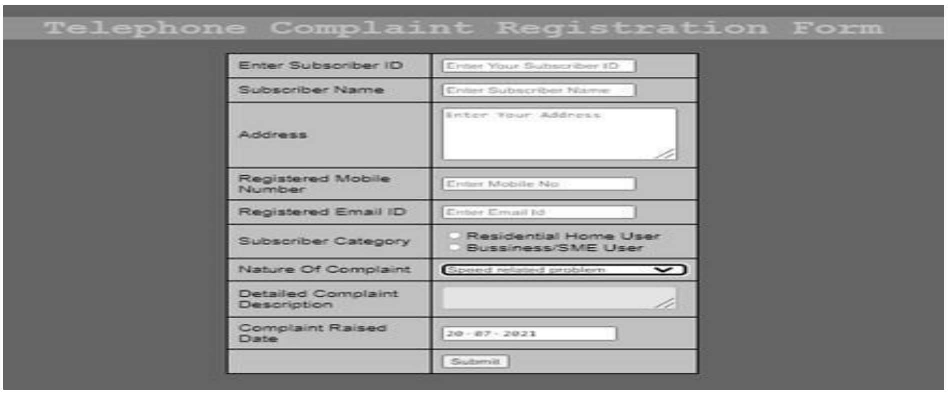
For this Application, use the existing application TelephoneComplaint.html created in folder Telephoneunder section 4.3

Modify the HTML page to include the below validations in JavaScript

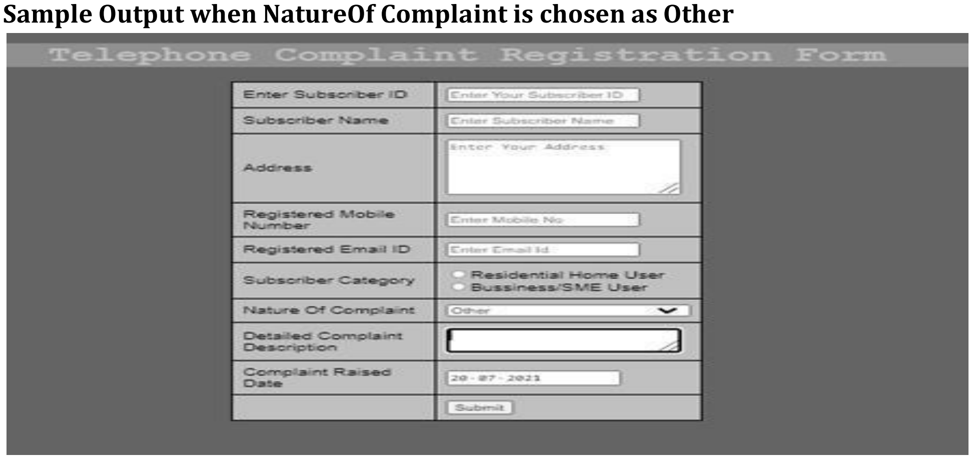
1. Subscriber Name is required and should have max length of 10.
2. validate Email to have @ and. symbol.
3. Registered Mobile number should be 10 digits

Detailed Complaint Description box should be disabled initially, and when user chooses Other option in Nature of Complaint, Description box should get enabled and get disabl ed when a subscriber changes the Nature Of Complaint to something else. (Disconnection Problem/Phone Dead).
Hint: Use onchange event and write JS Code in function enableDisableTextBox(this) to enable/disable description box. This refers to the option currently selected
Complaint raised date should be current date and shouldn't be changed, it should be readyonly and the date should be populated as soon as the form loads in browser.
Hint: write code in JS function getDate() to load current date. Invoke this function using window.onload.Open the application in browser or in LiveServer with URL as http://127.0.0.1:5500/TelephoneComplaint.html

Sample Output when form loads on browser (Assume sysdate/currentDate is 20-07-2021)



Sample Output when NatureOf Complaint is chosen as Other



8. Problem Description:

Zip codes consist of 5 consecutive digits. Given a string, write a JavaScript function isValid(zipCode) todetermine whether the input is a valid zip code.
A valid zip code is as follows:

- Must only contain numbers (no non-digits allowed).
- Must not contain any spaces. Must not be greater than 5 digits in length

Examples:

isValid("59001") ➞ true isValid("853a7") ➞ false isValid("732 32") ➞ false isValid("393939") ➞ false

A group of friends have decided to create a secret code which will be used to login their application. Thiscode will be the first letter of their names, sorted in alphabetical order and count of group members.

Create a function that takes in an array of names and returns the secret code.

Examples:
findCode(["Adam", "Sarah", "Malcolm"]) ➞ "AMS3"
findCode(["Harry", "Newt", "Luna", "Cho"]) ➞ "CHLN4"
findCode(["Phoebe", "Chandler", "Rachel", "Ross", "Monica", "Joey"]) ➞ "CJMPRR6"

Note

The secret code name should entirely uppercased

Week-8:

9. **Problem Description:**

1. To Create this application, create a folder called DomManipulation.
2. Create a HTML file called dom.html with hyperlink for the paragraph text
3. -[On mouse hover here bold words of the following paragraph will be highlighted]||
4. Include 2 events onMouseOver and onMouseOut for the above hyperlink. ForonMouseOver definea function highlight() and for onMouseOut define a function return_normal.
5. Include the other paragraph having bold(strong) and non bold text as in output.
6. Create an external JS called dom.js and link to html file.

7. Define following functions in dom.js such that when window loads, it invokes functiongetBold_items(). getBold_items() gets all the bold tags with tagname strong and stores it.

9. highlight() iterates all stored bold tags and changes color to red.
10. return_normal() makes all highlighted words dark once the mouse is moved out from hyperlink
11. Open the html application in browser or run in LiveServer with URL http://127.0.0.1:5500/dom.html

Sample Output:

On loading the page in browser

[On mouse hover here bold words of the following paragraph will be highlighted]

We have just started **this** section for the users (**beginner** to intermediate) who **want** to work with **various** JavaScript **problems** and write scripts online to **test** their JavaScript **skill**.

Sample output-1 when mouse is moved over hyperlink

[On mouse hover here bold words of the following paragraph will be highlighted]

We have just started **this** section for the users (**beginner** to intermediate) who **want** to work with **various** JavaScript **problems** and write scripts online to **test** their JavaScript **skill**.

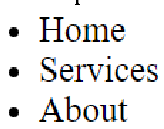
Sample Output-2 when mouse is moved away from hyperlink

10. Problem Description:

Given a list of items

<ul id="menu">
Homepage
Services
About
Contact

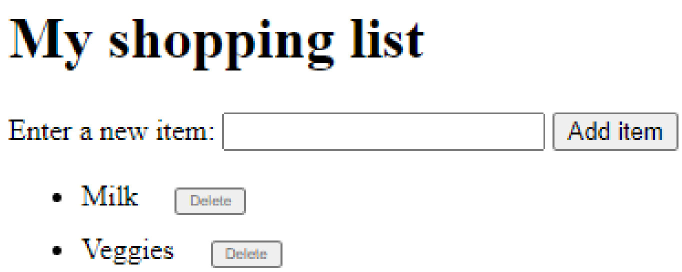
Manipulate DOM using JS such that the DOM is changed to
Problem Description:



Using DOM Manipulation create a dynamic shopping List as below

As items are entered, it gets added as below with the option to delete

When Chocolates is deleted, the List should be



week-9:

11. Problem Title: Insert Records – Tickets

nsert the below records into tickets table.

Ticket_id	Schedule_id	User_id	No_seats
T1	S5	1	2
T2	S2	5	1

12. Problem Title: Department name based on block number

Write a query to display the names of the departments in block number 3 in ascending order.

13. Problem Title: Students Name based on Start and Ending Character

Write a query to display the names of the students that start with letter 'A' and end with the letter 'a',ordered in ascending order.

14. Problem Title: Number of departments

Write a query to display the block number and number of departments in each block and give an alias asNO_OF_DEPT. Sort the result based on NO_OF_DEPT in descending.

15. Problem Title: Subject with Staff Details

Write a query to display the subjectname, code and staff name who handles that subject, ordered by code in ascending order.

16. Problem Title: Maximum mark in Subject with Staff name

Write a query to display list of staff name, subject name handled and maximum mark scored in that subject. Give an alias to the maximum mark as max_mark. Sort the result based on maximum mark in descending

17. Problem Title: Salesmen from New York

Write a query to create a view for those salesmen belongs to the city New York. Refer the following schema

Salesman_id	name	city	commission
5001	James Hoog	New York	0.15
5002	Nail Knite	Paris	0.13
5005	Pit Alex	London	0.11
5006	Mc Lyon	Paris	0.14
5007	Paul Adam	Rome	0.13
5003	Lauson Hen	San Jose	0.12

Problem Title: Create Index on Customer table

Create an index named customer_name for the cust_name column of the customer table Refer the following schema

Week-10:

18. Problem Title: Create Sequence

Write a PL/SQL query to create an ascending sequence called id_seq, starting from 10, incrementing by10, minimum value 10, maximum value 100.

19. Problem Title: Use Sequence in a Table Column

Create a new table called tasks with the below DDL query CREATE TABLE tasks(id NUMBER
PRIMARY KEY,

title VARCHAR2(255) NOT NULL
);
Create a sequence called task_id_seq for the id column of the tasks table and use it while insertingrecords to the tasks table:

20. Problem Title: Print Name

Write a Java program to print 'Hello' on screen and then print your name on a separate line.Sample
Output 1:
Hello Alex.

21. Problem Title: Divide Numbers

Write a Java program to divide two numbers and print on the screen.

Sample Input 1:
50/3
Sample Output 1:
16

22. Write a Java program to Print “Hello World” 5 times using for loop.

Sample Output 1:
Hello World Hello World Hello World Hello World Hello World

23. Problem Title: Swap Numbers Write
a Java program to swap two numbers.Sample
Input 1:
Input the First Number: 5 Input the Second Number: 6Sample
Output 1:
After Swapping: First Number : 6 Second Number : 5

24. Problem Title: Fibonacci Sequence

Construct Fibonacci sequence controlled by a do-while loopSample
Output 1:
0,1,1,2,3,5,8,13,21,34

25. Problem Title: Area of Circle

Write a Java program to print the area of a circle. Radius = 7.5Sample

Output 1:
Area is = 176.71458676442586

26. Problem Title: Temperature convertor

Write a Java program to convert temperature from Fahrenheit (ex 212) to Celsius degree

Sample Input 1:

Given temperature in Fahrenheit: 212
Sample Output 1:
212.0 degree Fahrenheit is equal to 100.0 in Celsius

Week-11:

Problem Title: Product class

27. Create class ProductTwoNum with two integer values and computes their product by calling the instance method int computeProd(int num1, int num2).

Sample Input 1
Num1 : 20
Num2 : 3
Sample Output 1
The product of 20 and 3 is 60.
Problem Title: Area calculation and print details

28. Write a program to print the area of two rectangles having sides (4,5) and (5,8) respectively by creating a class named _Rectangle' with a method named _rectangleArea' which returns the area and length and breadth passed as parameters to its constructor.

Sample Output 1
Print the area of the Rectangle

Problem Description:

29. Smith has library of magazines. He wants to maintain information of magazines.Write a java program for this. Create a class Magazine with the following attributes:

id, title, author, price Methods:

Sample Input 1

If below sample values are set for magazine object

Id	Title	Author	Price
23	Journey of Life	Michael Jo	600

Enter discount percentage: 5
Sample Output 1 Magazine Details: Id: 23

Title: Journey of Life Author: Michael Jo Price: 570

30. Problem Description:

Alina has to keep track of customers data who are buying products from her shop. For this create aclass Customer with the following attributes:

customerId, customerName, contactNo, paymentDone

- Parameterized constructor

- displaydetails() to display the details of the magazines
- discountedPrice() : pass the discount percent, calculate the discount on price and return theamount to be paid after discount

Input 1

If below sample values are set for customer object

customerId	customerName	contactNo	paymentDone
56	Anjali	9123456789	700
89	Sujoy	8123456790	360
22	Manju	7654389129	1200

Sample Output 1

Total payment done is 2260 Rs.
Highest payment done customer details: Customer Id: 22
Customer Name: Manju Contact number: 7654389129
Payment done: 1200

Week – 12:

31. **Problem Title: Palindrome check**

Write a program to Identify string given by user is palindrome or not.

Sample Input 1
Enter String: Malayalam
Sample Output 1
Given String is palindrome
Sample Input 2 Enter String: Test Sample Output 2Given
String is not palindrome

Problem Description:

32. **Write a java program with method checkEnding() that takes two strings and returns trueif the first string ends with the second string, otherwise return false.**

Sample Input 1
checkEnding(-abc||,||bc||);
Sample Output 1
true
Sample Input 2 checkEnding(–samurai||,||pi||); Sample Output 2 False

33. **Problem Description:**

Write a Java program to calculate the average value of array elements.

Sample Output 1
Average value of the array elements is: 7.0
Problem Description:
Write a Java program to find the maximum and minimum value of an array.Sample

Output 1Original Array: [25, 14, 56, 15, 36, 56, 77, 18, 29, 49]

Maximum value for the above array = 77 Minimum value for the above array = 14

Problem Description:

34. **Write a Java program to create a new array list, add some elements (string) and print outthe collection.**

Sample Output 1:
[Red, Green, Orange, White, Black]
Problem Description:

35. **Problem Description:**

Write a Java program to iterate through all elements in a hash Map.

Sample Output 1:
Red White Pink Yellow Black Green

36. **Problem Description:**

Declare an ArrayList called numList to hold values of Integer type. Write code such that the duplicatevalues are removed.

Sample Input 1
[1,2,3,2,1,4,5,6,6,7,8,8]

Sample Output 1
[1,2,3,4,5,6,7,8]

37. **Problem Description:**

Write a program to store only unique elements of Employee type in the collection, the uniqueness of employee must be identified by the employeeId, the employee must have other properties like name, salary & designation. Print all the employees stored in the collection.
Hint: Use Set<Employee> set = new HashSet<Employee>(); to store the employee object

Sample Output 1

Employee Id = 100, Name = Alex, Salary = 25000, Designation = Manager Employee Id = 101, Name = Bruce, Salary = 15000, Designation = Tester

38. **Problem Description:**

Use the comparator and sort the employee‘s id in ascending and descending order and print the employees in both ascending & descending order

39. **Problem Description:**

Create a menu that will display 4 options

a. Store
b. Display by id
c. Delete by id
d. Exit

The menu should repeat until you enter exit, however the other options must perform operations like storing in the collection, displaying the item based on the id, deleting the item based on id. The item has to be an Employee with properties like id, name, salary and designation. Employee properties must be initialized dynamically

Define a Java Class Main and in main method write code to load driver and establish connection with database.

Sample Output:

student Id	studentName	Branch	Percentage
100	Ann	Electronics	70.5
101	Ben	Computers	71.3
102	Ken	Mech	60
103	Ram	Computers	90
104	Bhim	Mech	72
105	Shyam	Computers	86

studentId **studentName** **Branch** **Percentage**
103 Ram Computers 90
105 Shyam Computers 86

Week-13:

40. Problem Description:

Create a menu that will display 4 options

a. Store
b. Display by id
c. Delete by id
d. Exit

The menu should repeat until you enter exit, however the other options must perform operations likestoring in the collection, displaying the item based on the id, deleting the item based on id. The item has to be an Employee with properties like id, name, salary and designation. Employee properties must be initialized dynamically.

41. Write the menu driven program using JDBC which will have following options

a. Store
b. Display by id
c. Delete by id
d. Update salary by id
e. Exit

The menu should repeat until you enter exit, however the other options must perform operation like storing in the database, displaying the item based on the id, deleting the item based on id, updating the salary of the item based on id. The item has to be an Employee with properties like id, name, salary and designation. Employee properties must be initialized dynamically and also program must ask the id dynamically to perform display and delete and for update id and salary must be dynamic.

Text books:

6. https://www.geeksforgeeks.org
7. https://www.w3schools.com
8. https://www.oracletutorial.com
9. https://www.tutorialspoint.com
10. https://www.javatpoint.com

References:

5. https://www.pcmag.com/encyclopedia
6. https://www.computerhope.com
7. https://courses.lumenlearning.com

https://docs.microsoft.com/en-us/windows-server/networking/technologies

‘

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-I Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

19A50409 **INTEGRATED CIRCUITS AND APPLICATIONS LAB**

LIST OF EXPERIMENTS

Course Objectives:

- To familiarize different Analog ICs.
- To implement linear and nonlinear application circuits by Op amp.
- To realize active filters using Op amp.
- To design of various multi-vibrator circuits using 555 timer application
- To design and Understand the working of mixed signal circuits like Analog to Digital Convertors, Digital to analog Convertors and Phase Locked Loop.
- To understand the working of a few application specific analog ICs and to design circuits based on these ICs.

Conduct any 8 experiments from the following list.
Note: All the Hardware experiments may be performed using ICs 741, TL082, 555,565

Interpretation of data sheets (741/TL082, 555, 565)

1. Applications of Op-amp
   Design and test the performance of the following circuits using Op-amp IC741/TL082
   a. Inverting amplifier
   b. Non-inverting amplifier
   c. Voltage follower
   d. Summer
2. Design and test the performance of practical differentiator and integrator circuits for various time constants. Plot the graphs.
3. Comparator circuits
   To study Schmitt trigger using Op-Amp.
4. Active filters using Op-amp
   Design and test the performance of any order Butterworth LPF, HPF.
5. Construct and verify the performance of
   a. Logarithmic and antilog amplifiers b. Instrumentation amplifier
6. Precision rectifiers
   Conduct experiments on half wave and full wave precision rectifiers and draw the output waveforms.
7. Design the mono stable multivibrator circuit and verify their performance practically using IC 555.
8. Design the astable multivibrator circuit and verify their performance practically using IC 555.

9. Data converters
   Construct and study performance of
   a. DAC circuits – R-2R and ladder type.

b. Successive approximation type ADC.

10. To study performance of PLL IC565
11. Design a DC power supply using 78XX/79XX and LM723, verify the same practically.

Equipment required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires
12. CRO Probes

Course Outcomes:

- Understand the working of Op amp ICs & Application specific analog ICs.
- Analyze operational amplifier based circuits for linear and non-linear applications.
- Design Operational amplifiers for linear and nonlinear application, Multivibrator circuits using 555 & application specific ICs.
- Simulate all linear and nonlinear application based Op amp Circuits and circuits based on application specific ICs.
- Compare theoretical, practical & simulated results in integrated circuits.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

III B.TECH–I SEM

		L	T	P	C
19A55502	**English Language Skills Lab**	0	0	3	1.5

Course Description:

English Language Skills Lab aims to enable the engineering students to meet the demands of the modern job market through group activities, individual presentations, mock interviews and group discussions. Students of our region have knowledge of their respective subjects, but the surveys make it clear that they are lagging behind in expressing themselves effectively in a professional setting. So, this course will enable them to hone these skills and excel in their respective fields.

Course Objectives:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.
- To initiate them into greater use of the computer in resume preparation, report writing, format making etc.
- To train them to use language effectively to face interviews, group discussions, public speaking.

Course Outcomes:

CO1: To recall and memorize tips to communicate effectively
CO2: To understand various listening components that includes listening comprehension of gist and detailed information.
CO3: To apply extensive and intensive reading methods for specific reading and voracious reading of vast material.
CO4: To analyze different descriptive and technical writing material.
CO5: To evaluate and develop, academic research paper with appropriate citations, quotations, and references when needed.
CO6: To develop communicative competency and make the students job ready

UNIT-I: COMMUNICATIVE COMPETENCY

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary for competitive purpose

Learning Outcomes:

1. To recall and memorize the basic concepts of reading and listening skills
2. To understand the various components to build up vocabulary

3. To apply English language skills to avoid barriers to effective reading and listening

UNIT-II: TECHNICAL WRITING

1. Email Writing
2. CV/Resume Writing
3. Mini Project Writing

Learning Outcomes:

1. To understand the basic components of writing Emails
2. To apply the knowledge of writing eye catching resumes
3. To analyze different ways of writing a mini project

UNIT-III: ORAL PRESENTATION SKILLS

1. Self-Introduction – Introducing Others – Welcome Speech – Vote of Thanks
2. Oral Presentation-Individual/Impromptu Speeches/ JAM
3. Stage Dynamics– Barriers to Effective Presentation

Learning Outcomes:

1. To understand the basic components of speeches
2. To apply knowledge of different forms of presentation.
3. To analyze stage dynamics for effective presentation

UNIT-IV: TECHNICALPRESENTATION SKILLS

1. Information Transfer
2. PPT Presentation
3. Poster Presentation

Learning Outcomes:

1. To apply knowledge of different types of pictograms to transfer the information
2. To analyze the techniques of preparing PPTs
3. To evaluate different skills in poster presentation

UNIT-V: PROFESSIONAL SKILLS

1. Group discussions-II
2. Interview skills
3. Answering Strategies

Learning Outcomes:

1. To analyze the different aspects of interviews and group discussions
2. To evaluate the group dynamics to excel in group discussions
3. To design and develop strategies to answer effectively in interviews

MINIMUM REQUIREMENT FOR ELCS LAB:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids

- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

SUGGESTED SOFTWARE:
1. Orell: Language Lab Software
2. Clarity Pronunciation Power – Part I (Sky Pronunciation)
3. Clarity Pronunciation Power – part II
4. LES(Learn English Select) by British council
5. TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
6. English Pronunciation in Use (Elementary, Intermediate, Advanced) CUP
7. Cambridge Advanced Learners' English Dictionary with CD.

The software consisting of the prescribed topics elaborated above should be procured and used.

Reference Books:
1. DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
2. TOEFL &GRE(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
3. Train2success.com

1. Objective English for Competitive Exams, Hari Mohana Prasad, 4th edition, Tata Mc Graw Hill.
2. Technical Communication by Meenakshi Raman & Sangeeta Sharma, O U Press 2009.
3. Books on TOEFL/GRE/GMAT/CAT/IELTS by Barron's/DELTA/Cambridge University Press.2012.
4. Handbook for Technical Writing by David A McMurrey& Joanne Buckely CENGAGE Learning 2008.
5. English for Technical Communication for Engineering Students, AyshaVishwamohan, Tata Mc Graw-Hill 2009.
6. Word Power Made Handy, Shalini Verma, S Chand Publications, 2011.
7. Effective Technical Communication, Ashrif Rizvi, TataMcGrahill, 2011.

WEB LINKS

1.https://www.slideshare.net/ruschellecossid/reading-comprehension-56872438
2.https://www.slideshare.net/FiveEEE/listening-comprehension-40031081
3.https://www.slideshare.net/shrutisalunkhe2/english-for-competitive-exams
4.https://www.slideshare.net/nidhipandey16/email-writing-52942112
5.https://www.slideshare.net/aamirmuhammadaamir77/resume-writing-ppt
6.https://www.powershow.com/view/1d8cf2-OWFhN/Mini_Project_Report_Writing_Workshop_powerpoint_ppt_presentation
7.https://www.slideshare.net/8788902/oral-presentations-28994496
8.https://www.slideshare.net/nandapalit/presentation-skills-33500438
9.https://www.slideshare.net/ritikadhameja/group-discussion-46255658
10.https://www.slideshare.net/vikkerkar/interview-skills-presentation

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-I Sem	**L T P C**
	0 0 3 1.5

19A50410 **DIGITAL COMMUNICATIONS LAB**

Course Objectives

- To Develops skills for performance analysis of practical digital communication systems.
- To understand the fundamental concepts on TDM, Pulse modulations& digital modulation techniques.
- To evaluate the performance of PCM, DPCM and DM in a digital communication system.
- To learns how to use MATLAB software and hardware effectively and creatively to synthesis digital communication systems.

LIST OF EXPERIMENTS
Minimum of Twelve experiments to be conducted (any six from Part-A)

HARDWARE EXPERIMENTS (PART – A)

1. Generation of random data using linear feedback shift registers at a given data rate. Plot the random data.
2. Construct Time division multiplexing circuit to multiplex three users' data.
3. Verify the functionality of each block in Pulse code modulation system practically.
4. Find the processing gain in a Differential pulse code modulation circuit experimentally.
5. Verify the operation of Delta modulation and demodulation.
6. Design and verify modulated and demodulated circuit for Frequency shift keying.
7. Construct a modulated and demodulated circuit for Differential phase shift keying.
8. Design and verify working principle of QPSK modulation and demodulation with suitable setup.

SOFTWARE EXPERIMENTS (PART-B)
Modeling of Digital Communications using MATLAB

1. Study Sampling Theorem and verify the effect of under sampling and oversampling while retrieving the original signal.
2. Understand functioning of each block in Pulse code modulation circuit and verify through simulation.
3. Write a program on Differential pulse code modulation and demodulation.
4. Write a program on Frequency shift keying modulation schemes for given two carrier frequencies, determine the bit error probability.
5. Write a program and verify QPSK modulation and demodulation, determine the bit error probability.
6. Write a program and verify Differential phase shift keying modulation scheme is a non-coherent modulation scheme, determine the bit error probability is inferior to that of QPSK.

EQUIPMENT REQUIRED FOR LABORATORIES:

1.	RPS	-	0 – 30V
2.	CROs	-	0 – 20 MHz.
3.	Function Generators	-	0 – 1 MHz

4. RF Generators - 0 – 1000 MHz.
5. Multimeters
6. Required Electronic Components (Active and Passive) which include ICs as well.
7. Arbitrary Wave form generators/ PNS generators – 2 Nos. (To generate digital data at required data rates)
8. Licensed MATLAB software with required toolboxes.

Course Outcomes

- Understand real time behavior of different digital modulation schemes and technically visualize spectra of different digital modulation schemes.
- Design and implement different modulation and demodulation techniques.
- Analyze digital modulation & demodulation techniques.
- Simulate all digital modulation and demodulation techniques in MATLAB.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-I Sem

		L	T	P	C
19A55404	**CONSTITUTION OF INDIA (Mandatory course for Semester III/IV)**	3	0	0	0

COURSE OBJECTIVES : The objective of this course is	
1	To Enable the student to understand the importance of constitution
2	To understand the structure of executive, legislature and judiciary
3	To understand philosophy of fundamental rights and duties
4	To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and Election Commission of India.
5	To understand the central-state relation in financial and administrative control

Syllabus

UNIT-I Introduction to Indian Constitution – Constitution -Meaning of the term - Indian Constitution- Sources and constitutional history - Features– Citizenship – Preamble - Fundamental Rights and Duties - Directive Principles of State Policy.

LEARNING OUTCOMES:-After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History and features of Indian constitution
- Learn about Preamble, Fundamental Rights and Duties

UNIT-II Union Government and its Administration Structure of the Indian Union - Federalism - Centre-State relationship – President's Role, power and position - PM and Council of ministers - Cabinet and Central Secretariat –Lok Sabha - Rajya Sabha - The Supreme Court and High Court - Powers and Functions

LEARNING OUTCOMES:-After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT-III State Government and its Administration - Governor - Role and Position -CM and Council of ministers - State Secretariat-Organization Structure and Functions

LEARNING OUTCOMES:-After completion of this unit student will

- Understand the structure of state government
- Analyze the role of Governor and Chief Minister
- Explain the role of State Secretariat
- Differentiate between structure and functions of state secretariat

UNIT-IV Local Administration - District's Administration Head - Role and Importance - Municipalities - Mayor and role of Elected Representatives -CEO of Municipal Corporation Pachayati Raj - Functions– PRI –Zilla Parishath - Elected officials and their roles – CEO,ZillaParishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy

LEARNING OUTCOMES:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration's role and importance
- Analyze the role of Mayor and elected representatives of Municipalities
- Learn about the role ofZillaParishath block level organization

UNIT-V Election Commission - Election Commission- Role of Chief Election Commissioner and Election Commissionerate - State Election Commission -Functions of Commissions for the welfare of SC/ST/OBC and Women

LEARNING OUTCOMES:-After completion of this unit student will

- Know the role of Election Commission
- Contrast and compare the role of Chief Election commissioner and Commissionerate
- Analyze the role of state election commission
- Evaluate various commissions viz SC/ST/OBC and women

TEXT BOOKS

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd.. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust

REFERENCES:

1. J.A. Siwach, Dynamics of Indian Government & Politics,
2. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
3. .J.C. Johari, Indian Government andPolitics, Hans India
4. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

E-RESOURCES: 1.nptel.ac.in/courses/109104074/8 2.nptel.ac.in/courses/109104045/ 3.nptel.ac.in/courses/101104065/

4.www.hss.iitb.ac.in/en/lecture-details
5.www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Understand historical background of the constitution making and its importance for building a democratic India.
CO2	Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
CO3	Understand the value of the fundamental rights and duties for becoming good citizen of India.
CO4	Analyze the decentralization of power between central, state and local self-government
CO5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A60401 **MICROPROCESSORS AND MICROCONTROLLERS**

Course Objectives:

- To introduce fundamental architectural concepts of microprocessors and microcontrollers.
- To impart knowledge on addressing modes and instruction set of 8086 and 8051.
- To introduce assembly language programming concepts.
- To explain memory and I/O interfacing with 8086 and 8051.
- To introduce16 bit and 32 bit microcontrollers.

Course Outcomes:

- Understand instruction set of 8086 microprocessor and ARM architecture.
- Explain addressing modes of 8086, develop assembly language programs for various problems, describe interfacing of 8086 with peripheral devices, architecture and addressing modes of ARM Cortex M0+, assembly instruction set of ARM Cortex M0+.
- Distinguish between microprocessor and microcontroller, 8085& 8086 microprocessors, design applications using microcontrollers.

UNIT- I

Introduction to 8085 and 8086 Microprocessors: 8085 Microprocessor Architecture, Pin Diagram, Flag Register, Interrupts of 8085. Register Organisation of 8086, Architecture, Pin Diagram, Flag Register, Physical Memory concept, Memory addressing in 8086, Stack organization of 8086, Addressing Modes in 8086, Interrupt structure of 8086.

Learning Outcomes:-

After completion of this unit student will

- Summarize features of a microprocessor
- Explain about ISR and interrupt structure of 8086
- Distinguish between Intel 8085& 8086 microprocessors

UNIT- II

8086 Microprocessor Instruction Set and Addressing Modes, Instruction Set of 8086, Assembly Language Programming, Simple programs, Assembler Directives, Procedures and Macros, String Instructions.

Learning Outcomes:-

After completion of this unit student will

- Understand instruction set of 8086 microprocessor
- Explain addressing modes of 8086
- Develop assembly language programs for various problems

UNIT- III

Memory interacting with 8086 and Peripheral Devices, Interfacing SRAMs, DRAMs and EPROMs to 8086, Programmable Peripheral Interface 8255, Programmable Interval Timer 8253, Programmable Interrupt Controller 8259, Programmable Communication Interface 8251 USART, DMA Controller 8257.

Learning Outcomes:-

After completion of this unit student will

- Demonstrate memory &I/O interfacing with 8086
- Describe interfacing of 8086 with peripheral devices

UNIT- IV

Intel 8051 Microcontroller, Microprocessor vs Microcontroller, 8051 Microcontroller Architecture, Microcontroller 8051 pin diagram, 8051 Ports, Internal and External Memory, Counters and Timers, Serial Communication in 8051, Interrupts in 8051, Addressing Modes, Data Transfer Instructions, Data and Bit-Manipulation Instructions, Arithmetic Instructions, simple programs.

Learning Outcomes:-

After completion of this unit student will

- Describe architecture and features of Intel 8051 microcontroller
- Develop assembly language programs to perform various operations using 8051
- Distinguish between microprocessor and a microcontroller

UNIT- V

ARM Architectures and Processors: What is ARM Architecture, ARM Processor Families, ARM Cortex-M Series, Cortex-M0+ Processor Overview, Cortex-M0+ Block Diagram, Registers, Memory Map, Bit-band Operations, Endianness, ARM Cortex-M0+ Processor Instruction Set – ARM and Thumb Instruction Set.

Learning Outcomes:-

After completion of this unit student will

- Explain architecture and addressing modes of ARM Cortex M0+.
- Explain the Assembly instruction set of ARM Cortex M0+.

Textbooks:

1. K M Bhurchandi, A K Ray, "Advanced Microprocessors and Peripherals", 3rd edition, McGraw Hill Education, 2017.
2. Alexander G. Dean "Embedded Systems Fundamentals on Arm Cortex-M based Microcontrollers": A Practical Approach, ARM Education Media.

Reference Books:

1. Raj Kamal, "Microcontrollers: Architecture, Programming, Interfacing and System Design", 2nd edition, Pearson, 2012.
2. Ramesh S Gaonkar, "Microprocessor Architecture Programming and Applications with the 8085", 6th edition, Penram International Publishing, 2013.
3. Kenneth J. Ayala, " the 8051 Microcontroller", 3rd edition, Cengage Learning, 2004.
   Andrew N. Sloss, Dominic Symes, Chris Wright, ARM System Developer's Guide: "Designing and Optimizing System Software", Elsevier, 2004.
4. John H. Davies, Newness, "MSP 430 Microcontroller Basics", Elsevier Publications, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A60402 **DIGITAL SIGNAL PROCESSING**

Course Objectives:

- To provide background and fundamental material for the analysis and processing of digital signals.
- To familiarize the relationships between continuous-time and discrete time signals and systems.
- To study fundamentals of time, frequency and Z-plane analysis and to discuss the inter-relationships of these analytic method.
- To study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications.
- To introduce a few real-world signal processing applications.
- To acquaint with DSP processor.

Course Outcomes

- Understand the basic concepts of IIR and FIR filters, DSP building blocks to achieve high speed in DSP processor, DSP TMS320C54XX architecture and instructions.
- Compute the fast Fourier transforms and find the relationship with other transforms. Realization of digital filter structures.
- Design of FIR and IIR digital filters.
- Compare FIR and IIR filters.

UNIT- I

Discrete Fourier Transform: Discrete Fourier series, Properties of Discrete Fourier series, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT.

Fast Fourier Transforms: Efficient computation of DFT algorithms - Radix 2-Decimation-in-Time & Decimation-in-Frequency algorithms, Inverse FFT, Illustrative problems.

Learning Outcomes:-

After completion of this unit student will

- Understand the concept of DFT and its properties.
- Find N-Point DFT/FFT for a given signal/sequence.

UNIT- II

IIR Digital Filters: Review of analog filter design, Frequency transformation in the analog and digital domains,Design of IIR filters from Analog filters – Approximation of derivatives, Impulse invariance, Bilinear transformation,Design of Butterworth, Chebyshev filters, Illustrative problems.

Realization of IIR Systems: Structures for IIR systems–Direct form I& Direct form II, Transposed, Cascade form, Parallel form and Lattice structures, Signal flow graphs.

Learning Outcomes:-

After completion of this unit student will

- Understands signal flow graph and block diagram representations of difference equations that realize digital filters
- Realization of different structures for IIR filters
- Design of IIR filters using different techniques.

UNIT- III

FIR Digital Filters: Linear phase FIR filter, characteristic response, location of zeros, Design ofFIR filter using Windowing Techniques - Rectangular, Hanning, Hamming, Kaiser, Bartlett, Blackman, Design ofFIR filter by Frequency sampling technique, Illustrative problems.
Realization of FIR Systems: Structures for FIR systems - Direct form, Cascade form and Lattice structures. Comparison of FIR and IIR filters.

Learning Outcomes:-
After completion of this unit student will

- Understand the concept of FIR filter
- Realization of different structures for FIR filters
- FIR filter design based on windowing methods.
- Compare FIR and IIR filters

UNIT -IV

Architectures for Programmable DSP Devices: Basic Architectural features, DSPComputational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues.

Learning Outcomes:-
After completion of this unit student will

- Recognize the fundamentals of fixed and floating point architectures of various DSPs.
- Learn the architecture details and instruction sets of fixed and floating point DSPs.
- Illustrate the control instructions, interrupts, and pipeline operations.

UNIT- V
Programmable Digital Signal Processors: Introduction, Commercial Digital signal-processingDevices, Architecture of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Learning Outcomes:-
After completion of this unit student will

- Illustrate the features of on-chip peripheral devices and its interfacing along with its programming details.
- Analyze and implement the signal processing algorithms in DSPs.

Textbooks:

1. John G. Proakis, Dimitris G. Manolakis, “Digital signal processing, principles, Algorithms and applications”, Pearson Education/PHI, 4th ed., 2007.
2. Avtar Singh and S. Srinivasan, “Digital Signal Processing”, Thomson Publications, 2004.

Reference Books:

1. Sanjit K Mitra, “Digital signal processing, A computer base approach,” Tata McGraw Hill, 3rd edition, 2009.
2. A.V.Oppenheim and R.W. Schaffer, & J R Buck, “Discrete Time Signal Processing”, 2nd, Pearson Education, 2012.
3. B. P. Lathi, “Principles of Signal Processing and Linear Systems”, Oxford Univ. Press, 2011.
4. B.VenkataRamani and M.Bhaskar, “Digital Signal Processors, Architecture, Programming and Applications”, TMH, 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A60403 **DIGITAL SYSTEM DESIGN THROUGH VHDL**

Course Objectives:

- Learn and understand the architectures of Field-programmable Gate Arrays.
- Translate a software application into hardware logic for FPGA architectures.
- Design synthesizable systems based on industry-standard coding methods.
- Build testbenches and create data models to verify bit-true accurate designs.
- Acquire the knowledge about Design and modelling of Parwan CPU, vending machine, washing machine, etc.

UNIT-I

Introduction and Field-Programmable Gate Arrays: Hardware Description Languages, FPGA Boards and Software Tools, Transistor as a Switch, Logic Gates from Switches, FPGA Building Blocks, Layout of the Xilinx Artix-7 XC7A35T FPGA, Resources of FPGA, Clock Management, The XADC Block, High-Speed Serial I/O Transceivers, Peripheral Component Interconnect Express Interface, FPGA-Based Digital System Design Philosophy, Advantages and Disadvantages of FPGAs, Usage Areas of FPGAs, Introduction to VHDL, VHDL Fundamentals, Entity and Architecture Representations, Dataflow Modeling, Behavioral Modeling, Timing and Delays in Modeling, Hierarchical Structural Representation, Testbench Formation in VHDL, Structure of a VHDL Testbench File, Displaying Test Results.

Learning Outcomes:-

After completion of this unit student will

- Understand the architecture of FPGA devices
- Know the software tools used in digital design
- Understand the VHDL design styles to design digital systems

UNIT-II

VHDL Data Types and Operators: Data Types in VHDL, Signal and Variable Data Types, Data Values, Naming a Signal or Variable, Defining Constants, Defining Arrays, Operators in VHDL, Application on Data Types and Operators, FPGA Building Blocks Used in Data Types and Operators, Implementation Details of Vector and Arithmetic Operations.

Learning Outcomes:-

After completion of this unit student will

- Know various data types used in VHDL language
- Understand the VHDL operators and apply them in digital design
- Implement various arithmetic and logical operations in digital design

UNIT-III

Combinational Circuits: Logic Gates, Combinational Circuit Analysis, Logic Function Formation between Input and Output, Boolean Algebra, Gate-Level Minimization,Combinational Circuit Implementation, Truth Table-Based Implementation, Implementing Combinational Circuits, Combinational Circuit Design,

Combinational Circuit Blocks: Adders in VHDL, Comparators in VHDL, Decoders in VHDL, Encoders in VHDL, Multiplexers in VHDL, Parity Generators and Checkers in VHDL, Applications on Combinational Circuit Blocks, Sample Designs, Home Alarm System, Digital Safe System, Car Park Occupied Slot Counting System, Applications on Combinational Circuits, Implementing the Home Alarm System, Implementing the Digital Safe System, Implementing the Car Park Occupied Slot Counting System, FPGA Building Blocks Used in Combinational Circuits,
Data Storage Elements: Latches in VHDL, Flip-Flops in VHDL, Register, Memory, Read-Only Memory, ROM in VHDL, ROM Formation Using IP Blocks, Random Access Memory, Application on Data Storage Elements, FPGA Building Blocks Used in Data Storage Elements.

Learning Outcomes:-
After completion of this unit student will
- Design and analyze various combinational logic circuits
- Use VHDL in design of combinational logic circuits to analyze the behaviour
- Implement various memory and data storage elements using VHDL

UNIT-IV
Sequential Circuits: Sequential Circuit Analysis, State Table, State Diagram, State Representation in VHDL, Timing in Sequential Circuits, Synchronous Operation, Asynchronous Operation, Shift Register as a Sequential Circuit, Shift Registers in VHDL, Multiplication and Division Using Shift Registers, Counter as a Sequential Circuit, Synchronous Counter, Asynchronous Counter, Counters in VHDL, Frequency Division Using Counters, Sequential Circuit Design, Applications on Sequential Circuits

Learning Outcomes:-
After completion of this unit student will
- Design sequential logic circuits
- Use VHDL in design of sequential logic circuits to analyze the behavior
- Create VHDL structural models to design sequential logic circuits

UNIT-V
CPU Modeling and Design: Defining a Comprehensive Example,ParwanCPU Memory Organization of Parwan, Instruction Set, Instruction Format, Programming in Parwan Assembly, Behavioral Description of Parwan, Timing and Clocking, Packages, Interface Description of Parwan,Parwan Behavioral Architecture, Parwan Bussing Structure, Interconnection of Components, Global View of Parwan Components, Instruction Execution
Advanced Applications: Vending Machine, Digital Clock, Moving Wave via LEDs, Translator, Air Freshener Dispenser, Obstacle-Avoiding Tank, Intelligent Washing Machine, Non-Touch Paper Towel Dispenser, Car Parking Sensor System, Digital Table Tennis Game

Learning Outcomes:-
After completion of this unit student will
- Understand the design of Parwan CPU
- Develop VHDL models for various advanced digital applications

- Use VHDL in design of digital design systems like washing machines, car parking systems

Course Outcomes:

- Understand the architecture of FPGAs, tools used in modelling of digital design and modelling styles in VHDL.
- Learn the IEEE Standard 1076 Hardware Description Language (VHDL).
- Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL.
- Model complex digital systems at several levels of abstractions, behavioural, structural.
- Design complex digital CPU, vending machine and washing machines etc and analyze the case studies.

Textbooks:

1. CemUnsalan, Bora Tar “Digital System Design with FPGA Implementation Using Verilog and VHDL” McGraw-Hill Education, 2017
2. ZainalabedinNavabi “VHDL: Analysis and Modeling of Digital Systems”, Z. Navabi, McGraw Hill International Ed. 1998.

Reference Books:

1. J. Bhaskar “A VHDL Primer”, Pearson Education India, 3rd edition, 2015
2. Stephen Brown and ZvonkoVranesic “Fundamentals of digital logic design with VHDL”Tata McGraw Hill, 2nd edition, 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A60404 **SPEECH PROCESSING**
Professional Elective - II

Course Objectives:

- To understand how speech signals are processed for Analysis and Synthesis. Also tounderstand speech processing in the context of its creation (anatomy, classification of sounds, etc.) as well as in its perception (psychology & neuroscience).
- To analyze tools that are needed for analysis and synthesis, in the areas of digital• signal processing for time-frequency analysis.

Course Outcomes:

- After completing the course, the student will be familiar with the principles and the techniques used in speech processing.
- Understand speech synthesis, speech coding and speech recognition.
- Analyze models for speech processing and LPC
- Learn about the recognition approaches, Parametric representation of speech and recognition.

UNIT-I

FUNDAMENTALS OF DIGITAL SPEECH PROCESSING: Anatomy & Physiology of Speech organs, the process of speech production, the acoustic theory of speech production, Digital models for speech signals.

TIME DOMAIN MODELS FOR SPEECH PROCESSING: IntroductionWindow considerations, Short time energy and average magnitude Short time average zero crossing rate ,Speech vs silence discrimination using Average energy and zero crossing, Pitch period estimation using parallel processing approach, The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

Learning Outcomes:

- Knowledge about digital speech processing and domain models.
- Understand the autocorrelation functions

UNIT-II

LINEAR PREDICTIVE CODING (LPC) ANALYSIS: Basic principles of Linear Predictive Analysis: The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition, Solution for Covariance Method, Durbin’s Recursive Solution for the Autocorrelation Equations, Comparison between the Methods of Solution of the LPC Analysis Equations, Applications of LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

Learning Outcomes:

- Knowledge about Linear Predictive Analysis and Autocorrelation Method
- Understand the Comparison between the Methods of Solution of the LPC Analysis Equations

UNIT-III

HOMOMORPHIC SPEECH PROCESSING: Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, the Complex Cepstrum of Speech, Pitch Detection, Formant Estimation, The Homomorphic Vocoder.

SPEECH ENHANCEMENT: Nature of interfering sounds, Speech enhancement techniques, Spectral subtraction, Enhancement by re-synthesis.

Learning Outcomes:

- Knowledge about Homomorphic Systems for Convolution
- Understand the Complex Cepstrum of Speech
- Understand the Speech enhancement techniques, Spectral subtraction

UNIT-IV

AUTOMATIC SPEECH RECOGNITION: Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System. Continuous digit Recognition System SPEAKER RECOGNITION: Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification System, Speaker Identification System.

Learning Outcomes:

- Knowledge about Parametric representation of speech
- Understand the Recognition techniques, Speaker Recognition Systems

UNIT-V

HIDDEN MARKOV MODEL (HMM) FOR SPEECH: Hidden markov model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS, Adapting to variability in speech, Language models.

Learning Outcomes:

- Knowledge about Hidden markov model (HMM) for speech recognition
- Understand the Viterbi algorithm, Training and testing using HMM.

Textbooks:

1. L.R Rabiner and S.W.Schafer, “Digital processing of speech signals”, Pearson, 2007.
2. Douglas O Shaughnessy, “Speech communication”, Second Edition Oxford University press, 2000.

Reference Books:

1.Thomas F. Quateri, “Discrete Time Speech Signal Processing”, 1/e, Pearson, 2006.
2. Ben Gold & Nelson Morgan, “Speech & Audio Signal Processing”, 1/e, Wiley, 2006.
3. L.R Rabinar and B.H.Juang, “Fundamentals of Speech Recognition”, Pearson, 1993.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-II Sem	L	T	P	C
	3	0	0	3

19A60405 **ADVANCED MACHINE LEARNING**
Professional Elective - II

Course Objectives:

- To understand basics of Linear algebra and importance of special kinds of matrices.
- Learn basics of Deep Learning and convolution algorithms
- Understand the concept of Docker containers and AWS
- Learn about Tensor flow and its limitations.

Course Outcomes:

- After completing the course, the student will be familiar with the principles and the techniques used in linear algebra.
- Understand concept of Deep learining and various efficient convolution algorithm
- Analyze the importance of Docker containers and installing docker.
- Knowledge about AWG sage maker and training models

Unit –I

Linear Algebra:

Scalars, Vectors, Matrices and Tensors, Multiplying Matrices and Vectors, Identity and Inverse Matrices, Linear Dependence and Span, Norms, Special Kinds of Matrices and Vectors, Eigendecomposition, Singular Value Decomposition, The Moore-Penrose Pseudoinverse, The Trace Operator, The Determinant, Example: Principal Components Analysis.

Learning Outcomes:

- Understand the importance of Linear algebra
- Know about the scalars, vectors and tensors and special kinds of matrices.

UNIT -II

Deep Learning

Convolution network, pooling, structured output, data types, efficient convolution algorithm, randomized and unsupervised features, Recurrent and recursive networks- unfold computation graphs, recurrent neural networks, encoder-decoder, deep recurrent network, recursive neural network, echo state network, optimization, and challenges,Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing.

Learning Outcomes:

- Understand the concept of Deep learning basics
- Know about the Convolution network, pooling, structured output, data types and convolution algorithms
- Knowledge about Reccurrent and recursive networks.

UNIT -III

Docker Container

Getting started with Docker, Installing docker – Mac OS X, Windows, Ubuntu, Google Cloud, Building Images, parameters, Examples Building an image from a Dockerfile, A simple Dockerfile, Difference between ENTRYPOINT and CMD, Exposing a Port in the Dockerfile, Pushing and Pulling an Image to Docker Hub or another Registry, Building using a proxy, Connecting Containers – parameters, Docker network, Docker compose, container linking.

Learning Outcomes:

- Understand the concept of Docker containers and installing docker.
- Know about the docker file between entrypoint and CMD

UNIT -IV

Machine Learning with Amazon Web Services

What Is Cloud Computing?, Cloud Service Models, Cloud Deployment Models, The AWS Ecosystem, Machine Learning Application Services, Machine Learning Platform Services, Support Services, AWS Global Infrastructure, Regions and Availability Zones Edge Locations, Accessing AWS.

AWS Sage maker: Creating an Amazon SageMaker Notebook Instance, Preparing Test and Training Data, Training a Scikit-Learn Model on an Amazon SageMaker Notebook Instance, Training a Scikit-Learn Model on a Dedicated Training Instance, Training a Model Using a Built-in Algorithm on a Dedicated Training Instance.

Learning Outcomes:

- Understand the concept of Cloud Computing and AWS services
- Know about the machine learning services for AWS
- Knowledge about AWG sage maker and training models used for built in algorithms

UNIT -V

Introduction to TensorFlow:

What Is Machine Learning?, Limitations of Traditional Programming, From Programming to Learning, What Is TensorFlow?, Using TensorFlow- Installing TensorFlow in Python, Using TensorFlow in PyCharm, Using TensorFlow in Google Colab, Getting Started with Machine Learning Seeing What the Network Learned.

Learning Outcomes:

- Understand the concept of Tensor flow and its limitations
- Know about usage of tensorflow in pycharm , goolge colab and in python

Textbooks:

1. Ian Goodfellow and Yoshua Bengio and Aaron Courville, “Deep learning”, MIT press, Cambridge, Massachusetts, London, 2016.
2. Laurence Moroney, “AI and Machine Learning for Coders”, Printed in the United States of America, y O’Reilly Media.

Reference Books:

1. Farhan Hasin Chowdhury-The Docker Handbook – 2021 Edition.
2. François Chollet,“Deep Learning with Python”, Second Edition,Manning Publications, 2017.
3. Abhishek Mishra, “Machine Learning in the AWS Cloud Add Intelligence to Applications with Amazon SageMaker and Amazon Rekognition”, John Wiley & Sons, Incorporated (2019).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A60406 **DATA COMMUNICATIONS AND NETWORKINGS**

Professional Elective-II

Course Objectives:

- To explain the basic concept of computer communication networks
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- To explore the various layers of OSI Model.
- To introduce IP addressing, UDP and TCP Models.
- To have the concept of different routing techniques for data communications.

Course Outcomes:

- Understand the requirement of theoretical & practical aspects of computer networks, functions of various layers involved in data communications, building the skills of sub netting and routing mechanisms.
- Explain the role of protocols in networking.
- Analyze the services and features of the various layers in the protocol stack.

UNIT- I

Introduction to Computer Networks: Uses of computer Network, Network Software-design Issues for layers, Service primitives and relationship of services to Protocols, Reference models- OSI & TCP/IP, network architectures introduction, Example of Networks-X.25, Frame Relay & ATM, Protocols and Standards.

Learning Outcomes:

At the end of this unit, the student will be able to

- Enumerate the layers of the OSI model and TCP/IP.
- Explain the function(s) of each layer.

UNIT- II

Physical Layer: Physical layer- Data rate limits, Transmission media-guided and Unguided, Switching systems, Circuit switching, Datagram switching & Virtual circuit switching, Structure of circuit and packet switch, cable modem and DSL technologies, SONET basics, selection of IEEE std 802.11, a, b, c, g.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand principles of data communication using transmission (guided and wireless) media.
- Know to the concepts of various switching techniques.
- Explain the basics of DSL, SONET, and IEEE standards.

UNIT- III

Data link layer: Framing, Flow & Error control Protocols, HDLC, PPP, Multiple access techniques, random access, controlled access & Channelization, Ethernet types-bridged, Switched, Full duplex, Fast & gigabit Ethernet, Introduction to Data link layer in 802.11 LAN, connecting devices like passive hubs, repeaters, Active hubs, Bridges, Two-layer

Switches, Routers, three layer switches, Gateway etc., Backbone networks, Virtual LANs, Simple Router architecture, Sliding window protocol.

Learning Outcomes:
At the end of this unit, the student will be able to

- List the different connecting devices for networking.
- Understand the principles of error control protocols, multiple access protocols, routers and switches in data link layer.
- Solve the error control and multiple access based problems.

UNIT- IV
Network Layer: IPv4 address, IPv6 address, Address mapping-ARP, RARP & DHCP, IPv4 datagram detail format, IPv6 datagram detail format, ICMP, IGMP, Network layer issues like Delivery, forwarding, intra-domain and Inter-domain routing, Routing algorithms like Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, Path vector routing etc., Addressing types-Physical, Logical & port address.
Transport Layer: Transport layer-Process to process delivery, Connection oriented & Connectionless Transport, UDP, TCP, congestion control and Quality of Service.
Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the concepts of IPvx and different protocols.
- Apply the knowledge on different routing algorithms and measure their performance metrics.
- Distinguish between the connection oriented and connection less transport protocols.

UNIT- V
Application Layer: Application layer protocols and applications like Ping, FTP, telnet, HTTP, SMTP, SNMP, TFTP, BOOTP, DNS, NFS, RPC, X-server, E-mail, Introduction to streaming Audio/Video,P2P file sharing, Introduction to socket programming.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the importance of application layer and the terminology like FTP, HTTP, SMTP, SNMP,TFTP etc.,
- Know about the P2P file sharing and socket programming.

Textbooks:

1. Behrouz A. Forouzan, “Data Communications and Networking”, 4th Edition, Tata McGraw Hill, 2007.
2. Andrew Tenenbaum, “Computer Networks”, 4th Edition, Pearson Education.

Reference Books:

1. William Stallings, “Computer Networks and Cryptography”, 3rd Edition, Pearson Education.
2. Stevens, “TCP/IP illustrated Volume - I & II”, Pearson education.
3. Feibel Werner, “Encyclopedia of networking”, Pearson education.
4. Kurose & Ross, “Computer Networking- A top down approach featuring the Internet”, 3rd Edition, Pearson Education

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A60407 **PRINCIPLES OF COMMUNICATIONS**

Open Elective-II

Course Objectives:

- To understand the concept of various modulation schemes and multiplexing.
- To apply the concept of various modulation schemes to solve engineering problems.
- To analyse various modulation schemes.
- To evaluate various modulation scheme in real time applications.

Note: ***The main emphasis is on qualitative treatment. Complex mathematical treatment may be avoided.***

UNIT-I

Amplitude Modulation

Introduction to Noise and Fourier Transform. An overview of Electronic Communication Systems. Need for Frequency Translation, Amplitude Modulation: DSB-FC, DSB-SC, SSB-SC and VSB. Frequency Division Multiplexing. Radio Transmitter and Receiver.

Learning Outcomes:

At the end of the unit, the student should be able to

- Understand the concept of noise, Fourier transform, career modulation and frequency division multiplexing.
- Apply the concept of amplitude modulationto solve engineering problems.
- Analyse various amplitude modulation schemes.
- Evaluate various amplitude modulation schemes in real time applications.

UNIT-II

Angle Modulation

Angle Modulation, Tone modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulation and Demodulation. Stereophonic FM Broadcasting.

Learning Outcomes:

At the end of the unit, the student should be able to

- Understand the concept of angle modulation and its components .
- Apply the concept of frequency modulation to solve engineering problems .
- Analyse angle modulation schemes.
- Evaluate frequency modulation scheme in real time applications.

UNIT-III

Pulse Modulation

Sampling Theorem: Low pass and Band pass Signals. Pulse Amplitude Modulation and Concept of Time Division Multiplexing. Pulse Width Modulation. Digital Representation of Analog Signals.

Learning Outcomes:
At the end of the unit, the student should be able to
- Understand the concept of various pulse modulation schemes and time division multiplexing.
- Analyse various pulse modulation schemes.

UNIT-IV
Digital Modulation
Binary Amplitude Shift Keying, Binary Phase Shift Keying and QuadraturePhase Shift Keying, Binary Frequency Shift Keying. Regenerative Repeater.

Learning Outcomes:
At the end of the unit, the student should be able to
- Understand the concept of various digital modulation schemes.
- Analyze various digital modulation schemes.

UNIT-V
Communication Systems
Satellite, RADAR, Optical, Mobile and Computer Communication (Block diagram approach only).

Learning Outcomes:
At the end of the unit, the student should be able to
- Understand the concept of various communication systems.
- Analyze various Radar Communication Systems

Course Outcomes:

- Understand the concept of various modulation schemes and multiplexing.
- Apply the concept of various modulation schemes to solve engineering problems.
- Analyse various modulation schemes, and evaluate various modulation scheme in real time applications.

Textbooks:
1. B. P. Lathi, Zhi Ding and Hari M. Gupta, “Modern Digital and Analog Communication Systems”, 4th Edition, Oxford University Press, 2017.
2. George Kennedy and Bernard Davis - Electronic Communication Systems – Tata McGraw Hill Education Pvt Ltd, 2019.

Reference Books:
1. Herbert Taub, Donald L Schilling and GoutamSaha, “Principles of Communication Systems”, 3rdEdition, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. K. Sam Shanmugam “Digital and Analog Communication Systems”, Wiley India Edition, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-II Sem	L	T	P	C
	3	0	0	3

19A60408 PRINCIPLES OF DIGITAL SIGNAL PROCESSING
Open Elective-II

Course Objectives:

- To explain about signals and perform various operations on it.
- To understand discrete time signals and systems.
- To solve Laplace transforms and z-transforms for various signals.
- To find Discrete Fourier Transform of a sequence by using Fast Fourier Transform.
- To design and realize IIR and FIR filters.

Course outcomes:

- Define basic signals and its operations, Classify discrete time signals and systems.
- Solve Laplace Transform and z-Transform for various signals, Calculate DFT of a given sequence by using Fast Fourier Transform.
- Analyze the continuous and discrete signals and systems
- Design and realize IIR and FIR filters from the given specifications.

UNIT- I

Introduction to Signals & Systems

Classification of Signals: Analog, Discrete, Digital, Deterministic & Random, Periodic & Aperiodic, Even & Odd, Energy & Power signals.

Basic operations on signals: Time shifting, Time scaling, Time reversal, Amplitude scaling and Signal addition.

Elementary Signals: Unit step, Unit ramp, Impulse, Sinusoidal function, Exponential function, Gate function,

Classification of Systems: Linear / Non-linear, Time invarient / Time variant, stable/Unstable, Static/Dynamic, causal/non causal,

Learning Outcomes:

At the end of this student, the student will be able to

- Define basic signals and its operations, Classify discrete time signals and systems.
- Understand various basic operations on signals

UNIT – II

Discrete Time Signals and Systems

Discrete Time Signals: Elementary discrete time signals, Classification of discrete time signals: power and energy signals, even and odd signals. Simple manipulations of discrete time signals: Shifting and scaling of discrete-time signals.

Discrete Time Systems: Input-Output description of systems, Block diagram representation of discrete time systems, Linear Constant Coefficient Difference Equations, Classification of discrete time systems: linear and nonlinear, time-invariant and variant systems, causal and non causal, stable and unstable systems.

Learning Outcomes:

At the end of this student, the student will be able to

- Define basic signals and its operations, Classify discrete time signals and systems.

- Understand various basic operations on signals

UNIT- III
LAPLACE TRANSFORMS AND Z- TRANSFORMS
Laplace Transforms: Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of Region of Convergence (ROC), Constraints on ROC for various classes of signals, Properties of Laplace transforms.
Z-Transforms: Concept of Z-transform of a discrete sequence, Region of convergence in Z-Transform, constraints on ROC for various classes of signals, inverse Z-transform, properties of Z-Transforms.
Learning Outcomes:

At the end of this student, the student will be able to
- Understand the basic concepts of Laplace and Z transforms
- Apply the transform techniques to solve the problems

UNIT – IV
FAST FOURIER TRANSFORMS
Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Radix-2 Fast Fourier Transforms (FFT), Decimation in Time and Decimation in Frequency FFT Algorithms: radix-2 DIT-FFT, DIF-FFT, and Inverse FFT: IDFT-FFT.
Learning Outcomes:

At the end of this student, the student will be able to
- Understand the importance of DTFT, DFT, FFT and their inverse transforms with respect to signals and systems
- Analyze the Decimation in time and frequency algorithms

UNIT – V
IIR AND FIR DIGITAL FILTERS
IIR DIGITAL FILTERS: Analog filters approximations: Butterworth and Chebyshev, Design of IIR digital filters from analog filters. Realization of IIR filters: Direct form-I, Direct form-II, cascade form and parallel form.
FIR DIGITAL FILTERS: Characteristics of FIR digital filters, frequency response. Design of FIR digital filters using window techniques: Rectangular window, Triangular or Bartlett window, Hamming window, Hanning window, Blackman window. Realization of FIR filters

Learning Outcomes:
At the end of this student, the student will be able to
- Understand the importance of IIR and FIR digital Filters
- Realize IIR filters and analyze various windowing techniques in FIR filters
- Design IIR and FIR filters

Textbooks:
1. John G. Proakis, Dimitris G. Manolakis, “Digital signal processing, principles, Algorithms and applications”, 4th edition, Pearson Education/PHI, 2007.
2. A.V. Oppenheim and R.W. Schaffer, “Discrete Time Signal Processing”, 2nd edition, PHI.

Reference Books:

1. A.V. Oppenheim, A.S. Will sky and S.H. Nawab, “Signals and Systems”, PHI, 2nd Edition, 2013.
2. Andreas Antoniou, “Digital signal processing”, Tata McGraw Hill, 2006.
3. R S Kaler, M Kulkarni,, Umesh Gupta, “A Text book on Digital Signal processing”, I K International Publishing House Pvt. Ltd.
4. M H Hayes, Schaum’sOutlines, “Digital Signal Processing”, Tata Mc-Graw Hill, 2007.
5. B. P. Lathi, “Signals, Systems and Communications”, BS Publications, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech III–II SEM

		L	T	P	C
19A65401	**Managerial Economics and Financial Analysis (Humanities Elective – I)**	3	0	0	3

Course Objectives:

• To inculcate the basic knowledge of micro economics and financial accounting
• To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
• To know the various types of Market Structures & pricing methods and its strategies
• To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
Course Outcomes:
CO1: Define the concepts related to Managerial Economics, financial accounting and management.
CO2: Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
CO3: Apply the concepts of production, cost and revenues for effective business decisions
CO4: Analyze how to invest their capital and maximize returns
CO5: Evaluate the capital budgeting techniques

UNIT-I:Managerial Economics

Introduction – Nature, meaning, significance, functions and advantages. Demand-Concept, Function, Law of Demand – DemandElasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

Learning Outcomes:

At the end of the Unit, the learners will be able to
1. State the Nature of Managerial Economics and its importance
2. Understand the concept of demand andits determinants
3. Analyze the Elasticity and degree of elasticity
4. Evaluate demand forecasting methods
5. Design the process of demand estimation for different types of demand

UNIT-II: Production and Cost Analysis

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination– Shortrun and longrun Production Function- Isoquants andIsocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale.Cost&Break-Even Analysis - Cost concepts and Cost behavior-

Break-Even Analysis (BEA) -Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

Learning Outcomes:

At the end of the Unit, the learners will be able to
1. Define the production function, Input-Output relationship and different cost concepts
2. Apply the least-cost combination of inputs
3. Analyze the behavior of various cost concepts
4. Evaluate BEA for real time business decisions
5. Develop profit appropriation for different levels of business activity

UNIT-III: Business Organizations and Markets
Introduction – Nature, meaning, significance, functions and advantages.Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises.Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition – Monopoly-Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies.

Learning Outcomes:
At the end of the Unit, the learners will be able to
1. Explain the structure of markets, features of different markets and forms of business organizations
2. Apply the price output relationship in different markets
3. Analyze the optimum output levels to maximize profit in different markets
4. Evaluate price-output relationship to optimize cost,revenue and profit

UNIT- IV:Capital Budgeting
Introduction – Nature, meaning, significance, functions and advantages. Typesof Working Capital,Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals,Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

Learning Outcomes:
At the end of the Unit, the learners will be able to
1. Explain the concept of capital budgeting and its importance in business
2. Contrast and compare different investment appraisal methods
3. Analyze the process of selection of investment alternatives using different appraisal methods
4. Evaluate methods of capital budgeting for investment decision making and for maximizing returns
5. Design different investment appraisals and make wise investments

UNIT-V: Financial Accounting and Analysis
Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts

(Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).***Financial Analysis*** **-** Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Learning Outcomes:

At the end of the Unit, the learners will be able to

1. Discuss the concept,convention and significance of accounting
2. Apply the fundamental knowledge of accounting while posting the journal entries
3. Analyze the process and preparation of final accounts and financial ratios
4. Evaluate the financial performance of an enterprise by using financial statements

<u>Text Books:</u>

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

<u>References:</u>

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage,201

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech III–II SEM

		L	T	P	C
19A65402	**Business Ethics and Corporate Governance (Humanities Elective – I)**	3	0	0	3

Course Objective:

- To make the student understand the principles of business ethics
- To enable them in knowing the ethics in management
- To facilitate the student's role in corporate culture
- To impart knowledge about the fair-trade practices

UNIT-I: ETHICS

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior - Value systems - Business Ethics,Types, Characteristics, Factors, Contradictions and Ethical Practices inManagement- Corporate Social Responsibility – Issues of Management – Crisis Management.

Learning Outcomes:

After completion of this unit student will

1. Understand the meaning of loyalty and ethical Behavior
2. Explain various types of Ethics
3. Analyze the corporate social responsibility of management

UNIT-II: ETHICS IN MANAGEMENT

Introduction Ethics in production, finance, ,Human Resource Managementand,Marketing,Management - Technology Ethics and Professional ethics - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individual Ethics.

Learning Outcomes:

After completion of this unit student will

1. Understand the meaning of Marketing Ethics
2. Compare and contrast technical ethics and professional ethics
3. Develop ethical values

UNIT-III: CORPORATE CULTURE

Introduction, Meaning, definition, Nature, Scope, Functions and significance– Cross cultural issues in Ethics - - Emotional Honesty – Virtue of humility – Promote happiness – karma yoga – proactive – flexibility and purity of mind. The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individual Ethics.

Learning Outcomes:

After completion of this unit student will

1. Define UniversalismUtilitarianism, Distributive

2. Understand the corporate culture in business
3. Analyze Ethical Value System Ethical Values in different Cultures

UNIT- IV: LEGAL FRAME WORK
Law and Ethics, Agencies enforcing Ethical Business Behavior, Legal Impact– Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers.
Learning Outcomes:
After completion of this unit student will
1. Understand Law and Ethics
2. Analyze Different fair-trade practices
3. Make use of Environmental Protection andFair-Trade Practices

UNIT -V: CORPORATE GOVERNANCE
Introduction, meaning – scope Nature - Issues, need, corporate governance code, transparency & disclosure, role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work, corporate scams, committees in India and abroad, corporate social responsibility. of BODs composition, Cadbury Committee - various committees - reports - Benefits and Limitations.
Learning Outcomes:
After completion of this unit student will
1. Understand corporate governance code
2. Analyze role ofauditors, board of directors and shareholders in corporate governance
3. Implementing corporatesocialresponsibility in India.

Text books.
1. Murthy CSV: Business Ethics and Corporate Governance, HPH
2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH.
Reference books
1. Dr. K. Nirmala, KarunakaraReaddy : Business Ethics and Corporate Governance, HPH
2. H.R.Machiraju: Corporate Governance
3. K. Venkataramana, Corporate Governance, SHBP.
4. N.M.Khandelwal : Indian Ethos and Values for Managers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

III B.TECH–II SEM

		L	T	P	C
19A65403	**Entrepreneurship and Incubation (Humanities Elective – I)**	3	0	0	3

Course Objective:

- To make the student understand about Entrepreneurship
- To enable the student in knowing various sources of generating new ideas in setting up of new enterprise
- To facilitate the student in knowing various sources of finance in starting up of a business
- To impart knowledge about various government sources which provide financial assistance to entrepreneurs/ women entrepreneurs
- To encourage the student in creating and designing business plans

Course Outcomes:

CO1: Define the Concepts related to the Entrepreneurship and Incubators
CO2: Understand the concept of Entrepreneurship and challenges in the world of competition.
CO3: Apply the Knowledge in generating ideas for New Ventures.
CO4: Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
CO5: Evaluate the role of central government and state government in promoting Entrepreneurship.

UNIT-I: Entrepreneurship

Introduction-Nature, meaning, significance, functions and advantages. concept, characteristics-knowledge and skills requirement - process - Factors supporting entrepreneurship - Differences between Entrepreneur and Entrepreneur - entrepreneurial mindset and personality - Recent trends.

Learning Outcomes

At the end if the Unit, the learners will be able to
1. Understand the concept of Entrepreneur and Entrepreneurship in India
2. Analyze recent trends in Entrepreneurship across the globe
3. Develop a creative mind set and personality in starting a business.

UNIT-II: Women Entrepreneurship

Introduction – Nature, meaning, significance, functions and advantages. Growth of women entrepreneurship in India. - Issues & Challenges - Entrepreneurial motivations.Entrepreneurship Development and Government. Role, of Central and State Government - incentives, subsidies and grants – Export-oriented Units - Fiscal and Tax concessions.

Learning Outcomes

At the end of the Unit, the learners will be able to

1. Understand the role of government in promoting women entrepreneurship
2. Analyze the role of export-oriented units
3. Evaluate the tax concessions available for Women entrepreneurs

.

UNIT-III:Product Development

Introduction – Nature, meaning, significance, functions and advantages. Startup Initiatives - Generating business/ Service idea – Sources and methods –Identifying opportunities - Feasibility study - Market feasibility, technical/operational feasibility, Financial feasibility. Developing business plan, Preparing project report, Presenting business plan to investors.

Learning Outcomes

At the end if the Unit, the learners will be able to

1. Analyze the sources of new methods in generating business idea
2. Evaluate market feasibility, financial feasibility and technical feasibility
3. Design and draw business plans in project preparation and prepare project reports

UNIT-IV: Startups

Introduction – Nature, meaning, significance, functions and advantages. Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence theType/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure -Value proposition

Learning Outcomes

At the end of the Unit, the learners will be able to:

1. Understand the importance of business incubation
2. Apply brilliant ideas in the process of business incubation
3. Analyze the process of business incubation/incubators.
4. Design their own business incubation/incubators as viable-business unit.

UNIT-V: Finance

Introduction – Nature, meaning, significance, functions and advantages. Sources - Long term and Short term - Institutional Finance – Commercial Banks, SFC's and NBFC's in India, Role in small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions supporting entrepreneurship development.

Learning Outcomes

At the end of the Unit, the learners will be able to

1. Understand the various sources of finance in Starting the new venture
2. Analyze the role of banks and other financial institutions in promoting entrepreneurship in India
3. Evaluate the need and importance of MSMEs in the growth of country

Text Books

1. D F Kuratko and T V Rao, **Entrepreneurship** - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)

2 .Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

References

1.Vasant Desai,Small Scale Industries and Entrepreneurship, Himalaya Publishing 2012.

2. Rajeev Roy Entrepreneurship, 2nd Edition, Oxford, 2012.

3.B.JanakiramandM.Rizwana‖ Entrepreneurship Development: Text & Cases, Excel Books, 2011.

4.Stuart Read, Effectual Entrepreneurship, Routledge, 2013.

E-Resources

1. Entrepreneurship-Through-the-Lens-of-enture Capital
2. http://www.onlinevideolecture.com/?course=mba-programs&subject=entrepreneurship
3. http://nptel.ac.in/courses/122106032/Pdf/7_4.pd
4. http://freevideolectures.com/Course/3514/Economics-/-Management-/-Entrepreneurhip/50

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

19A60409 **MICROPROCESSORS AND MICROCONTROLLERS LAB**

Course Objectives:
- Write ALP for arithmetic and logical operations in 8086
- Familiarize with MASM, Embedded C & Code composer studio
- Write and execute programs in 8086, 8051 and ARM Cortex M0

Course Outcomes:
- Execution of different programs for 8086, 8051 in Assembly Level Language using MASM Assembler
- Design and implement some specific real time applications.

Conduct all the experiments:
List of Experiments:
Intel 8086 (16 bit Micro Processor)
1. Perform simple arithmetic operations using different addressing modes.
2. Sort an array of binary numbers.
3. Code Conversion (Eg. ASCII to Packed BCD form).
4. Addition of an array of BCD numbers stored in packed form.
5. Multiplying two 3x3 matrices and print on DOS
6. Identification & displaying the activated key using DOS & BIOS function calls.

Intel 8051 (8 bit Microcontroller)
1. Detection of key closure (connected to a port line) by polling technique.
2. Delay generation using i) Nested loop & ii) Timers.
3. Counting of external event occurrence through port line

ARM Cortex M0 – NXP LPC Xpress/1115
1. Introduction to the Keil MDK-ARM tool, C and Assembly coding - Processing text in assembly language
2. Configure GPIO for Digital input and output
3. Study of mixed assembly and C programming – Calling a C function from assembly and Calling an assembly function from C

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

19A60410 **DIGITAL SYSTEM DESIGN THROUGH VHDL LAB**

Course Objectives:

1 To familiarize with CAD tools

2 To familiarize with design, simulation and synthesis of combinational and sequential circuits using CAD tools

Course Outcomes

Students will be able to

CO1 understand and use CAD tools for simulation and synthesis of digital systems

CO2 design and synthesize different combinational and sequential circuits

CO3 design and implement complex digital systems using CAD tools

CO4 Implement and test simple digital circuits on FPGA

CO5 write and prepare a lab report that details design procedures and experimental results.

1. Write structural and dataflow VHDL models for
   a) 4-bit ripple carry adder.
   b) 4-bit carry look ahead adder
   c) 8-bit comparator
2. Write a VHDL program in structural model for
   a) 16:1 mux realization
   b) 3:8 decoder realization through 2:4 decoder
3. Write a VHDL program in behavioral model for
   a) 16:1 mux
   b) 3:8 decoder
   c) 8:3 encoder
   d) 8 bit parity generator and checker
4. Write a VHDL program in structural and behavioral models for
   a) 8 bit asynchronous up-down counter
   b) 8 bit synchronous up-down counter
5. Write a VHDL program for 4 bit sequence detector through Mealy and Moore state machines.
6. Write a VHDL program for traffic light controller realization through state machine.
7. Write a VHDL program in behavioral model for 8 bit shift and add multiplier.
8. Write a VHDL program in structural model for 8 bit Universal Shift Reg

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – III-II Sem	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

19A60411 **DIGITAL SIGNAL PROCESSING LAB**

Course Objectives:

- Students can learn the basics of using DSP chips to perform real-time digital signal processing.
- Ability to apply knowledge of mathematics, science and engineering: Construction of tools for visualizing the basic concepts of discrete signal representation such as Fourier transforms, discrete time representations.
- Students will learn numerous programming tools for design and implementations of filtering algorithms.
- Understand the concept of Multi-rate signal processing and sample rate conversion.
- Develop and Implement DSP algorithms in software using CCS with DSP floating point Processor.

Course Outcomes:

- Ability to design-test, to verify, to evaluate, and to benchmark a real-time DSP system.
- Ability to calculate discrete time domain and frequency domain of signals using discrete Fourier series and Fourier transform.
- Ability to design, using MATLAB-based filter design techniques, FIR and IIR digital filters and Determine the frequency response of filters.
- Implementation of basic signal processing algorithms such as convolution, difference equation implementation and application of them in the construction of FIR and IIR filters.
- Design DSP based real time processing systems to meet desired needs of the society.

Conduct any <u>eight</u> experiments from part-A and any <u>four</u> experiments from part-B
List of Experiments:

PART-A

The following experiments shall be conducted using MATLAB / Lab View / C Programming/ Equivalent software.

1. Generation of sinusoidal waveform / signal based on recursive difference equations.
2. Find DFT / IDFT of given discrete time signal.
3. Find frequency response of a system given in transfer function/ differential equation form.
4. Implementation of FFT of given Sequence.
5. Design and implementation of IIR filter using bilinear transformation and impulse invariant method.
6. Design and implementationof IIR Butterworth (LP/HP) filter.
7. Design and implementationof IIR Chebyshev (LP/HP) filter.
8. Design and implementation of FIR with low pass filter using any three windowing techniques. Plot its magnitude and phase responses.

9. Design and implementation of FIR filter with high passfilter using any three windowing techniques. Plot its magnitude and phase responses.
10. Design and implementation of FIR filter with band pass / band stopfilter using any three windowing techniques. Plot its magnitude and phase responses.

PART-B

The following experiments shall be conducted using (TI / Analog Devices / Motorola / Equivalent DSP processors).

11. Study the architecture of DSP chips – TMS 320C 5X/6X Instructions.
12. Find DFT / IDFT of given discrete time signal.
13. Implementation of FFT of given Sequence.
14. Design and implementationof IIR Butterworth / Chebyshev (LP/HP) filter.
15. Design and implementation of FIR with low pass / high pass filter using any three windowing techniques. Plot its magnitude and phase responses.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

III B.TECH–II SEM

		L	T	P	C
19A65404	Research Methodology	3	0	0	0

Course Objectives:
- To understand the basic concepts of research and research problem
- To make the students learn about various types of data collection and sampling design
- To enable them to know the method of statistical evaluation
- To make the students understand various testing tools in research
- To make the student learn how to write a research report

Course Outcomes:
CO1: Define the basic concepts and its methodologies
CO2: Understand the concept of sampling, research design etc.
CO3: Demonstrate the knowledge of research processes
CO4: Analyze the importance of research articles in their academic discipline
CO5: Select appropriate testing tools used in research
CO6: Design a research paper without any ethical issues

UNIT I
Introduction to Research
Meaning of Research – Objectives of Research – Types of Research – Research Approaches – Guidelines for Selecting and Defining a Research Problem – Research Design – Concepts related to Research Design – Basic Principles of Experimental Design.

Learning Outcomes:
After completion of this unit student will
1. Understand the concept of research and its process
2. Explain various types of research
3. Know the steps involved in research design
4. Understand the different research approaches

UNIT II:
Sampling Design
Steps in Sampling Design –Characteristics of a Good Sample Design – Random Sampling Design. Measurement and Scaling Techniques-Errors in Measurement – Tests of Sound Measurement – Scaling and Scale Construction Techniques – Time Series Analysis – Interpolation and Extrapolation. Data Collection Methods – Primary Data – Secondary data – Questionnaire Survey and Interviews.

Learning Outcomes:
After completion of this unit student will
1. Understand the concept of sampling and sampling design
2. Explain various techniques in measurement and scaling
3. Learn various methods of data collection
4. Design survey questionnaires for different kinds of research

5. Analyze the questionnaires

UNIT III
Correlation and Regression Analysis
Method of Least Squares – Regression vs Correlation – Correlation vs Determination – Types of Correlations and Their Applications

Learning Outcomes:
After completion of this unit student will
1. Know the association of two variables
2. Understand the importance of correlation and regression
3. Compare and contrast correlation and regression
4. Learn various types of correlation
5. Apply the knowledge of C&R Analysis to get the results

UNIT IV
Statistical Inference
Tests of Hypothesis – Parametric vs Non-parametric Tests – Hypothesis Testing Procedure – Sampling Theory – Sampling Distribution – Chi-square Test – Analysis of variance and Co-variance – Multivariate Analysis

Learning Outcomes:
After completion of this unit student will
1. Know the statistical inference
2. Understand the hypothesis testing procedure
3. Compare and contrast Parametric and Non-parametric Tests
4. Understand the use of chi-square test in investigating the distribution of categorical variables
5. Analyze the significance of variance and covariance

UNIT V
Report Writing and Professional Ethics
Interpretation of Data – Report Writing – Layout of a Research Paper – Techniques of Interpretation- Making Scientific Presentations in Conferences and Seminars – Professional Ethics in Research.

Learning Outcomes:
After completion of this unit student will
1. Learn about report writing
2. Understand how to write research paper
3. Explain various techniques of interpretation
4. Understand the importance of professional ethics in research
5. Design a scientific paper to present in the conferences/seminars

Text books:
1. Research Methodology: Methods and Techniques – C.R.Kothari, 2nd Edition, New Age International Publishers.

2. Research Methodology: A Step by Step Guide for Beginners- Ranjit Kumar, Sage Publications

References:

1. Research Methodology and Statistical Tools – P.Narayana Reddy and G.V.R.K.Acharyulu, 1st Edition,ExcelBooks,New Delhi.
2. Business Research Methods–Donald R. Cooper & Pamela S Schindler, 9/e,
3. S C Gupta, Fundamentals of Statistics,7th Edition Himalaya Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – IV-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A70401 **MICROWAVE ENGINEERING AND OPTICAL COMMUNICATIONS**

Course Objectives:

- To understand the wave propagation in waveguides, principle of operation of optical sources, detectors, microwave active and passive devices.
- To apply the boundary conditions of the waveguides to solve for field expressions in waveguides.
- To derive the field expressions for different modes of the waveguides, and Scattering matrix for passive microwave devices.
- To differentiate Linear bean tubes and crossed field tubes in terms of operation and performance.
- To remember various types of fibers, modes, configurations and signal degradations.
- To analyze signal degradation in optical fibers and compare the performance of various optical sources and detectors.

Course Outcomes:

- Understand the wave propagation in waveguides, principle of operation of optical sources, detectors, microwave active and passive devices. Also remember various types of fibers, modes, configurations and signal degradations
- Apply the boundary conditions of the waveguides to solve for field expressions in waveguides.
- Derive the field expressions for different modes of the waveguides, and Scattering matrix for passive microwave devices.Analyze signal degradation in optical fibers and compare the performance of various optical sources and detectors
- Differentiate Linear bean tubes and crossed field tubes in terms of operation and performance.

UNIT-I

Waveguides (Microwave Transmission lines): Introduction, Rectangular waveguides, Field expressions for TE and TM modes, Wave propagation in the guide, Phase and group velocities, Power transmission and attenuation, Waveguide current and mode excitation, Circular waveguide – TE and TM modes, Wave propagation, waveguide resonators – problem solving.

Learning Outcomes:

After completing this Unit, students will be able to

- Know the importance of waveguides
- Derive field expressions for different modes of propagation in the waveguides.
- Understand the concept of wave propagation in the guides
- Problem solving to find the parameters like cutoff frequency, phase and group velocities etc. in waveguides

UNIT-II

Passive Microwave Devices: Introduction to scattering parameters and their properties, Terminations, Variable short circuit, Attenuators, Phase shifters, Hybrid Tees (H-plane, E-plane, Magic Tees), Hybrid ring, Directional Couplers – Bethe hole and Two hole Couplers, Microwave propagation in Ferrites, Microwave devices employing Faraday rotation – Isolator, Circulator, Deriving Scattering matrix for Microwave passive devices.

Learning Outcomes:
After completing this Unit, students will be able to

- Understand principle of operation of all passive microwave devices
- Know the importance of Scattering parameters and their properties
- Derive the Scattering matrix for the microwave devices
- Apply the Scattering matrix to understand the working of passive devices and solve problems

UNIT-III

Microwave Amplifiers and Oscillators:
Microwave Tubes: (i) Linear Beam Tubes – Two cavity Klystron amplifier -velocity modulation, bunching process, output power, Reflex Klystron oscillator, power output and efficiency, Travelling Wave Tube (TWT) – Bunching process and amplification process (Qualitative treatment only).
(ii) Crossed Field Tubes – Magnetron oscillator, pi-mode operation, power output and efficiency, Hartree Condition, Mode jumping in Magnetron, Principle of operation of Cross Field Amplifier (CFA).
Microwave Semiconductor Devices: Gunn Oscillator – Principle of operation, Characteristics, Two valley model, IMPATT, TRAPATT diodes, Parametric Amplifier.

Learning Outcomes:
After completing this Unit, students will be able to

- Understand principle of operation of Microwave Tubes and semiconductor devices
- Derive the expressions power output and efficiency of all microwave devices
- Differentiate Linear bean tubes and crossed field tubes in terms of operation and performance

UNIT-IV
Optical Communications:
Overview of Optical Fiber Communications, optical fibers – Structures, Optical fiber modes and configurations, Signal degradation in optical fibers – Signal attenuation, absorption, scattering losses, Bending Losses, Core and Cladding losses, Signal distortion in optical waveguides, Information capacity determination, Group delay, waveguide dispersion, Inter model dispersion.

Learning Outcomes:
After completing this Unit, students will be able to

- Remember the optical fiber types, modes, configurations, and signal degradation types
- Analyze the signal degradation in optical fibers

UNIT-V

Optical Sources and Detectors: Introduction, LEDs – structure – Light source, Quantum efficiency, Modulation of an LED, LASER diodes, Source to Fiber power launching, LASER diode to fiber coupling, LED coupling to single mode fibers, Fiber, Splicing, Optical Fiber connectors, Photo diodes – Principle of Photo diodes, Avalanche Photodiodes, Photo detector noise, detector response time, Comparison of Photo diodes.

Learning Outcomes:
After completing this Unit, students will be able to

- Understand the working principle of optical sources, detectors and power coupling
- Compare the performance of various optical source and detectors

Textbooks:

1. Samuel Y. Liao, "Microwave Devices and Circuits", PHI publications, Third Edition, 1997.
2. Gerd Keiser, "Optical Fiber Communications", McGraw Hill, Third Edition, 2000.

Reference Books:

1. Matthew N. O. Sadiku, "Elements of Electromagnetics", Oxford Publications, Third Edition, 2003.
2. R. E. Collin, "Foundations for Microwave Engineering", Wiley Student Edition, Second Edition, 2009.
3. Om. P. Gandhi, "Microwave: Engineering and Applications", Kai Fa Book Company, 1981.
4. Reich H. J., et al, "Microwave Principles", MIT Press, 1972.
5. F E Terman, "Electronic and Radio Engineering", McGraw Hill, 4^{th} Edition, 1984.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – IV-I Sem		**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
19A70402	**VLSI DESIGN**				

Course Objectives:

- To identify the design for testability methods for combinational & sequential CMOS Circuits.
- To understanding of CMOS fabrication flow, technology scaling, sheet resistance, square capacitance and propagation delays in CMOS circuits.
- To apply the design Rules and draw layout of a given logic circuit and basic circuit concepts to MOS circuits.
- To analyze the behaviour of amplifier circuits with various loads. Analyze the behaviour of static and dynamic logic circuits. Analyze the various test generation methods for static and dynamic CMOS circuits.
- To Design MOSFET based logic circuit, Amplifier circuits using MOS transistors and
  MOSFET based logic circuits using various logic styles like static and dynamic CMOS.

Course Outcomes:

- Identify the design for testability methods for combinational & sequential CMOS circuits. Understand CMOS fabrication flow, technology scaling, sheet resistance, and square capacitance and propagation delays in CMOS circuits.
- Apply the design Rules and draw layout of a given logic circuit and basic circuit concepts to MOS circuits.
- Analyze the behavior of amplifier circuits with various loads, static and dynamic logic circuits, various test generation methods for static and dynamic CMOS circuits.
- Design MOSFET based logic circuit, Amplifier circuits using MOS transistors and MOSFET based logic circuits using various logic styles like static and dynamic CMOS

UNIT-I

Introduction and Basic Electrical Properties of MOS Circuits: VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology.
MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits

Learning Outcomes:
After completing this Unit, students will be able to

- Understand CMOS fabrication flow and technology scaling .
- Apply the design Rules and draw layout of a given logic circuit .

- Design MOSFET based logic circuits .

UNIT-II

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, Some area Capacitance Calculations, The Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

Learning Outcomes:

After completing this Unit, students will be able to

- Apply basic circuit concepts to MOS circuits .
- Estimate the sheet resistance, square capacitance and propagation delays in CMOS circuits

UNIT-III

Basic building blocks of Analog IC design

Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks.

Learning Outcomes:

After completing this Unit, students will be able to

- Analyze the behavior of amplifier circuits with various loads .
- Design amplifier circuits using MOS transistors .

UNIT-IV

CMOS Combinational and sequential logic circuit design

Static CMOS Design: Complementary CMOS, Ratioed Logic, Pass-Transistor Logic, **Dynamic CMOS Design:** Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates, Choosing a Logic Style, Gate Design in the Ultra Deep-Submicron Era,Latch Versus Register, Latch based design, timing decimation, positive feedback, instability, Metastability, multiplexer based latches, Master-Slave Based Edge Triggered Register, clock to q delay, setup time, hold time, reduced clock load master slave registers, Clocked CMOS register. Cross coupled NAND and NOR, SR Master Slave register, Storage mechanism, pipelining

Learning Outcomes:

After completing this Unit, students will be able to

- Analyze the behaviour of static and dynamic logic circuits .
- Design MOSFET based logic circuits using various logic styles like static and dynamic CMOS

UNIT-V

CAD Tools for Design and Simulation, Aspects of Design Tools, Test and Testability-System Partitioning, Layout and Testability, Reset/Initialization, Design for Testability,Testing

Combinational Logic, Testing Sequential Logic, Practical Design for Test (OFT) Guidelines, Scan Design Techniques, Built-In-Self-Test (BIST), Future Trends.

Learning Outcomes:

After completing this Unit, students will be able to

- Identify the design for testability methods for combinational & sequential CMOS circuits .
- Analyze the various test generation methods for static and dynamic CMOS circuits .

Textbooks:

1. Kamran Eshraghian, “Essentials of VLSI Circuits and Systems”, Douglas and A. Pucknell and SholehEshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. BehzadRazavi , “Design of Analog CMOS Integrated Circuits”, McGraw Hill, 2003.

Reference Books:

1. Jan M. Rabaey, “Digital Integrated Circuits”, AnanthaChandrakasan and Borivoje Nikolic, Prentice-Hall of India Pvt.Ltd, 2nd edition, 2009.
2. John P. Uyemura, “Introduction to VLSI Circuits and Systems”, John Wiley & Sons, reprint 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – IV-I Sem **L T P C**
3 0 0 3

19A70403 **DIGITAL IMAGE PROCESSING**
Professional Elective - III

Course Objectives:

- To introduce fundamentals of Image Processing.
- To expose various intensity transformations in spatial and frequency domains.
- To impart concepts of wavelets and various coding techniques for image compression.
- To dissimilate various segmentation techniques for images.
- To teach various color models and to introduce the concepts of color image segmentation.

Course Outcomes:

- Analyze various types of images mathematically.
- Compare image enhancement methods in spatial and frequency domains.
- Demonstrate various segmentation algorithms for given image.
- Justify DCT and wavelet transform techniques for image compression.
- Describe various color models for color image processing.

UNIT-I

Digital Image Fundamentals-Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighbourhood, adjacency, connectivity, distance measures.

Learning Outcomes:

After completing this Unit, students will be able to

- Explain the basic building blocks of image processing
- Define image processing parameters such as adjacency and distance measures

UNIT-II

Image Enhancements and Filtering- Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.

Learning Outcomes:

After completing this Unit, students will be able to

- Compare image enhancement methods in spatial and frequency domains
- Apply frequency Domain filtering techniques for image enhancement

UNIT-III

Image Segmentation, Detection of discontinuities, edge linking and boundary detection, thresholding – global and adaptive, region-based segmentation.

Learning Outcomes:

After completing this Unit, students will be able to

- Describe various Image segmentation techniques
- Illustrate detection of discontinuities in an image

UNIT-IV

Wavelets and Multi-resolution image processing- Uncertainty principles of Fourier Transform, Time-frequency localization, continuous wavelet transforms, wavelet bases and multi-resolution analysis, wavelets and Sub-band filter banks.
Image Compression, -Redundancy, inter-pixel and psycho-visual; Loss less compression – predictive, entropy; Lossy compression- predictive and transform coding; Discrete Cosine Transform; Still image compression standards – JPEG and JPEG-2000.

Learning Outcomes:
After completing this Unit, students will be able to
- Describe various transform techniques for lossy compression
- Apply various coding techniques for lossless compression

UNIT-V
Color Image Processing-Color models–RGB, YUV, HSI; Color transformations–formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation.

Learning Outcomes:
After completing this Unit, students will be able to
- Describe various color models for color image processing
- Apply various techniques for color image smoothing, sharpening and segmentation

Textbooks
1. R.C. Gonzalez and R.E. Woods, "Digital Image Processing", 2^{nd} Edition, Pearson Education, 2008.
2. Anil Kumar Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 2^{nd} edition 2004.

Reference Books:

1. Rafael C. Gonzalez, Richard E woods and Steven L. Eddins, "Digital Image processing using MATLAB", Tata McGraw Hill, 2010.
2. Milan Sonka, Vaclav Hlavac, Roger Boule, "Image Processing, Analysis, and Machine Vision", 3^{rd} Edition, Cengage Learning, 2016.
3. S Jayaraman, S Esakkirajan, T Veerakumar, "Digital Image processing", Tata McGraw Hill.
4. William K. Pratt, "Digital Image Processing", John Wiley, 3rd Edition, 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – IV-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A70404

DATA SCIENCE
Professional Elective - III

Course Objectives

- Develop practical data analysis skills, which can be applied to practical problems
- Explain how math and information sciences can contribute to building better algorithms and software.
- an overview of simple statistical models and the basics of machine learning techniques of clustering, associations, classification, regression and text analysis
- do regression, correlation and knowledge discovery of the data
- implement Data Visualization Techniques
- understanding of the basics of the ethical use of data science

Course Outcomes:

At the end of this course, learners will be able to:

- Describe what Data Science is and the skill sets needed to be a data scientist
- Describe the Data Science Process and how its components interact
- Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes) for predictive modelling
- Be able to translate a real-world problem into mathematical terms.
- Identify basic Feature Selection algorithms (Filters, Wrappers, Decision Trees, Random Forests) and use in applications.
- Create effective visualization of given data

UNIT-I

Introduction to Data Science:

What is Data Science?, Where do we see Data Science?, How does data science relate to other Fields? , Information vs Data, Computational Thinking, Skills for Data Science, Tool for Data Science. Issues of Ethics, Bias, Privacy in Data Science

Learning Outcomes:

- Knowledge about basics of data science and relation with other fields
- Lean skill for Data science and tools

UNIT-II

Data Types, Data Collection, Data Pre Processing, Data Analysis and Analytics, Descriptive Analytics, Diagnostic Analytics, Predictive and Perspective Analytics. Explorative Analysis, Mechanistic Analysis

Learning Outcomes:

- Knowledge about basics of data types and Pre Processing, Data Analysis and Analytics
- Lean about Descriptive Analytics, Diagnostic Analytics, Predictive and Perspective Analytics

UNIT-III

What is Machine Learning?, Regression, Gradient Descent, Supervised Learning-Introduction, Logistic Regression,Softmax Regression, Classification with KNN, Decision Tree, Random forest, Navie Bayes, SVM, Unsupervised Learning.

Learning Outcomes:

- Knowledge about Machine Learning- Regression, Gradient Descent, Supervised Learning
- Lean about Classification with KNN, Decision Tree

UNIT-IV

Introduction to Data Collection, Surveys, Question Types, Survey Audience, Services, Analyzing Survey Data, Pros and Cons of Surveys, Interview and Focus groups, Pros and Cons of Interview and Focus groups, Log and Diary Data, User Studies in Lab and Field.

Learning Outcomes:

- Knowledge about Data Collection, Surveys, Question Types.
- Lean about Analyzing Survey Data, Pros and Cons of Surveys.

UNIT-V

Analysis and Evaluation, Jobs

Introduction to Quantitative methods, Introduction to Qualitative methods, Comparing models, Training, Testing and A/B testing, Cross-Validation, Data Science Jobs- Marketing, Data Science Jobs- Retail and Sales. Data Science Jobs – Legal, Data Science Jobs - Health and Human SLO-2 Services.

Learning Outcomes:

- Knowledge about Quantitative methods and Comparing models.
- Lean about Testing and A/B testing, Cross-Validation.
- Knowledge about Data Science Jobs

Textbooks:

1. Shah, C., “A Hands-On Introduction to Data Science”, Cambridge: Cambridge University Press. 2020
2. Rafael A. Irizarry, “Introduction to Data Science: Data Analysis and Prediction Algorithms with R”, CRC Press, 2020.

Reference Books:

1. Joel Grus, “Data Science from Scratch: First Principles with Python”, O’Reilly Media, 2015.
2. Hastie,Tibshirani, R., Friedman, J., “The Elements of Statistical Learning”, 2nd Edition, Springer, 2009.
3. Murphy, “K, Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – IV-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A760405 **EMBEDDED SYSTEMS**
Professional Elective - III

Course Objectives:

- To introduce major components of an embedded system
- To expose role of firmware, operating systems in correlation with hardware systems.
- To explain interfacing of various communication and I/O devices to an embedded system
- To demonstrate implementation of embedded systems for different applications

Course Outcomes:

- Identify hardware and software components of an embedded system.
- Choose appropriate embedded system architecture for the given application.
- Discuss quality attributes and characteristics of an embedded system.
- Illustrate different Inter Process Communication (IPC) mechanisms used by tasks/process/tasks to communicate in multitasking environment.
- Design an RTOS based embedded system.

UNIT –I

Introduction to Embedded Systems: Definition of embedded system, embedded systems vs general computing systems, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, Processor and OS trends in embedded system.
Embedded hardware units and devices in a system, embedded software in a system and an overview of programming languages, skills required for an embedded system designer, examples of the embedded systems.

Learning Outcomes:

After completing this Unit, students will be able to

- Differentiate embedded system and general computing system
- Classify embedded systems based on performance, complexity and era in which they are evolved
- Discuss basic hardware and software units used in embedded systems

UNIT –II

Core of the embedded system, memory, sensors and actuators, communication interface, embedded firmware, other system components, Characteristics of an embedded system, Quality attributes of embedded systems.

Learning Outcomes:

After completing this Unit, students will be able to

- Summarize different factors to be considered in the selection of memory for an embedded system

- Describe role of sensors, actuators and their interfacing with I/O subsystems
- Explain role of embedded firmware in embedded system
- Understand characteristics describing an embedded system
- Discuss important quality attributes of the embedded system for online and offline modes

UNIT- III

I/O, Communication devices and Interrupt Service Mechanism: I/O types and examples, serial communication devices, parallel device ports, wireless devices, timer and counting devices, Interrupt-driven input and output, interrupt service routine concept, interrupt sources, hardware interrupts, software interrupts, interrupt-servicing mechanism, multiple interrupts, interrupt service threads as second-level interrupt handlers, context and the periods for context switching, interrupt latency, interrupt-service deadline, interrupt service mechanism form context-saving angle, direct memory access driven I/O, Device driver programming.

Learning Outcomes:
After completing this Unit, students will be able to

- Summarize pros and cons of interrupt driven data transfer
- Discuss hardware and software interrupts with examples
- Know how interrupts can be used to minimize latency
- Differentiate ISRs & device driver functions
- Describe uses of hardware and software assigned priorities in an interrupt service mechanism

UNIT –IV
Inter-process Communication (IPC): Multiple processes in an application, multiple threads in an application, tasks, task and thread states, tasks and data, distinction between function, ISR, IST and task by their characteristics, inter-process communication and synchronization, signals, concept of semaphores, disabling and enabling functions, shared data problem, queues and mailboxes, pipe and socket functions, remote procedure call functions.

Learning Outcomes:
After completing this Unit, students will be able to

- Describe mechanism to create multiple tasks (processes & threads),control task states and allocate system resources to the tasks
- Explain IPC functions to enable communication of signals, semaphores and messages from ISRs and tasks
- Discuss IPC functions for pipes, sockets and RPCs

UNIT –V
REAL-TIME OPERATING SYSTEMS - Operating System Overview, Operating System - Functions, Types and Services of Operating Systems, Real-Time Operating System, RTOS overview, RTOS Task Scheduling, Keil RTX RTOS, RTOS on **Mbed** platform, **Mbed**RTOSAPI, Using **Mbed** RTOS API for your Project, Thread, Mutex and Semaphore.

Learning Outcomes:
After completing this Unit, students will be able to

- Explain about operating system and RTOS
- Summarize different features of RTOS
- Build RTOS based embedded system using Keil RTX mbed platform

Textbooks:

1. Shibu K V, "Introduction to Embedded Systems", 2nd edition, McGraw Hill Education, 2017.
2. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", 3rd edition, McGraw Hill Education, 2017.

Reference Books:

1. Muhammad Ali Mazidi, Janice GillispieMazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems Using Assembly and C", 2nd edition, Pearson Education India, 2007
2. Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", 3rdEdition Cengage Learning, 2012.
3. David. E. Simon, "An Embedded Software Primer" 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – IV-I	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A70406 **INDUSTRIAL ELECTRONICS**

Open Elective-III

Course Objectives:

This course will enable students to:

- Understand the characteristics of Gas devices and thyrathon.
- Understand about the practical applications Electronics in industries
- Describe the Inverters and Industrial Timing**.**

Course Outcome:

- Understand the Gas devices and thyrathon V-I characteristics.
- Apply the Classification of Photo electronic devices and Frequecy response characteristics
- Analyze the types of Families of thyristors and Magnetic Amplifiers
- Develop the practical applications Inverters and Industrial Timing.

UNIT – I

Gas Devices:

Introduction, Ionisation in Gases, I-V relation in cold cathode Gas Tube, Glow and Arc discharges, Classifications of Gas tubes, glow discharge tubes, glow discharge tubes as source light, Voltage regulator tube, Glow discharge rectifier tube, Grid glow tube, Glow tube protective devices, Strobotron, photography flasher, thermionic gas devices – working, influence of Gas pressure on thermionic gas diode performance.

Learning Outcomes:

- Learn basic of Gas devices and V-I characteristics
- Understand various gas tubes and its working performances

UNIT – II

Thyratron : Negative Grid thyratron, Action of Grid Firing of thyratron, Firing characteristics of negative grid thyratron, construction negative grid thyratron, Positive Grid Thyratron, shield Grid thyratron, ionization and deionization times thyratrons, general theory of tubes using mercury pool cathode, mercury arc rectifier, excitron, ignition.

Learning Outcomes:

- Learn basic of Grid thyratron and Firing characteristics
- Understand about ionization and deionization times thyratrons

UNIT – III

Photo electronic devices: Classification of Photo electronic devices, Photo electric emission,Frequecy response characteristics of Photo electric emitters, significance of special sensitivity curve in Industrial applications,Photo tubes,Vaccum photo tubes,Luminous sensitivity of a photo tubes, Gas photo tubes,Photo emission multipler, choice of photo tube, light absorption and photo condition, photoconductive cells, Photo diode, Pin photo diode, avalanche photo diode, NPN photo diode, photo transistor, Miscellaneous photo transistor, photo voltaic effect, solar cells, photo emissive electron tube, infrared emitting diode, LED, laser diodes.

Learning Outcomes:

- Learn basic of Classification of Photo electronic devices
- Understand about Photo tubes,Vaccum photo tubes,Luminous sensitivity of a photo tubes.

UNIT-IV

Thyristors: Types of thyristors, Families of thyristors, PNPN Diode and characteristics, SCR, SCS, Triac, Diac, Unijunction Transistor, delayed firing of SCR by UJT.

Magnetic Amplifiers: The saturable Reactors, Reactor saturation by direct current, self saturation rectifier, DC control of self saturated reactor, The bias winding, Feedback in magnetic amplifier, Waveshape at output voltage, Reset control, Push pull magnetic amplifier, Positive feedback causing switiching action.

Learning Outcomes:

- Learn basic of Classification of Photo electronic devices
- Understand about Photo tubes, Vaccum photo tubes, luminous sensitivity of a photo tubes.

UNIT-V

Inverters: simple inverters using thyratrons, Power inverter using thyratrons, Power inversion using mercury arc rectifier tube, single phase inverters using thyristors, ability to operate into inductive load, over current protection, output voltage control in inverter, Wavefrom control, Typical Inverter circuits, Three phase inverters.

Timer Circuits: constituents of industrial timing circuits, Timers, classification of Timers, Thermal Timers, Electro mechanical timers, Electronic Timers, classification of Electronic Timers, RC timing elements , Digital Timing Element, Time base generator, Digital counters, Transistor timer with relay load control, SCR Delay timer, IC electronic Timer.

Learning Outcomes:

- Learn basic of inverters using thyratrons
- Understand about industrial timing circuits and classification of Timers.

Textbooks:

1. G. K. Mithal, "Industrial Electronics", Khanna Publishers, Delhi, 2000.
2. J.Gnanavadivel, R.Dhanasekaran, P.Maruthupandi, "Industrial Electronics", Anuradha Publications, 2011.

Reference Books:

1. F. D. Petruzulla, "Industrial Electronics", McGraw Hill, Singapore, 1996.
2. M. H. Rashid, "Power Electronics Circuits, Devices and Application", PHI, 3rdedition, 2004.
3. G. M. Chute and R. D. Chute, "Electronics in Industry", McGraw Hill Ltd, 1995.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – IV-I Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A70407 **MICROCONTROLLERS & APPLICATIONS**
Open Elective-III

Course Objectives:

This course will enable students to:

- Describe theArchitecture of 8051 Microcontroller and Interfacing of 8051 to external memory.
- Write 8051 Assembly level programs using 8051 instruction set.
- Describe the Interrupt system, operation of Timers/Counters and Serial port of 8051.
- Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051.

Course outcomes:

- Understand the importance of Microcontroller and Acquire the knowledge of Architecture of 8051 Microcontroller.
- Apply and Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to using 8051 I/O ports.
- Develop the 8051 Assembly level programs using 8051 instruction set.
- Design the Interrupt system, operation of Timers/Counters and Serial port of 8051.

UNIT – I

8051 Microcontroller:

Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.

Learning Outcomes:

At the end of this student, the student will be able to

- Understand the importance of Microcontroller and acquire the knowledge of Architecture of 8051 Microcontroller.
- Analyze interface required memory of RAM & ROM.

UNIT – II

Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples to usethese instructions.

Learning Outcomes:

At the end of this student, the student will be able to

- Explain different types instruction set of 8051.
- Develop the 8051 Assembly level programs using 8051 instruction set.

UNIT – III

8051 Stack, Stack and Subroutine instructions. Simple Assembly language program examples to use subroutine instructions.8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode- 2 on a port pin.

Learning Outcomes:

At the end of this student, the student will be able to

- Describe Stack and Subroutine of 8051.

- Design Timer /counters using of 8051.

UNIT –IV

8051 Serial Communication- Basics of Serial Data Communication, RS- 232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.**8051 Interrupts**. 8051 Assembly language programming to generate an external interrupt using a switch.

Learning Outcomes:

At the end of this student, the student will be able to

- Acquire knowledge of Serial Communication and develop serial port programming.
- Develop an ALP to generate an external interrupt using a switch.

UNIT – V

8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, DAC, LCD and Interfacing with relays and opto isolators, Stepper Motor Interfacing, DC motor interfacing, PWM generation using 8051.

Learning Outcomes:

At the end of this student, the student will be able to

- Apply and Interface simple switches, simple LEDs, ADC 0804 and LCD to using 8051 I/O ports.
- Design Stepper Motor and f motor interfacing of 8051.

Textbooks:

1. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; “The 8051 Microcontroller and Embedded Systems – using assembly and C”, PHI, 2006 / Pearson, 2006.
2. Kenneth J. Ayala, “The 8051 Microcontroller”, 3rd Edition, Thomson/Cengage Learning.

Reference Books:

1. Manish K Patel, “The 8051 Microcontroller Based Embedded Systems”, McGraw Hill, 2014.
2. Raj Kamal, “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Pearson Education, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.TECH IV–I SEM

		L	T	P	C
19A75401	**Management Science (Humanities Elective – II)**	3	0	0	3

Course Objectives:

- To provide fundamental knowledge on Management, Administration, Organization & its concepts.
- To make the students understand the role of management in Production
- To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training &Development, job evaluation and Merit rating concepts
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
- To make the students aware of the contemporary issues in management

Course Outcomes:

CO1: Define the Management, and its Functions
CO2: Understand the concepts & principles of management and designs of organization in a practical world
CO3: Apply the knowledge of Work-study principles & Quality Control techniques in industry
CO4: Analyze the concepts of HRM in Recruitment, Selection and Training & Development.
CO5: Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.

Mapping of CO's with PO's and PSO's

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1											3		3		
CO2											2				1
CO3									1		2				
CO4											3				
CO5									1		3				

UNIT-I: INTRODUCTION TO MANAGEMENT

Management- Concept and meaning-Nature-Functions-Management as a Science and Art and both. Schools of Management Thought-Taylor's Scientific Theory-Henry Fayol's principles-Elton Mayo's Human relations-Systems Theory- **Organizational Designs**-Line organization-Line & Staff Organization-Functional Organization-Matrix Organization-Project Organization-Committee form of Organization-Social responsibilities of Management.

Learning Outcomes: At the end if the Unit, the learners will be able to
1. Understand the concept of management and organization
2. Analyze the organization chart & structure for an enterprise.
3. Apply the concepts & principles of management in real life industry.
4. Evaluate and interpret the theories and the modern organization theory.

UNIT-II: OPERATIONS MANAGEMENT

Principles and Types of Plant Layout-Methods of Production (Job, batch and Mass Production), Work Study- Statistical Quality Control- Deming 's contribution to Quality. **Materials Management -** Objectives- Inventory-Functions - Types, Inventory Techniques-EOQ-ABC Analysis-Purchase Procedure and Stores Management-**Marketing Management -**Concept- Meaning - Nature-Functions of Marketing - Marketing Mix- Channels of Distribution -Advertisement and Sales Promotion- Marketing Strategies based on Product Life Cycle.

Learning Outcomes: At the end of the Unit, the learners will be able to
1. Understand the core concepts of Management Science and Operations Management
2. Apply the knowledge of Quality Control, Work-study principles in real life industry.
3. Analyze Marketing Mix Strategies for an enterprise
4. Evaluate Materials departments &Determine EOQ
5. Create and design advertising and sales promotion

UNIT-III: HUMAN RESOURCES MANAGEMENT (HRM)

HRM- Evolution of HRM - Definition and Meaning – Nature-Managerial and Operative functions--Job Analysis -Human Resource Planning (HRP)–Process of Recruitment&Selection - Training and Development-Performance Appraisal-Methods of Performance Appraisal – Placement-Employee Induction-Wage and Salary Administration.

Learning Outcomes: At the end if the Unit, the learners will
1. Understand the concepts of HRM in Recruitment, Selection, Training& Development
2. Apply Managerial and operative Functions
3. Analyze the need of training
4. Evaluate performance appraisal
5. Design the basic structure of salaries and wages

UNIT-IV: STRATEGIC& PROJECT MANAGEMENT

Strategy Definition& Meaning-Vision - Mission- Goals- Corporate PlanningProcess-Environmental Scanning-Steps in Strategy Formulation and Implementation-SWOT Analysis
Project Management- Network Analysis- ProgrammeEvaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost Analysis - Project Crashing (Simple problems).

Learning Outcomes: At the end of the Unit, the learners will be able to

1. Understand Mission, Objectives, Goals & strategies for an enterprise
2. Apply SWOT Analysis to strengthen the project
3. Analyze Strategy formulation and implementation
4. Evaluate PERT and CPM Techniques
5. Creative in completing the projects within given time

UNIT -V: Contemporary Issues In Management

The concept of Management Information System (MIS)- Materials Requirement Planning (MRP)- Customer Relations Management (CRM)- Total Quality Management (TQM)- Six Sigma Concept- Supply Chain Management (SCM)- Enterprise Resource Planning (ERP)- Performance Management- Business Process Outsourcing (BPO) - Business Process Re-engineering and Bench Marking -Balanced Score Card-Knowledge Management.

Learning Outcomes: At the end if the Unit, the learners will be able to
1. Understand modern management techniques
2. Apply Knowledge in Understanding in modern
3. Analyze CRM,MRP,TQM
4. Evaluate Six Sigma concept and SCM

Text Books:

1. A.R Aryasri, Management Science, TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education,New Delhi, 2012.

References:

1. Koontz &Weihrich, Essentials of Management, 6/e, TMH, 2005.
2. Thomas N.Duening& John M.Ivancevich, ManagementPrinciples and Guidelines,Biztantra.
3. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
4. Samuel C.Certo, Modern Management, 9/e, PHI, 2005

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.TECH IV–I SEM

		L	T	P	C
19A75402	**Organizational Behavior (Humanities Elective – II)**	3	0	0	3

Course Objective:

- To enable student's comprehension of organizational behaviour
- To offer knowledge to students onself-motivation, leadership and management
- To facilitate them to become powerful leaders
- To Impart knowledge about group dynamics
- To make them understand the importance of change and development

Course Outcomes: At the end of the course, students will be able to
CO1: Define the Organizational Behavior, its nature and scope.
CO2: Understand the nature and concept of Organizational behaviour
CO3: Apply theories of motivation to analyze the performance problems
CO4: Analyze the different theories of leadership
CO5: Evaluate group dynamics

Unit-I: Introduction
Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective -Understanding Individual Behavior –Attitude -Perception - Learning – Personality.
Learning Outcomes: -After completion of this unit student will
1. Understand the concept of Organizational Behavior
2. Contrast and compare Individual& Group Behavior and attitude
3. Evaluate personality types

Unit-II: Motivation and Leading

Theories of Motivation- Maslow'sHierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theoryof expectancy - McClelland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory – Locke's goal setting theory– Alderfer'sERG theory - Leadership–research,theories, traits - LeadersVs Managers.
Learning Outcomes: -After completion of this unit student will
1. Understand the concept of Motivation
2. Analyze the Theories of motivation
3. Explain how employees are motivated according to Maslow's Needs Hierarchy

Unit-III: Organizational Culture
Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Conflict Management -Evaluating Leader- Women and Corporate leadership.
Learning Outcomes: -After completion of this unit student will
1. Understand the concept of Leadership
2. Contrast and compare Trait theory and Managerial Grid
3. Distinguish the difference between Transactional and Transformational Leadership

4. Evaluate the qualities of good leaders

Unit-IV: Group Dynamics

Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of group behavior - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decisionmaking - Team building - Conflict in the organization– Conflict resolution

Learning Outcomes: -After completion of this unit student will

1. Understand the concept of Group Dynamics
2. Contrast and compare Group behavior and group development
3. Evaluate how to resolve conflicts in the organization

Unit-V: Organizational Change and Development

Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development

Learning Outcomes: -After completion of this unit student will

1. Understand the importance of organizational change and development
2. Apply change management in the organization
3. Analyze work stress management
4. Evaluate Managerial implications of organization

Text Books:

1. Luthans, Fred, OrganisationalBehaviour, McGraw-Hill, 12 Th edition 2011 2. P Subba Rao, OrganisationalBehaviour,Himalya Publishing House 2017

References

1. McShane,Organizational Behaviour, TMH 2009
2. Nelson, OrganisationalBehaviour, Thomson, 2009.
3. Robbins, P.Stephen, Timothy A. Judge, OrganisationalBehaviour, Pearson 2009.
Aswathappa, OrganisationalBehaviour,Himalaya, 2009

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.TECH IV–I SEM

		L	T	P	C
19A75403	**Business Environment (Humanities Elective – II)**	3	0	0	3

Course Objective:

- To make the student understand about the business environment
- To enable them in knowing the importance of fiscal and monitory policy
- To facilitate them in understanding the export policy of the country
- To Impart knowledge about the functioning and role of WTO
- To Encourage the student in knowing the structure of stock markets

Course Outcome: At the end of the course, students will be able to
CO1: Define Business Environment and its Importance.
CO2: Understand various types of business environment.
CO3: Apply the knowledge of Money markets in future investment
CO4: Analyze India's Trade Policy
CO5: Evaluate fiscal and monitory policy

Unit-I: Overview of Business Environment
Introduction – meaning Nature,Scope,significance, functions and advantages. Types- Internal & External, Micro and Macro.Competitive structure of industries -Environmental analysis- advantages & limitations of environmental analysis& Characteristics of business.
Learning Outcomes: -After completion of this unit student will
1. Understand the concept of Business environment
2. Classify various types of business environment
3. Evaluate the environmental analysis in business
4. Discuss the Characteristics of Business.

Unit-II: Fiscal Policy
Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Public debt - Development activities financed by publicexpenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget- Monetary Policy - Demand and Supply of Money –RBI -Objectives of monetary and credit policy - Recent trends- Role of Finance Commission.
Learning Outcomes: -After completion of this unit student will
1. Understand the concept of public revenue and public Expenditure
2. Identify the functions of RBI and its role
3. Analyze the Monitory policy in India
4. Know the recent trends and the role of Finance Commission in the development of our country
5. Differentiate between Fiscal and Monitory Policy

Unit-III: India's Trade Policy
Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM

policy and role of EXIM bank -Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

Learning Outcomes: -After completion of this unit student will
1. Understand the role ofIndian international trade
2. Understand and explain the need for Export and EXIM Policies
3. Analyze causes for Disequilibrium and correction measure
4. Differentiate between Bilateral and Multilateral Trade Agreements

UNIT-IV: World Trade Organization

Introduction – Nature, meaning, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - Agreements in the Uruguay Round –TRIPS, TRIMS, and GATT - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

Learning Outcomes: -After completion of this unit student will
1. Understand the role of WTO in trade
2. Analyze Agreements on trade by WTO
3. Understand the Dispute Settlement Mechanism
4. Compare and contrast the Dumping and Anti-dumping Measures.

Unit-V: Money Markets and Capital Markets

Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI – Stock Exchanges - Investor protection and role of SEBI.

Learning Outcomes: -After completion of this unit student will
1. Understand the components of Indian financial system
2. Know the structure of Money markets and Capital markets
3. Analyze the Stock Markets
4. Apply the knowledge in future investments
5. Understand the role of SEBI in investor protection.

Text Books:

1. Francis Cherunilam (2009), International Business: Text and Cases, Prentice Hall of India.
2. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH2016

Reference Books:

1. K. V. Sivayya, V. B. M Das (2009), Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black (2009), International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.
3. Chari. S. N (2009), International Business, Wiley India.
4. E. Bhattacharya (2009), International Business, Excel Publications, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – IV-I Sem

L	T	P	C
0	0	3	1.5

19A70408 **MICROWAVE AND OPTICAL COMMUNICATIONS LAB**

Course Outcomes:

- Understand the mode characteristics of Reflex Klystron oscillator and negative resistance characteristics of Gunn Oscillator.
- Determine the Scattering matrix of given passive device experimentally and verify the same theoretically. Also determine numerical aperture and bending losses of a given optical fiber
- Analyze the radiation characteristics to find the directivity and HPBW of a given antenna.
- Establish optical link between transmitter and receiver **experimentally** to find attenuation and signal strength of the received signal.

Note: All the experiments shall be conducted and there is no choice.

Microwave Engineering:

1. Set up the Full Microwave bench and know the importance of each block. Identify the pin configuration of Reflex Klystron with the help of its power supply cable connected from the power supply unit. Also identify the Microwave signal coupling from Klystron Oscillator to the waveguide.
2. Make use of the bench set up and conduct the experiment to find mode characteristics of Reflex Klystron: (i) Repeller voltage vs output power (ii) Repeller voltage vs Frequency.
3. Measurement of Frequency and wavelength of generated Microwave signal using Reflex Klystron oscillator.
4. Verify the negative resistance characteristics of Gunn oscillator using the Microwave bench set up with Gunn oscillator set up.
5. Find the Scattering matrix of E-plane, H-plane, and Magic Tees experimentally.
6. Make use of Microwave bench setup to find VSWR and impedance of an unknown load that is connected at the end of the bench set up. Make use of VSWR meter for the measurement of VSWR of a given load.
7. Determine directivity, insertion loss and coupling factor of a given Directional Coupler experimentally.
8. Making use of Microwave bench set up, find the radiation characteristics in both the planes and determine HPBW and directivity of a pyramidal horn antenna.

Optical Communication:

9. Conduct the experiment to draw the DC characteristics of LED and Photo diode.
10. Make use of Fiber optic kit to determine the **numerical aperture** and **bending losses** of a given optical fiber (transmission line).
11. Establish an optical link between transmitter and receiver and determine the signal strength at the receiver. Give the comments about the experiment by transmitting (i) **analog signal** (ii) **digital signal.**
12. Attenuation measurement in Fibers for various lengths.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – IV-I Sem

L	T	P	C
0	0	3	1.5

VLSI DESIGN LAB

Objectives:

- To understand and develop HDL source code for the given problem/experiment
- To analyze the obtained results of the given experiment/problem
- To simulate the given circuit with suitable simulator and verify the results
- To understand how to use FPGA/CPLD hardware tools in the lab
- To design and implement the experiments using FPGA/CPLD hardware tools

Course Outcomes:

- Understand how to use FPGA/CPLD hardware tools in the lab.
- Develop HDL source code for the given problem/experiment, and simulate the given circuit with suitable simulator and verify the results.
- Analyze the obtained results of the given experiment/problem.
- Design and implement the experiments using FPGA/CPLD hardware tools.

List of Experiments:

PART (A): FPGA Level Implementation (Any Seven Experiments)

Note 1: The students need to develop VHDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.

Note 2: All the experiments need to be implemented on the latest FPGA/CPLD Hardware in the Laboratory.

Design and Implementation of the following

1. Realization of Logic gates
2. 4-bit ripple carry and carry look ahead adder using behavioral, dataflow and structural modelling
    a) 16:1 mux through 4:1 mux
    b) 3:8 decoder realization through 2:4 decoder
3. 8:3 encoder
4. 8-bit parity generator and checker
5. Flip-Flops
6. 8 bit synchronous up-down counter
7. 4bit sequence detector through Mealy and Moore state machines.

EDA Tools/Hardware Required:

1. EDA Tool that supports FPGA Programming including Xilinx Vivado / Altera (Intel) / Cypress / Equivalent Industry Standard tool along with corresponding FPGA Hardware.
2. Desktop Computer with appropriate Operating system that supports the EDA tools.

PART (B): Back-end Level Design and Implementation (Any Five Experiments)

Note: The students need to design the following experiments at schematic level using CMOS logic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can be used while simulating the design using Industry standard EDA Tools.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

Design and Implementation of the following

1. Universal Gates
2. an Inverter
3. Full Adder
4. Full Subtractor
5. Decoder
6. D-Flip-Flop

EDA Tools/Hardware Required:

1. Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry Standard Software/CAD Tool.
2. Desktop Computer with appropriate Operating system that supports the EDA tools.

List of Experiments

PART (A): Any Seven Experiments

Note 1: The students need to develop VHDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.

Note 2: All the experiments need to be implemented on the latest FPGA/CPLD Hardware in the Laboratory.

1. Realization of Logic gates
2. Design and Implementation of 4-bit ripple carry and carry look ahead adder using behavioral, dataflow and structural modelling
3. Design and Implementation of
   a. 16:1 mux through 4:1 mux
   b. 3:8 decoder realization through 2:4 decoder
4. Design and Implementation of 8:3 encoder
5. Design and Implementation of 8-bit parity generator and checker
6. Design and Implementation of different Flip-Flops
7. Design and Implementation of 8 bit synchronous up-down counter
8. Design and Implementation of 4bit sequence detector through Mealy and Moore state machines.

Equipment/Software required:

1. FPGA Programming Software like Xilinx Vivado / Altera (Intel) / Cypress / Equivalent Industry Standard Software
2. FPGA Hardware like Xilinx / Altera (Intel) / Cypress / Equivalent Industry Standard Hardware
3. Personal computer system with necessary software to run the programs and Implement.

PART (B): Any Five Experiments

Note: The students need to design the schematic diagrams using CMOS logic and to draw the layout diagrams, to perform the following experiments using 130nm technology with the Industry standard EDA Tools.

1. Design and Implementation of Universal Gates

2. Design and Implementation of an Inverter
3. Design and Implementation of Full Adder
4. Design and Implementation of Full Subtractor
5. Design and Implementation of Decoder
6. Design and Implementation of D-Latch

Software Required:

1. Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry Standard Software/CAD Tool.

b. Personal computer system with necessary software to run the programs and to implement.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

	L	T	P	C
B.Tech – IV-II	**3**	**0**	**0**	**3**

19A80401 **ADVANCED 3G AND 4G WIRELESS MOBILE COMMUNICATIONS**
Professional Elective - IV

Course Objectives:
- To understand the concepts of wireless communications and standards .
- To apply a wireless technique to solve engineering problem .
- To analyze working of wireless technologies .
- To evaluate a wireless technique in a given situation .
- To plan a wireless system for deployment .

Course Outcomes:
At the end of the course, the student should be able to
- Understand the concepts of wireless communications and standards .
- Apply a wireless technique to solve engineering problem .
- Analyze working of wireless technologies .
- Evaluate a wireless technique in a given situation .
- Plan a wireless system for deployment .

UNIT-I

Introduction to 3G and 4G standards.
Teletraffic Theory:
Introduction to teletraffic theory, Cellular traffic modelling and blocking probability.
Large Scale Path Loss:
Introduction to wireless propagation models, Ground reflection model, Okumura model, Hata model, Link budget analysis, Log normal shadowing.

Learning Outcomes:

At the end of the unit, student shall be able to
- Understand the concept of a standard, teletraffic and signal loss model .
- Apply a model to study the signal losses .
- Analyzethe suitability of a model to a given situation .
- Evaluate a model in a given situation .
- Plan a wireless system for deployment .

UNIT-II
Small Scale Fading and Multipath:
Fading in wireless channel, Rayleigh fading, BER in wired and wireless channels. Wireless channel and delay spread, Coherence bandwidth of wireless channel, ISI and Doppler in wireless channel, Doppler spectrum and Jake's model.
Diversity Techniques:
Introduction to diversity techniques, MRC for multi-antenna system, BER with diversity, Spatial diversity and diversity order.

Learning Outcomes:

At the end of the unit, student shall be able to

- Understand the concept of fading and diversity .
- Apply a diversity technique to improve BER
- Compare various diversity techniques
- Evaluate channel model in a given situation

UNIT-III

Code Division Multiple Access

Introduction to CDMA, spread spectrum and LFSR. Generation and properties of PN sequences, Correlation of PN sequences and Jammer margin, CDMA advantages and RAKE receiver, Multiuser CDMA downlink,Multiuser CDMA uplink and asynchronous CDMA, CDMA near-far problem.

Learning Outcomes:

At the end of the unit, student shall be able to

- Understand the concept of PN sequence .
- Apply CDMA in a multiuser environment .
- Analyze near-far problem .
- Evaluate CDMA technique in a multiuser environment .

UNIT-IV

Multiple Input Multiple Output Systems:

Introduction to MIMO, MIMO system model, Zero-forcing receiver, MIMO MMSE receiver, Introduction to SVD, SVD based optimal MIMO transmission and capacity, OSTBCs, V-blast receiver, MIMO beam forming.

Orthogonal Frequency Division Multiplexing:

Introduction to OFDM, Multicarrier modulation, IFFT sampling for OFDM, OFDM schematic, Cyclic prefix, OFDM based parallelization, OFDM examples.

Learning Outcomes:

At the end of the unit, student shall be able to

- Understand the concept of MIMO and OFDM .
- Apply MIMO/ OFDM techniques in a given situation .
- Analyze working of MIMO/ OFDM systems .
- Evaluate aMIMO/ OFDM techniques in a given situation .

UNIT-V

MIMO-OFDM:

Introduction to MIMO-OFDM, Impact of carrier frequency offset in OFDM, PAPR in OFDM systems, Introduction to SC-FDMA.

3G and 4G Standards:
WCDMA, LTE/ LTE Advanced and WiMAX.

Learning Outcomes:

At the end of the unit, student shall be able to

- Understand 3G and 4G standards and the combined concept of MIMO-OFDM .
- Apply MIMO-OFDM techniques in a given situation .
- Analyze working of MIMO-OFDM systems .
- Evaluate a MIMO-OFDM techniques in a given situation .

Textbooks:

1. Aditya K. Jagannatham, "Principles of Modern Wireless Communications Systems – Theory and Practice", McGraw-Hill International, 2015.
2. Theodore S. Rappaport, "Wireless Communications – Principles and Practice", 2nd Edition, PHI, 2004.

Reference Books:

1. David Tse and PramodViswanath, "Fundamentals of Wireless Communications", Cambridge University Press.
2. Andrea Goldsmith, "Wireless Communications", Cambridge University Press.
3. EzioBiglieri, "MIMO Wireless Communications", Cambridge University Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – IV-II	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A80402 **INTRODUCTION TO INTERNET OF THINGS**

Professional Elective – IV

Course Objectives:

- To present interconnection and integration of the physical world and the cyber space.
- To demonstrate applications of Internet of Things
- To educate building blocks and characteristics of Internet of Things
- To introduce communication protocols used in Internet of Things
- To impart knowledge on design & develop IoT devices

Course Outcomes:

- Examine the application areas of IoT
- Illustrate revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- Examine communication protocols used in IoT
- Make use of python programming to implement Internet of Things
- Design IoT applications using Raspberry Pi

UNIT-I

Introduction & Concepts: Introduction to Internet of Things, physical design of IoT, logical design of IoT, IoT enabling Technologies, IoT levels.

Learning Outcomes:

At the end of the unit, student shall be able to

- Explain characteristics, protocols, functional blocks of IoT
- Explain physical and logical design of IoT
- Categorize different levels of IoT

UNIT –II

Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

Learning Outcomes:

At the end of the unit, student shall be able to

- Categorize different domains where IoT can be applied
- Select physical design components for real time applications

UNIT –III

M2M & System Management with NETCONF-YANG: M2M, Difference between IOT andM2M, SDN and NFV for IOT, Software defined Networking, Network FunctionVirtualization, Need for IOT Systems Management, Simple Network Management Protocol,Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systemsmanagement with NETCONF-YANG.

Learning Outcomes:
At the end of the unit, student shall be able to

- Describe concept of M2M and differentiate it with IoT
- Explain about SDN and NFV for IoT
- Examine NETCONF and YANG modelling language for IoT

UNIT –IV
Internet of Things Systems - Logical Design using Python: Introduction, Motivation for using Python, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages of Interest for IoT.

Learning Outcomes:
At the end of the unit, student shall be able to

- Explain the data manipulation and file handling using Python
- Apply various Python packages of interest for IoT

UNIT-V
IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming with Python; Python web application framework – Django, Designing a Restful web API.

Learning Outcomes:

At the end of the unit, student shall be able to

- Discuss about Django and RESTful web API with respect to IoT
- Design IoT applications using Raspberry Pi

Textbooks:
1. Adrian McEwen, “Designing the Internet of Things”, Wiley Publishers, 2013
2. Vijay Madisetti, ArshdeepBahga, “Internet of Things A Hands-On- Approach”,2014.

Reference Books:
1. Matt Richardson & Shane Wallace, “Getting Started with Rasperry Pi”, O’Reilly (SPD), 2014.
2. Daniel Kellmereit, “The Silent Intelligence: The Internet of Things”, 2013

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech – IV-II	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A80403 **SYSTEM VERILOG**

Professional Elective - IV

Course Objectives:

- To study fundamentals of data types in verilog programming.
- To study the various design operators, and loop concepts in verilog.
- To introduce a clocking and program blocking events and semaphores.
- To acquaint with connecting the design and testbench

Course Outcomes

- Understand the basic concepts data types, arrays in verilog programming.
- Compute the operators, fork and join and loop concepts in verilog.
- Design logic implementation for clocking and program blocking events and semaphores.
- Understand the concept of advanced OOPs concepts and threads and inter process communications.

UNIT-I

DATA TYPES: Introduction, Built-in Data Types, Fixed-Size Arrays, Dynamic Arrays, Queues,Associative Arrays, Linked Lists, Array Methods, Choosing a Storage Type, Creating New Types with typedef, Creating User-Defined Structures, Enumerated Types, Constants, Strings, Expression Width, Net Types.

Learning Outcomes

- Illustrate the Built in data types and arrays in system verilog
- Analyze and implement the methods of arrays and various typedef

UNIT-II

Operators- operands, operator types, Tasks and Functions- Differences between tasks and functions, declaration, invocation, automatic tasks and functions, **Fork and Join-** Sequential and Parallel Blocks, Block Types, Special Features of Blocks, **Loop Concepts-** While Loop, For Loop, Repeat Loop, Forever loop, Value Change Dump File.

BASIC OOP: Introduction, Think of Nouns, not Verbs, Your First Class, Where to Define a Class, OOP Terminology, Creating New Objects, Object Deallocation, Using Objects, Static Variables vs. Global Variables, Class Routines, Defining Routines Outside of the Class, Scoping Rules, Using One Class Inside Another, Understanding Dynamic Objects, Copying Objects, Public vs. Private, Straying Off Course, Building a Testbench, Inheritance encapsulation, polymorphism,

Learning Outcomes

- Learn the various different operator types and task functions
- Analyze and implement the methods of fork and join in parallel blocks
- Understand the concepts of Loops and VCD file.
- Understand the concepts of basic oops and routines used for class rules.

UNIT-III

Clocking block- Stimulus Timing, Controlling timing of synchronous signals with a clocking block, Timing problems in Verilog, Testbench – design race condition.

Program block- The program block and timing regions, Specifying delays between the design and testbench, Interface Driving and Sampling- Interface synchronization, Interface signal sample, Interface signal drive, Bidirectional signals in the interface, the clock generator.
Events- Blocking on the edge of an event, waiting for an event trigger, passing events, waiting for multiple events.
Semaphores- Semaphore operations, Semaphores with multiple keys.
Mailboxes- Mailbox in a testbench, Bounded mailboxes, Unsynchronized threads communicating with a mailbox, Synchronized threads using a mailbox and events, Synchronized threads using two mailboxes.
CONNECTING THE TESTBENCH AND DESIGN: Introduction, Separating the Testbench and Design, The Interface Construct, Stimulus Timing, Interface Driving and Sampling, Connecting It All Together, Top-Level Scope, Program – Module Interactions, SystemVerilog Assertions, The Four-Port ATM Router.

Learning Outcomes

- Learn the various clocking block, program block design conditions
- Analyze and implement the Events of edge blocking, waiting and passing events.
- Understand the concepts of semaphores and mailboxes.
- Analyze the Design testbench for the Interface Construct, Stimulus timming and top level scope of programming modules.

UNIT-IV
RANDOMIZATION: What to Randomize, Randomization in SystemVerilog, Constraint Details, Solution Probabilities, Controlling Multiple Constraint Blocks, Valid Constraints, In-line Constraints, The pre_randomize and post_randomize Functions, Constraints Tips and Techniques, Common Randomization Problems, Iterative and Array Constraints, Atomic Stimulus Generation vs. Scenario Generation, Random Control, Random Generators, Random Device Configuration, Seeds- Random Number Generation , Semi-formal Verification ,Seed Management.
Learning Outcomes

- Learn the cocept of randomize in system verilog.
- Analyze pre randomize and post randomize functions, and constranints.

UNIT-V
THREADS AND INTERPROCESS COMMUNICATION: Working with Threads, Interprocess Communication, Building a Testbench with Threads and IPC.
Advanced OOP: Sub Classes, super, casting, static Methods, Object property methods, Parameterized class, Typedef class, abstract Class, Virtual Class, Factory Patterns, Type Casting and Virtual Methods, Assertion, Composition and Alternatives, Copying an Object, Callbacks.
Learning Outcomes

- Knowledge in understanding about the threads and interprocess communication
- Analyze working with threads and testbench with IPC.

- Understand the concepts of Advanced OOP for various methods and class casting and virtual methods.

Textbooks:

1. Chris Spear, "SystemVerilog for Verification"- A Guide to Learning the Testbench Language Features, 2006 Springer Science – USA.
2. Janick Bergeron, "Writing Testbenches Using System Verilog, Features", 2006 Springer Science – USA.

Reference:

1. Janick Bergeron, Eduard Cerny, Alan Hunter, and Andy Nightingale, Verification Methodology Manual for SystemVerilog

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech –IV-II	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

19A80404 **ELECTRONIC INSTRUMENTATION**
Open Elective-IV

Course Objectives:
This course will enable students to:
- To introduce various measuring instruments and their functionality
- To teach various measurement metrics for performance analysis
- To explain principles of operation and working of different electronic instruments
- To familiarize the characteristics, operations, calibrations and applications of the different oscilloscopes and signal generators.
- To provide exposure to different types of transducers

Course outcomes:
- Learn different types of errors in measurement, calibration process and standards, various methods for measurement of non-electrical quantities, Understand the different methods for measurement of various electrical quantities.
- Familiarize the dynamics of instrument systems, various passive and active transducers
- Compare the various measuring techniques for measuring voltage

UNIT – I
Measurement and Error: Definitions, Accuracy, Precision, Resolution and Significant Figures, Types of Errors, Measurement error combinations.
Ammeters: DC Ammeter, Multi-range Ammeter, The Ayrton Shunt or Universal Shunt, Requirements of Shunt, Extending of Ammeter Ranges, RF Ammeter (Thermocouple), Limitations of Thermocouple.
Voltmeters and Multi-meters: Introduction, Basic Meter as a DC Voltmeter, DC Voltmeter, Multi range Voltmeter, Extending Voltmeter Ranges, Loading, AC Voltmeter using Rectifiers. True RMS Voltmeter, Multi-meter.

Learning Outcomes:
At the end of this unit, the student will be able to
- Explain the importance of measurement system
- Examine the characteristics of different Instruments
- Illustrate different types of errors that may occur in instruments during measurements

UNIT – II
Digital Voltmeters: Introduction, RAMP technique, Dual Slope Integrating Type DVM, Integrating Type DVM, Most Commonly used principles of ADC, Successive Approximations, -Digit, Resolution and Sensitivity of Digital Meters, General Specifications of DVM,
Digital Instruments: Introduction, Digital Multi-meters, Digital Frequency Meter, Digital Measurement of Time, Universal Counter, Digital Tachometer, Digital pH Meter, Digital Phase Meter, Digital Capacitance Meter,

Learning Outcomes:
At the end of this unit, the student will be able to
- Explain working of digital measuring Instruments
- Compare the various measuring techniques for measuring voltage

UNIT – III
Oscilloscopes: Introduction, Basic principles, CRT features, Block diagram of Oscilloscope, Simple CRO, Vertical Amplifier, Horizontal Deflecting System, Sweep or Time Base Generator, Measurement of Frequency by Lissajous Method, Digital Storage Oscilloscope.
Signal Generators: Introduction, Fixed and Variable AF Oscillator, Standard Signal Generator, Laboratory Type Signal Generator, AF sine and Square Wave Generator, Function Generator,
Learning Outcomes:
At the end of this unit, the student will be able to
- Describe functions of basic building of CRO
- Measure parameters viz. Amplitude, frequency and time period using CRO
- Classify signal generators and describe its characteristics

UNIT – IV
Measuring Instruments: Field Strength Meter,Stroboscope, Phase Meter, Q Meter, Megger.
Bridges: Introduction, Wheatstone‘s bridge, Kelvin‘s Bridge; AC bridges, Capacitance Comparison Bridge, Inductance Comparison Bridge, Maxwell‘s bridge, Wien‘s bridge.
Learning Outcomes:
At the end of this unit, the student will be able to
- Describe function of various measuring Instruments.
- Describe how unknown capacitance and inductance can be measured using bridges
- Select appropriate bridge for measuring R, L and C parameters

UNIT – V
Transducers: Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer, LVDT, Piezoelectric transducer, Photo cell, Photo voltaic cell, Semiconductor photo diode and transistor.
Learning Outcomes:
At the end of this unit, the student will be able to
- Explain the importance of transducer
- Illustrate different measuring techniques in transducers to measure physical quantities.
- Select the appropriate transducer for the measurement of physical parameters

Textbooks:
1. H. S. Kalsi, “Electronic Instrumentation”, McGraw Hill, 3rd Edition, 2012.
2. A. D. Helfrick and W.D. Cooper, “Modern Electronic Instrumentation and Measuring Techniques”, Pearson, 1st Edition, 2015.

Reference Books:

1. David A. Bell, “Electronic Instrumentation & Measurements”, Oxford University Press PHI 2nd Edition, 2006.
2. A. K. Sawhney, “Electronics and Electrical Measurements”, Dhanpat Rai &Sons.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

B.Tech –IV-II

L	T	P	C
3	0	0	3

19A80405 **FUNDAMENTALS OF INTEGRATED CIRCUITS APPLICATIONS**
Open Elective-IV

Course Objective

- To introduce the basic building blocks of linear & digital integrated circuits.
- To learn the linear and non - linear applications of operational amplifiers.
- To introduce the theory and applications of 555 and PLL.
- To learn the theory of ADC and DAC
- To understand different families of digital integrated circuits and their characteristics.

Course Outcomes

- Understand the basic concepts of Op -AMPs, characteristics and specifications.
- Design circuits using operational amplifiers for various applications .
- Develop, apply and analyze circuits for advanced applications using Opamps, PLL, VCO and Analog multipliers.
- Understand different families of digital integrated circuits and their characteristics
- Design various and sequential circuits using digital ICs.

UNIT -I

Operational Amplifier Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 OpAmp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

Learning Outcomes:

- Understand about Operational Amplifiers and its characteristics
- Analyze the arithematics operation of Inverting, Non-Inverting differential amplifiers
- Knowledge on comparators, Schmitt tiggers, and voltage regulators.

UNIT -II

Op-Amp, IC-555 & IC 565 Applications Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave,IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

Learning Outcomes:

- Understand various IC 555 and IC565 applications.
- Analyze the Characteristics of Band pass, Band reject and All Pass Filters
- Knowledge on Triangular, Sawtooth, Square Wave, IC555 Timer in Monostable and Astable Operations.

UNIT -III

Data Converters Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

Learning Outcomes:

- Learn about various basic DAC techniques and different types .

- Analyze the DAC, R-2-R ladder DAC and inverted R-2R DAC
- Knowledge on ADC- counter type and dual slope ADC.

UNIT -IV

Digital Integrated Circuits Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing- TTL Driving CMOS & CMOS Driving TTL, Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

Learning Outcomes:

- Learn about various basic Digital ICs and Various Logic Families,
- Analyze the CMOS Transmission Gate and IC interfacing- TTL Driving CMOS & CMOS Driving TTL
- Knowledge on Combinational Logic ICs.

UNIT -V

Sequential Logic IC's and Memories Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers. Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

Learning Outcomes:

- Learn about Sequential Logic IC's and Memories.
- Analyze the Flip-flops, Synchronous Counters, Decade Counters, Shift Registers
- Knowledge on Memories - ROM Architecture, Types of ROMS & Applications.

Textbooks:

1. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", PHI, 2003.
2. Floyd and Jain, "Digital Fundamentals", Pearson Education, 8th Edition, 2005.

Reference Books:

1. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (p) Ltd, Second Edition, 2003.
2. James M. Fiore, "Op Amps and Linear Integrated Circuits-Concepts and Applications", Cengage Learning/ Jaico, 2009.
3. K.Lal Kishore, "Operational Amplifiers with Linear Integrated Circuits", Pearson, 2009.
4. John. F. Wakerly, "Digital Design Principles and Practices", Pearson, Third Edition, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B.Tech (R19 Regulation)

Additional Courses offered by ECE department for B.Tech. (Honors) (For 20 Credits)

1. 5G Wireless Communications
2. Automotive Electronics
3. Low power VLSI Design.
4. Pattern Recognition
5. Smart Antennas
6. Digital Video Signal Processing (MOOCs)
7. MEMS & Nano Technology
8. Mini Project.

Note:
1. Out of the ‘7’theory courses listed above the students can opt for ‘5’ courses
2. No. of credits for each theory courseis ‘3’ and for mini project is ‘5’

Minor degree courses offered by ECE Department for (For 20 Credits)

S.No	Course Code	Circuit Branches
1	19A04M11	Probability Theory and Stochastic Processes
2	19A04M12	Analog Communications
3	19A04M13	VLSI Design
4	19A04M14	Embedded Systems
5	19A04M15	Analog Communications Lab
6	19A04M16	VLSI Design Lab
7	19A04M17	Mini Project

Minor degree courses offered by ECE Department for (For 20 Credits)

S.No	Course Code	Non-Circuit Branches
1	19A04M21	Analog Electronics
2	19A04M22	Digital Electronics
3	19A04M23	Principles of Communications
4	19A04M24	Microprocessors and Microcontrollers
5	19A04M25	Communication Lab
6	19A04M26	Electronics Lab
7	19A04M27	Mini Project

Note:
No. of credits for each theory course is ‘3’, lab course is ‘1.5’ and for mini project is ‘5’.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous):: ANANTHAPURAMU
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
B.Tech. Course Structure (R20)
2020 Admitted Batch

Induction Program – 3 weeks

Semester-I(Theory-5,Lab -4)

S.No	Course No	Course Name	Category	L-T-P	Credits
1.	20A15101	Linear Algebra and Calculus Common to All branches of Engineering	BS	3-0-0	3
2.	20A15201	AppliedPhysics Common to EEE, ECE, CSE	BS	3-0-0	3
3.	20A15501	Communicative English Common to EEE, ECE, CSE, CHEM	HS	3-0-0	3
4.	20A12403	Basic Electrical Engineering	ES	3-0-0	3
5.	20A10301	Engineering Drawing Common to EEE, ECE, CSE	ES	1-0-2	2
6.	20A10302	Engineering Graphics Lab Common to EEE, ECE, CSE	ES	0-0-2	1
7.	20A15202	AppliedPhysics Lab Common to EEE, ECE, CSE	BS	0-0-3	1.5
8.	20A15502	Communicative EnglishLab Common to EEE, ECE, CSE, Chem	HS	0-0-3	1.5
9.	20A12404	Basic Electrical Engineering Lab	ES	0-0-3	1.5
				Total	**19.5**

Semester-II(Theory-5,Lab -5)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	20A15102	**Differential Equations and Vector Calculus** Common to all branches of Engineering except CSE	BS	3-0-0	3
2.	20A15303	Chemistry Common to EEE, ECE, CSE	BS	3-0-0	3
3.	20A10506	C-Programming & Data Structures Common to EEE, ECE	ES	3-0-0	3
4.	20A10402	Electronic Devices & Circuits Common to EEE, ECE	ES	3-0-0	3
5.	20A10303	EngineeringWorkshop Common to EEE, ECE, CSE	ES	0-0-3	1.5
6.	20A10401	Electronics & IT Workshop	ES	0-0-3	1.5
7.	20A10507	C-Programming & Data Structures Lab Common to EEE, ECE	ES	0-0-3	1.5
8.	20A15304	Chemistry Lab Common to EEE, ECE, CSE	BS	0-0-3	1.5
9.	20A10403	Electronic Devices &Circuits Lab Common to EEE, ECE	ES	0-0-3	1.5
1	20A10803	Environmental Science Common to EEE, ECE, CSE	MC	3-0-0	0.0
				Total	**19.5**

- For 20 Batch only

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

III Semester

S.No	Course No	Course Name	Category	L-T-P	Credits
1	20A35102	Complex Variables & Transform Techniques Common to EEE,MECH, ECE	BS	3-0-0	3
2	20A30401	Analog Circuits	PC/ES	3-0-0	3
3	20A30402	Digital Design	PC/ES	3-0-0	3
4	20A30403	Networks , Signals and Systems	PC/ES	3-0-0	3
5	20A39101a	Managerial Economics and Financial Analysis	HS	3-0-0	3
	20A39101B	Entrepreneurship & Incubation			
	20A39101C	Business Ethics And Corporate Governance			
8	20A30406	Analog Circuits Lab	PC/ES	0-0-3	1.5
9	20A30407	Digital Design Lab	PC/ES	0-0-3	1.5
1	20A30408	Simulation and Networks Lab	PC/ES	0-0-3	1.5
1	20A30409	Skill oriented Course – I (PCB Design and	SC	1-0-2	2
1	20A19101	Universal Human Values(Common to EEE, ECE, CSE) (Mandatory credit Course-II)	MC	3-0-0	0
1	20A39901	NSS/NCC/NSO Activities	-	0-0-2	0
				Total	**21..5**

***For 2020 Admitted batch only**

IV Semester

S.No	Course	Course Name	Category	L-T-P	Credits
1	20A45102	Probability Theory and Stochastic Processes (Mathematics)	BS	3-0-0	3
2	20A40401	Electromagnetic Waves and Transmission	PC/ES	3-0-0	3
3	20A40402	Analog Communications	PC/ES	3-0-0	3
4	20A40403	Microcontrollers and Interfacing	PC/ES	3-0-0	3
5	20A40404	IC Applications	PC/ES	3-0-0	3
6	20A40405	Analog Communications Lab	PC/ES	0-0-3	1.5
7	20A40406	Microcontrollers and Interfacing Lab	PC/ES	0-0-3	1.5
8	20A40407	IC Applications Lab	PC/ES	0-0-3	1.5
9	20A40408	Skill oriented Course – II (Object Oriented Programming through Java)	SC	1-0-2	2
10	20A49102	Mandatory non-credit Course-III (Design Thinking for Innovation) Common to all Branches	MC	2-1-0	0
Community Service Internship/Project (Mandatory) for 6 weeks duration during Summer vacation					
				Total	**21..5**

Note:

Semester–V						
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20A50401	Digital Communications	3	0	0	3
2.	20A50402	Antennas and Wave Propagation	3	0	0	3
3.	20A50403	Digital Signal Processing	3	0	0	3
4.	20A50404a 20A50404b 20A50405c	**Professional Elective Course – I** 1.Control Systems Engineering 2. Sensors and Actuators 3. Computer Architecture and organization	3	0	0	3
5.	20A50405	**Open Elective Course – I* Common to all** Basics of Electronics and Communication	3	0	0	3
6.	20A50406	Digital Communications Lab	0	0	3	1.5
7.	20A50407	Digital Signal Processing Lab	0	0	3	1.5
8.	20A55502	**Skill oriented course - III** Soft Skills (EEE, ECE, CSE)	1	0	2	2
9.	20A50408	Evaluation of Community Service Project				1.5
10.	20A59901	**Mandatory Non-credit Course** Intellectual Property Rights & Patents (EEE, ECE, CSE)	2	0	0	0
Total						**21.5**

1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.
2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.
3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline

Semester–VI						
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20A60401	VLSI Design	3	0	0	3
2.	20A60402	Microwave Engineering and Optical Communications	3	0	0	3
3.	20A60403	Data Communications and Networks	3	0	0	3
4.	20A60404a 20A60404b 20A60404c	**Professional Elective Course– II** 1. Electronic Measurements & Instrumentation 2. Satellite Communications 3. System Verilog	3	0	0	3
5.	20A60405	**Open Elective Course – II*** Basics of Integrated Circuits Applications(ECE)	3	0	0	3
6.	20A60406	VLSI Design Lab	0	0	3	1.5
7.	20A60407	Microwave and Optical Communications Lab	0	0	3	1.5
8.	20A60408	Data Communications and Networks Lab	0	0	3	1.5
9.	20A60409	**Skill oriented course - IV** Scripting Languages	1	0	2	2
10.	20A65901	**Mandatory Non-credit Course** Indian Constitution (EEE, ECE, CSE)	2	0	0	0
Total						**21.5**
20A60412Industry Internship (Mandatory) for 6 - 8 weeks duration during summer vacation						

Semester-VII						
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20A70401a 20A70401b 20A70401c	**Professional Elective Course– III** 1. Digital Image Processing 2. Introduction to Internet of Things 3. Radar Systems	3	0	0	3
2.	20A70402a 20A70402b 20A70402c	**Professional Elective Course– IV** 1. Artificial Intelligence and Machine Learning 2. Embedded System Design 3. RF Circuit Design	3	0	0	3
3.	20A70403a 20A70403b 20A70403c	**Professional Elective Course– V** 1. Cellular and Mobile Communications 2. Real Time Operating Systems 3. FPGA Architectures and Applications	3	0	0	3
4.	20A75401a 20A75401b 20A75401c	**Humanities Elective – II** **Common to all Branches** 1. Management Science 2. Business Environment 3. Organizational Behaviour	3	0	0	3
5.	20A70404	**Open Elective Course – III*** Digital Electronics (ECE) Common to all Branches	3	0	0	3
6.	20A70405	**Open Elective Course – IV*** Principles of Digital Signal Processing Common to all Branches	3	0	0	3
7.	20A70408	**Skill oriented course – V** Industrial IoT and Automation	1	0	2	2
8.	20A70407	Evaluation of Industry Internship				3
Total						**23**

Semester-VIII							
S.No.	**Course Code**	**Course Name**	**Category**	**L**	**T**	**P**	**Credits**
1.	20A80401	Full Internship & Project work	PR				12
Total							**12**

		Open Elective Course – I*				
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20A50105	Experimental Stress Analysis	3	0	0	3
2.	20A50205	Electric Vehicle Engineering	3	0	0	3
3.	20A50305	Optimization Techniques	3	0	0	3
4.	20A50405	Basics of Electronics and Communication	3	0	0	3
5.	20A50505	Introduction to Java Programming	3	0	0	3
6.	20A50805	Energy Conversion and Storage Devices	3	0	0	3
7.	20A55101	Optimization Methods (Mathematics)	3	0	0	3
8.	20A55201	Material Characterization	3	0	0	3
9.	20A55401	E-Business (H & SS)	3	0	0	3
10.	20A55301	CHEMISTRY OF ENERGYMATERIALS (CHEMISTRY)	3	0	0	3
		Open Elective Course – II*				
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20A60105	Disaster Management(CIVIL)	3	0	0	3
2.	20A60205	Renewable Energy Systems(EEE)	3	0	0	3
3.	20A60305	Solar Energy Systems(MECH)	3	0	0	3
4.	20A60405	Basics of Integrated Circuits Applications(ECE)	3	0	0	3
5.	20A60505	Introduction to Linux Programming (CSE) (CSE)	3	0	0	3
6.	20A60805	Green Technology(CHEM)	3	0	0	3
7.	20A65101	Mathematical Modelling & Simulation (Common for CIVIL,MECH &CHEM) (Mathemtics)	3	0	0	3
8.	20A65102	Wavelet transforms and its Applications (Common for EEE&ECE) (Mathemtics)	3	0	0	3
9.	20A65103	Statistical Methods for Data ScienceCSE (Data Science)(Mathemtics)	3	0	0	3
10.	20A65201	Physics Of Electronic Materials And Devices (Physics)	3	0	0	3
11.	20A65501	Academic Writing and Public Speaking(H & SS)	3	0	0	3
12.	20A65301	Chemistry Of Polymers And Its Applications (Chemistry)	3	0	0	3

***It is mandatory that the candidate should select any subject other than parent branch subject.**

		Open Elective Course – III*				
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20A70104	Building Technology for Engineers (CIVIL)	3	0	0	3
2.	20A70204	Battery Management Systems (EEE)	3	0	0	3
3.	20A70304	Modern Manufacturing Methods (MECH)	3	0	0	3
4.	20A70404	Digital Electronics (ECE)	3	0	0	3
5.	20A70504	Cyber Security (CSE)	3	0	0	3
6.	20A70804	Industrial Pollution Control Engineering (CHEM)	3	0	0	3
7.	20A75101	Numerical Methods for Engineers	3	0	0	3
8.	20A75201	SMART MATERIALS AND DEVICES (Physics)	**3**	**0**	**0**	**3**
9.	20A75501	Employability Skills (H&SS)	**3**	**0**	**0**	**3**
10.	20A75301	GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (Chemistry)	**3**	**0**	**0**	**3**

***It is mandatory that the candidate should select any subject other than parent branch subject.**

		Open Elective Course – IV				
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20A70105	Environmental Impact and Assessment (CIVIL)	3	0	0	3
2.	20A70205	IOT Applications in Electrical Engineering	3	0	0	3
3.	20A70305	Material Handling Equipment (MECH)	3	0	0	3
4.	20A70405	Principles of Digital Signal Processing (ECE)	3	0	0	3
5.	20A70505	Introduction to DBMS (CSE)	3	0	0	3
6.	20A70805	Solid Waste management (CHEM)	3	0	0	3
7.	20A75102	Number theory and its Applications(Mathemtics)	3	0	0	3
8.	20A75202	SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS (Physics)	**3**	**0**	**0**	**3**
9.	20A79102	ENGLISH LITERARY SPECTRUM (H & SS)	**3**	**0**	**0**	**3**
10.	20A75302	CHEMISTRY OF NANOMATERIALS AND APPLICATIONS (Chemistry)	**3**	**0**	**0**	**3**

***It is mandatory that the candidate should select any subject other than parent branch subject.**

HONOURS DEGREE IN ECE

S.No.	Course Code	Course Name	Contact Hours per week		Credits
			L	T	
1	20A04H11	Adaptive Signal Processing	3	1	4
2	20A04H12	5G Communications	3	1	4
3	20A04H13	Low power VLSI Design	3	1	4
4	20A04H14	Micro Electro-Mechanical Systems	3	1	4
SUGGESTED MOOCs**					
5	20A04H15a	VLSI related courses not studied earlier	--	--	2
6	20A04H16a	Embedded Systems related courses not studied earlier	--	--	2

**** Based on the availability of courses offered by NPTEL SWAYAM with a minimum of 12 weeks duration.**

MINOR
INTERNET OF THINGS

S.No.	Course Code	Course Title	Contact Hours per week			Credits
			L	T	P	
1.	20A04M11	Introduction to Internet of Things	3	1	0	4
2.	20A04M12	IoT with Arduino, ESP, and Raspberry Pi	3	1	0	4
3.	20A04M13	Communication Protocols for IoT	3	1	0	4
4.	20A04M14	Industrial IoT	3	1	0	4
5.	20A04M15a	**MOOC I: Data Analytics related courses	-	-	-	2
6.	20A04M16a	**MOOC II: Machine Learning related courses	-	-	-	2

**** Based on the availability of courses offered by NPTEL SWAYAM with a minimum of 12 weeks duration.**

B. Tech (E.E.E) I-Year I-sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A15101	**Linear Algebra & Calculus**	**3**	**0**	**0**	**3**

(Common to all branches of Engineering)

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Bridge Course: Limits, continuity, Types of matrices

Unit 1:Matrices **10 hrs**

Rank of a matrix by echelon form, normal form. Solving system of homogeneous and non-homogeneous equations linear equations. Eigenvalues and Eigenvectors and their properties, Properties of Eigen values and Eigen vectors on special matrices, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix.

Learning Outcomes:

At the end of this unit, the student will be able to

- solving systems of linear equations, using technology to facilitate row reduction determine the rank, eigenvalues and eigenvectors (L3).
- identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics; (L3)

Unit 2: Mean Value Theorems **6hrs**

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), related problems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Translate the given function as series of Taylor's and Maclaurin's with remainders (L3)
- analyze the behaviour of functions by using mean value theorems (L3)

Unit 3:Multivariable calculus **10 hrs**

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies. (L3)
- Acquire the Knowledge maxima and minima of functions of several variable (L1)
- Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (L3)

Unit 4:Multiple Integrals **10hrs**

Double integrals, change of order of integration, change of variables. Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates. Finding areas and volumes using double and triple integrals.

Learning Outcomes:

- At the end of this unit, the student will be able to
- Evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates (L5)
- Apply double integration techniques in evaluating areas bounded by region (L4)
- Evaluate multiple integrals in Cartesian, cylindrical and spherical geometries (L5)

Unit 5:Beta and Gamma functions **6 hrs**

Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of definite integrals using beta and gamma functions.

Learning Outcomes:

At the end of this unit, the student will be able to

- understand beta and gamma functions and its relations (L2)
- Conclude the use of special function in evaluating definite integrals (L4)

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.
4. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
5. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
6. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
7. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, Pearson Education
8. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education
9. H. k Das, Er. RajnishVerma, Higher Engineering Mathematics, S. Chand.
10. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

Course Outcomes:

At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- Utilize mean value theorems to real life problems (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems (L5)
- Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
B. Tech (E.E.E) I-Year I-sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A15201	Applied Physics	3	0	0	3

Common to ECE, EEE & CSE

PREAMBLE

There has been an exponential growth of knowledge in the recent past opening up new areas and challenges in the understanding of basic laws of nature. This helped to the discovery of new phenomena in macro, micro and nano scale device technologies. The laws of physics play a key role in the development of science, engineering and technology. Sound knowledge of physical principles is of paramount importance in understanding new discoveries, recent trends and latest developments in the field of engineering.

To keep in pace with the recent scientific advancements in the areas of emerging technologies, the syllabi of applied physics has been thoroughly revised keeping in view of the basic needs of engineering branches like ECE, EEE and CSE branches by including the topics like optics, quantum mechanics, free electron theory. Also new phenomenon, properties and device applications of semiconducting, dielectric, magnetic and superconducting materials along with their modern device applications have been introduced.

COURSE OBJECTIVES	
1	To make a bridge between the physics in school and engineering courses.
2	To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
3	To understand the mechanisms of emission of light, the use of lasers as light sources for low and high energy applications, study of propagation of light wave through optical fibres along with engineering applications.
4	To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
5	To enlighten the concepts of Quantum Mechanics and to provide fundamentals of de'Broglie waves, quantum mechanical wave equation and its applications, the importance of free electron theory and band theory of solids.
6.	Evolution of band theory to distinguish materials, basic concepts and transport phenomenon of charge carriers in semiconductors. To give an impetus on the subtle

	mechanism of superconductors using the concept of BCS theory and their fascinating applications.

Unit-I: Wave Optics
12hrs
Interference- Principle of superposition – Interference of light – Conditions for sustained interference - Interference in thin films (Reflection Geometry) – Colors in thin films – Newton's Rings – Determination of wavelength and refractive index.

Diffraction- Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Grating spectrum.

Polarization-Introduction – Types of polarization – Polarization by reflection, refraction and double refraction - Nicol's Prism - Half wave and Quarter wave plates with applications.

Unit Outcomes:

The students will be able to

- **Explain** the need of coherent sources and the conditions for sustained interference (L2)
- **Identify** engineering applications of interference (L3)
- **Analyze** the differences between interference and diffraction with applications (L4)
- **Illustrate** the concept of polarization of light and its applications (L2)
- **Classify** ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics
8hrs
Lasers-Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Lasing action – Pumping mechanisms – Nd-YAG laser – He-Ne laser – Applications of lasers.

Fiber optics-Introduction – Principle of optical fiber – Acceptance Angle – Numerical Aperture – Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers – Fiber optic communication system – Losses in optical fibers – Applications.

Unit Outcomes:

The students will be able to

- **Understand** the basic concepts of LASER light Sources (L2)
- **Apply** the concepts to learn the types of lasers (L3)
- **Identifies** the Engineering applications of lasers (L2)
- **Explain** the working principle of optical fibers (L2)
- **Classify** optical fibers based on refractive index profile and mode of propagation (L2)
- **Identify** the applications of optical fibers in various fields (L2)

Unit-III: Dielectric and Magnetic Materials 8hrs

Dielectric Materials-Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations: Orientation polarization (Qualitative), Electronic and Ionic polarization – Lorentz internal field – Clausius-Mossotti equation – Dielectric breakdown - Dielectric Loss – Piezoelectricity and Ferro electricity.

Magnetic Materials-Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and Permeability – Origin of permanent magnetic moment – Classification of magnetic materials: Dia, Para, Ferro, Ferri&Antiferro – Domain concept of Ferromagnetism (Qualitative) – Hysteresis – Soft and Hard magnetic materials.

Unit Outcomes:

The students will be able to

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Claussius-Mosotti relation in dielectrics (L2)
- **Apply** the concept of polarization to materials like piezoelectric and ferroelectrics (L3)
- **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **Explain** the applications of dielectric and magnetic materials (L2)
- **Apply** the concept of magnetism to magnetic devices (L3)

Unit IV: Quantum Mechanics, Free Electron Theory and Band theory of Solids 10hrs

Quantum Mechanics- Dual nature of matter – Schrodinger's time independent and dependent wave equation – Significance of wave function – Particle in a one-dimensional infinite potential well.

Free Electron Theory-Classical free electron theory – Quantum free electron theory – Equation for electrical conductivity based on quantum free electron theory – Origin of resistance – Fermi-Dirac distribution – Density of states – Fermi energy.

Band theory of Solids- Bloch's Theorem (Qualitative) – Kronig-Penney model (Qualitative) – E vs K diagram – Classification of crystalline solids – Effective mass of electron – m^* vs K diagram – Concept of hole.

Unit Outcomes:

The students will be able to

- **Explain** the concept of dual nature of matter (L2)
- **Understand** the significance of wave function (L2)
- **Interpret** the concepts of classical and quantum free electron theories (L2)

- **Explain** the importance of K-P model
- **Classify** the materials based on band theory (L2)
- **Apply** the concept of effective mass of electron (L3)

Unit – V: Semiconductors and Superconductors
10hrs

Semiconductors- Introduction – Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors – Density of charge carriers – Dependence of Fermi energy on carrier concentration and temperature – Drift and diffusion currents – Einstein's equation – Direct and indirect band gap semiconductors – Hall effect – Hall coefficient – Applications of Hall effect.

Superconductors- Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory – Josephson effects (AC and DC) – High T_c superconductors – Applications of superconductors.

Unit Outcomes:

The students will be able to

- **Classify** the energy bands of semiconductors (L2)
- **Interpret** the direct and indirect band gap semiconductors (L2)
- **Identify** the type of semiconductor using Hall effect (L2)
- **Identify** applications of semiconductors in electronic devices (L2)
- **Explain** how electrical resistivity of solids changes with temperature (L2)
- **Classify** superconductors based on Meissner's effect (L2)
- **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2)

Text books:

1. Engineering Physics by M. N. Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy S.Chand Publications, 11th Edition 2019.
2. Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2018).
3. Applied Physics by P.K.Palanisamy ,SciTech publications (2018)

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons, 11th Edition (2018)
2. Engineering Physics by M.R.Srinivasan, New Age international publishers (2014).
3. Engineering Physics – K. Thyagarajan, McGraw Hill Publishers (2018).
4. Engineering Physics by Shatendra Sharma, Jyotsna Sharma, Pearson Education (2018)
5. Engineering Physics by Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press(2016)
6. Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc GrawHill(2014)
7. Engineering Physics by B.K. Pandey and S. Chaturvedi, Cengage Learning(2018)
8. University Physics by H.D.Young and R.A. Freedman,Pearson(2017)

COURSE OUTCOMES	
CO1	**Study** the different realms of physics and their applications in both scientific and technological systems through physical optics. (L2)
CO2	**Identify** the wave properties of light and the interaction of energy with the matter (L3). **Asses** the electromagnetic wave propagation and its power in different media (L5).
CO3	**Understands** the response of dielectric and magnetic materials to the applied electric and magnetic fields. (L3)
CO4	**Study** the quantum mechanical picture of subatomic world along with the discrepancies between the classical estimates and laboratory observations of electron transportation phenomena by free electron theory and band theory. (L2)
CO5	**Elaborate** the physical properties exhibited by materials through the understanding of properties of semiconductors and superconductors. (L5)

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
B. Tech (E.E.E) I-Year I-sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A15501	**COMMUNICATIVE ENGLISH**	**3**	**0**	**0**	**3**

Common to EEE, ECE, CSE & CHEM

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

COURSE OBJECTIVES	
1	Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
2	Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
3	Help improve speaking skills through participation in activities such as role plays,discussions and structured talks/oral presentations
4	Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
5	Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing
COURSE OUTCOMES	
CO1	Retrieve the knowledge of basic grammatical concepts
CO2	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
CO3	Apply grammatical structures to formulate sentences and correct word forms
CO4	Analyze discourse markers to speak clearly on a specific topic in informal discussions
CO5	Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.

CO6	Create a coherent paragraph interpreting a figure/graph/chart/table

Course Outcomes

At the end of the course, the learners will be able to

- Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
- Apply grammatical structures to formulate sentences and correct word forms
- Analyze discourse markers to speak clearly on a specific topic in informal discussions
- Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
- Create a coherent paragraph interpreting a figure/graph/chart/table

Unit 1

Lesson: On the Conduct of Life: William Hazlitt

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. **Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Reading for Writing :**Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. **Grammar and Vocabulary:** Parts of Speech, Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Learning Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

Unit 2

Lesson: The Brook: Alfred Tennyson

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/small groups on specific topics followed by short structured talks. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters. **Grammar and Vocabulary:** Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.

Learning Outcomes

At the end of the module, the learners will be able to

- comprehend short talks on general topics
- participate in informal discussions and speak clearly on a specific topic using suitable discourse markers
- understand the use of cohesive devices for better reading comprehension
- write well structured paragraphs on specific topics
- identify basic errors of grammar/ usage and make necessary corrections in short texts

Unit 3

Lesson: The Death Trap: Saki

Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.**Writing:** Summarizing, Paragraph Writing **Grammar and Vocabulary:** Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Learning Outcomes

At the end of the module, the learners will be able to

- comprehend short talks and summarize the content with clarity and precision
- participate in informal discussions and report what is discussed
- infer meanings of unfamiliar words using contextual clues
- write summaries based on global comprehension of reading/listening texts
- use correct tense forms, appropriate structures and a range of reporting verbs in speech and writing

Unit4

Lesson: Innovation: Muhammad Yunus

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Letter Writing: Official Letters/Report Writing **Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; Voice - Active & Passive Voice

Learning Outcomes

At the end of the module, the learners will be able to

- infer and predict about content of spoken discourse

- understand verbal and non-verbal features of communication and hold formal/informal conversations
- interpret graphic elements used in academic texts
- produce a coherent paragraph interpreting a figure/graph/chart/table
- use language appropriate for description and interpretation of graphical elements

Unit 5
Lesson: Politics and the English Language: George Orwell

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides. **Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences. **Grammar and Vocabulary:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Learning Outcomes
At the end of the module, the learners will be able to
- take notes while listening to a talk/lecture and make use of them to answer questions
- make formal oral presentations using effective strategies
- comprehend, discuss and respond to academic texts orally and in writing
- produce a well-organized essay with adequate support and detail
- edit short texts by correcting common errors

Prescribed Text:

Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2nd Edition, 2018.
- Raymond Murphy's *English Grammar in Use* Fourth Edition (2012) E-book
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
- Oxford Learners Dictionary, 12th Edition, 2011
- Norman Lewis *Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary* (2014)
- *Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words* by David Butler

Web links

- www.englishclub.com
- www.easyworldofenglish.com
- www.languageguide.org/english/

- www.bbc.co.uk/learningenglish
- www.eslpod.com/index.html
- www.myenglishpages.com

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Part – A: Basic Electrical Engineering

Course Code:20A12401 **Semester – I(R20)** **L T P C: 3 0 0 3**

Course Objectives:

- To introduce basics of electric circuits.
- To teach DC and AC electrical circuit analysis.
- To explain working principles of transformers and electrical machines.
- To impart knowledge on Power system generation, transmission and distribution

Course Outcomes:

- Apply concepts of KVL/KCL in solving DC circuits
- Understand and choose correct rating of a transformer for a specific application
- Illustrate working principles of DC Motor
- Identify type of electrical machine based on their operation
- Understand the basics of Power generation, Transmission and Distribution

UNIT – I:

DC & AC Circuits:

Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Superposition Theorem - Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits, Resonance.

UNIT – II:

DC & AC Machines:

Principle and operation of DC Generator - EMF equations - OCC characteristics of DC generator – principle and operation of DC Motor – Performance Characteristics of DC Motor - Speed control of DC Motor – Principle and operation of Single Phase Transformer - OC and SC tests on transformer - Principle and operation of 3-phase AC machines [Elementary treatment only]

UNIT – III:

Basics of Power Systems:

Layout & operation of Hydro, Thermal, Nuclear Stations - Solar & wind generating stations – Typical AC Power Supply scheme – Elements of Transmission line – Types of Distribution systems: Primary & Secondary distribution systems

Text Books:

1. D. P. Kothari and I. J. Nagrath - "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. V.K. Mehta &Rohit Mehta, "Principles of Power System" – S.Chand – 2018.

References:

1. L. S. Bobrow - "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
2. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.
3. C.L. Wadhwa – "Generation Distribution and Utilization of Electrical Energy", 3rd Edition, New Age International Publications.

Part – B: Electronics Engineering

Course Objectives

- Understand principles and terminology of electronics.
- Familiar with the theory, construction, and operation of electronic devices.
- Learn about biasing of BJTs and FETs.
- Design and construct amplifiers.
- Understand the concept & principles of logic devices.

Course Outcomes:

- Explain the theory, construction, and operation of electronic devices.
- Apply the concept of science and mathematics to explain the working of diodes and its applications, working of transistor and to solve the simple problems based on the applications
- Analyze small signal amplifier circuits to find the amplifier parameters
- Design small signal amplifiers using proper biasing circuits to fix up proper Q point.
- Distinguish features of different active devices including Microprocessors.

Unit-1:

Diodes and Applications: Semiconductor Diode,Diode as a Switch& Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Operation and Applications ofZener Diode, LED, Photo Diode.

Transistor Characteristics: Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Biasing of Transistor Configuration; Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Concepts of Small Signal Amplifiers –CE & CC Amplifiers.

UNIT – II:

Operational Amplifiers and Applications: Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground; Op-Amp Applications - Inverting, NonInverting, Summing and Difference Amplifiers, Voltage Follower, Comparator, Differentiator, Integrator.

UNIT – III:

Digital Electronics: Logic Gates,Simple combinational circuits–Half and Full Adders, BCD Adder.Latches and Flip-Flops (S-R, JK andD), Shift Registers and Counters.Introduction to Microcontrollers and their applications (Block diagram approach only).

Text Books:

1. R.L.Boylestad& Louis Nashlesky, Electronic Devices &Circuit Theory, Pearson Education,2007.
2. Ramakanth A. Gayakwad, Op-Amps & Linear ICs, 4th Edition, Pearson, 2017.
3. R. P. Jain, Modern Digital Electronics,3rd Edition, Tata Mcgraw Hill,2003.
4. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd Edition, Pearson, 2012.

Reference Books:

1. SantiramKal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India,2002.
2. R. S. Sedha, A Text Book of Electronic Devices and Circuits, S.Chand& Co,2010.

3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

B. Tech (E.CE) I-Year I-Sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A10301	**Engineering Drawing** **Common to EEE, ECE & CSE**	1	0	2	2

Course Objectives:

- Bring awareness that Engineering Drawing is the Language ofEngineers.
- Familiarize how industry communicates technicalinformation.
- Teach the practices for accuracy and clarity in presenting the technicalinformation.
- Develop the engineering imagination essential for successfuldesign.

Unit:I -

Introduction to Engineering Drawing: Principles of Engineering Drawing and its significance-Conventions in drawing-lettering - BIS conventions.

a)Conic sections including the rectangular hyperbola- general methodonly,
b) Cycloid, epicycloids andhypocycloid c) Involutes

Learning Outcomes:

At the end of this unit the student will be able to

1. Lettering and dimensioning by freehand (L1)
2. Create geometric constructions; drawing parallel and perpendicular lines, and to construct circles, arcs, tangencies, and irregular curves (L6)
3. Create Conic sections and cycloidal curves.(L6)

Unit: II

Projection of points, lines and planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

Learning Outcomes:

At the end of this unit the student will be able to

1. Understand the Projection of the objectives in four quadrants (L2)
2. Project the points, lines and planes (L6)

Unit: III

Projections of solids: Projections of regular solids inclined to one or both planes by rotational or auxiliaryviewsmethod.

Learning Outcomes:

At the end of this unit the student will be able to

1.Project the solids in both planes. (L6)

2. To draw the solids by auxiliary method. (L6)

Unit: IV

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

Learning Outcomes:

At the end of this unit the student will be able to

1.Project the sectional view of regular solids.(L6)

2. Understand how to draw the true shapes of the sections.(L2)

Unit:V

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

Learning Outcomes:

At the end of this unit the student will be able to

1. Draw the development of surfaces of the solids.(L6)
2. Understand to develop the sectional parts of the solids.(L2)

Text Books:

1. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers,2016.

Reference Books:

1. DrK.Prahlada Rao, Dr. S. Krishnaiah, Prof.A.V.S. Prasad, Engineering Graphics, Amaravati publications. Copy right.2020
2. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right,2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers,2000

4. Shah and Rana, Engineering Drawing, 2/e, Pearson Education,2009
5. K.C.John, Engineering Graphics, 2/e, PHI,2013
6. Basant Agarwal &C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Course Outcomes:

After completing the course, the student will be able to

- draw various curves applied in engineering.(L2)
- show projections of solids and sections graphically. (L2)
- draw the development of surfaces of solids.(L3)

Additional Sources

1. Youtube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

B. Tech (E.C.E) I-Year I-sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A10302	**Engineering Graphics Lab** **Common to EEE, ECE & CSE**	**0**	**0**	**2**	**1**

Course Objectives:

- Instruct the utility of drafting & modelling packages in orthographic and isometric drawings.
- Instruct graphical representation of machinecomponents.

Computer Aided Drafting:

Introduction to Geometric Modeling: Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling,

mirroring, layers, templates, polylines, trimming, extending, stretching, fillets,arrays,dimensions.
Dimensioning principles and conventional representations.
Orthographic Projections: Systems of projections, conventions and application to orthographic projections - simple objects.
Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, simple solids.

Text Books:

1. K. Venugopal, V.Prabhu Raja, Engineering Drawing + Auto Cad, New Age International Publishers.
2. Kulkarni D.M, AP Rastogi and AK Sarkar, Engineering Graphics with Auto Cad, PHI Learning, Eastern Economy editions.

Reference Books:

1. T. Jayapoovan, Engineering Graphics using Auto Cad, Vikas Publishing House
2. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
3. LinkanSagar, BPB Publications, Auto Cad 2018 Training Guide.
4. K.C.John, Engineering Graphics, 2/e, PHI,2013
5. Basant Agarwal &C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Course Outcomes:
After completing the course, the student will be able to

- Use computers as a drafting tool.(L2)
- Draw isometric and orthographic drawings using CAD packages.(L3)

Additional Sources: 1. Youtube: http-sewor,Carleton.cag, kardos/88403/drawings.html conic sections-online, red woods.edu.

B. Tech (E.C.E) I-Year I-Sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A15202	**Applied Physics Lab** **Common to EEE, ECE & CSE**	**0**	**0**	**3**	**1.5**

Course Objectives:

- Understands the concepts of interference, diffraction and their applications.
- Understand the role of optical fiber parameters in communication.
- Recognize the importance of energy gap in the study of conductivity and Hall Effect in a semiconductor.
- Illustrates the magnetic and dielectric materials applications.
- Apply the principles of semiconductors in various electronic devices.

Note: In the following list, out of 15 experiments, any 12 experiments (minimum 10) must be performed in a semester

List of Applied Physics Experiments

1. Determination of the thickness of the wire using wedge shape method
   Experimental outcomes:
   Operates optical instrument like travelling microscope. (L2)
   Estimate the thickness of the wire using wedge shape method (L2)
   Identifies the formation of interference fringes due to reflected light from non-uniform thin film. (L2)
2. Determination of the radius of curvature of the lens by Newton's ring method
   Experimental outcomes:
   Operates optical instrument like travelling microscope. (L2)
   Estimate the radius of curvature of the lens (L2)
   Identifies the formation of interference fringes due to reflected light from non-uniform thin film. (L2)
   Plots the square of the diameter of a ring with no. of rings (L3)
3. Determination of wavelength by plane diffraction grating method
   Experimental outcomes:
   Operates optical instrument like spectrometer. (L2)
   Estimate the wavelength of the given source (L2)
   Identifies the formation of grating spectrum due diffraction. (L2)
4. Determination of dispersive power of prism.
   Experimental outcomes:
   Operates optical instrument like spectrometer. (L2)
   Estimate the refractive index and dispersive power of the given prism (L2)
   Identifies the formation of spectrum due to dispersion. (L2)
5. Determination of wavelength of LASER source using diffraction grating.
   Experimental outcomes:
   Operates various instrument (L2)

Estimate the wavelength of laser source (L2)
Identifies the formation of grating spectrum due diffraction. (L2)

6. Determination of particle size using LASER.
   Experimental outcomes:
   Operates various instrument (L2)
   Estimate the Particles size using laser (L2)
   Identifies the application of laser (L2)
7. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
   Experimental outcomes:
   Operates various instruments and connect them as per the circuit. (L2)
   Estimate the numerical aperture and acceptance angle of a given optical fiber. (L2)
   Identifies the significance of numerical aperture and acceptance angle of an optical fiber in various engineering applications. (L2)

8. Determination of dielectric constant by charging and discharging method.
   Experimental outcomes:
   Operates various instruments and connect them as per the circuit. (L2)
   Estimatethedielectricconstantof the given substance. (L2)
   Identifies the significance of dielectric constant in various devices. (L2)
9. Magnetic field along the axis of a circular coil carrying current –Stewart Gee's method.
   Experimental outcomes:
   Operates various instruments and connect them as per the circuit. (L2)
   Estimate the magnetic field along the axis of a circular coil carrying current. (L2)
   Plots the intensity of the magnetic field of circular coil carrying current with distance (L3)
10. Measurement of magnetic susceptibility by Gouy's method
    Experimental outcomes:
    Operates various instruments and connect them as per the circuit. (L2)
    Estimate the magnetic susceptibility of the given material. (L2)
    Identifies the significance of magnetic susceptibility in various engineering applications. (L2)
11. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)
    Experimental outcomes:
    Operates various instruments and connect them as per the circuit. (L2)
    Estimate the hysteresis loss, coercivity and retentivity of the ferromagnetic material. (L2)
    Classifies the soft and hard magnetic material based on B-H curve. (L2)
    Plots the magnetic field H and flux density B (L3)
12. To determine the resistivity of semiconductor by Four probe method

Experimental outcomes:
Operates various instruments and connect them as per the circuit. (L2)
Estimate the resistivity of a semiconductor. (L2)
Identifies the importance of four probe method in finding the resistivity of semiconductor. (L3)

13. To determine the energy gap of a semiconductor
    Experimental outcomes:

Operates various instruments and connect them as per the circuit. (L2)
Estimate the energy gap of a semiconductor. (L2)
Illustrates the engineering applications of energy gap. (L3)
Plots1/T with log R (L3)

14. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.

    Experimental outcomes:
    Operates various instruments and connect them as per the circuit. (L2)
    Estimate the charge carrier concentration and mobility in a semiconductor. (L2)
    Illustrates the applications of Hall Effect. (L3)
    Plots the voltage with current and voltage with magnetic field (L3)

15. Measurement of temperature coefficient of resistance using thermostat.

    Experimental outcomes:
    Operates various instruments and connect them as per the circuit. (L2)
    Estimate the resistance with varying temperature. (L2)
    Plots resistance R with temperature T (L3)

Course Outcomes:
The students will be able to

- **Operate** optical instruments like microscope and spectrometer (L2)
- **Determine** thickness of a hair/paper with the concept of interference (L2)
- **Estimate** the wavelength of different colors using diffraction grating and resolving power (L2)
- **Plot** the intensity of the magnetic field of circular coil carrying current with distance (L3)
- **Evaluate** the acceptance angle of an optical fiber and numerical aperture (L3)
- **Determine** the resistivity of the given semiconductor using four probe method (L3)
- **Identify** the type of semiconductor i.e., n-type or p-type using hall effect (L3)
- **Calculate** the band gap of a given semiconductor (L3)

References: 1. S. Balasubramanian, M.N. Srinivasan “A Text book of Practical Physics”- S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

B. Tech (E.C.E) I-Year I-Sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A15502	**COMMUNICATIVE ENGLISH LAB**	**0**	**0**	**3**	**1.5**

Common to All EEE, ECE, CSE & CHEM

Course Objectives

- students will be exposed to a variety of self instructional, learner friendly modes of language learning
- students will learn better pronunciation through stress, intonation and rhythm
- students will be trained to use language effectively to face interviews, group discussions, public speaking
- students will be initiated into greater use of the computer in resume preparation, report writing, format making etc

Course Outcomes

- CO1: Listening and repeating the sounds of English Language
- CO2: Understand the different aspects of the English language proficiency with emphasis on LSRW skills
- CO3: Apply communication skills through various language learning activities
- CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- CO5: Evaluate and exhibit acceptable etiquette essential in social and professional settings
- CO6: Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

Unit 1

1. Phonetics
2. Reading comprehension
3. Describing objects/places/persons

Learning Outcomes

At the end of the module, the learners will be able to

- understand different accents spoken by native speakers of English

- employ suitable strategies for skimming and scanning on monitor to get the general idea of a text and locate specific information
- learn different professional registers and specific vocabulary to describe different persons, places and objects

Unit 2

1. Role Play or Conversational Practice
2. JAM
3. Etiquettes of Telephonic Communication

Learning Outcomes
At the end of the module, the learners will be able to

- produce a structured talk extemporarily
- comprehend and produce short talks on general topics
- participate in debates and speak clearly on a specific topic using suitable discourse markers

Unit 3

1. Information Transfer
2. Note Making and Note Taking
3. E-mail Writing

Learning Outcomes
At the end of the module, the learners will be able to

- Learn different ways of greeting and introducing oneself/others
- summarize the content with clarity and precision and take notes while listening to a talk/lecture and make use of them to answer questions
- replenish vocabulary with one word substitutes, homonyms, homophones, homographs to reduce errors in speech and writing

Unit4

1. Group Discussions
2. Resume Writing
3. Debates

Learning Outcomes
At the end of the module, the learners will be able to

- Learn different ways of asking information and giving directions
- Able to transfer information effectively
- understand non-verbal features of communication

Unit 5

1. Oral Presentations
2. Poster Presentation
3. Interviews Skills

Learning Outcomes

At the end of the module, the learners will be able to

- make formal oral presentations using effective strategies
- learn different techniques of précis writing and paraphrasing strategies
- comprehend while reading different texts and edit short texts by correcting common errors

Suggested Software

- Orell
- Walden Infotech
- Young India Films

Reference Books

- Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
- Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2nd Edition, 2018.
- Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
- A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

Web Links

- **www.esl-lab.com**
- **www.englishmedialab.com**
- **www.englishinteractive.net**

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Part – A: Electrical Engineering Lab

Course Code:20A12402 Semester – II(R20) L T P C: 0 0 3 1.5

Course Objectives:

- To Verify Kirchoff's laws and Superposition theorem To learn performance characteristics of DC Machines. To perform various tests on 1- Phase Transformer.
- To Study the I – V Characteristics of Solar PV Cell

Course Outcomes:

- Understand Kirchoff's Laws & Superposition theorem.
- Analyze the various characteristics on DC Machines by conducting various tests.
- Analyze I – V Characteristics of PV Cell
- Apply the knowledge to perform various tests on 1-phase transformer

List of experiments: -

1. Verification of Kirchhoff laws.
2. Verification of Superposition Theorem.
3. Magnetization characteristics of a DC Shunt Generator.
4. Speed control of DC Shunt Motor.
5. OC & SC test of 1 – Phase Transformer.
6. Load test on 1-Phase Transformer.
7. I – V Characteristics of Solar PV cell
8. Brake test on DC Shunt Motor

Part – B: Electronics Engineering Lab

Course Objectives:

- To verify the theoretical concepts practically from all the experiments.

- To analyze the characteristics of Diodes, BJT, MOSFET, UJT.
- To design the amplifier circuits from the given specifications.
  - Exposed to linear and digital integrated circuits.

Course Outcomes:

- Learn the characteristics of basic electronic devices like PN junction diode, Zener diode &BJT.
- Construct the given circuit in the lab
- Analyze the application of diode as rectifiers, clippers and clampers and other circuits. Design simple electronic circuits and verify its functioning.

List Of Experiments:

1. PN Junction diode characteristics A) Forward bias B) Reverse bias.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Full Wave Rectifier with & without filter.
4. Wave Shaping Circuits. (Clippers & Clampers)
5. Input & Output characteristics of Transistor in CB / CE configuration.
6. Frequency response of CE amplifier.
7. Inverting and Non-inverting amplifiers using Op-AMPs.
8. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
9. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required:

DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices

B. Tech (E.C.E) I-Year II-sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A15102	**Differential Equations and Vector Calculus**	**3**	**0**	**0**	**3**

Common to all branches of Engineering except CSE

Course Objectives:

1) To enlighten the learners in the concept of differential equations and multivariable calculus.
2) To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

UNIT 1: Linear differential equations of higher order (Constant Coefficients)
10hrs

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, method of variation of parameters.Simultaneous linear equations, Applications to L-C-R Circuit problems and Mass spring system.

Learning Outcomes:

At the end of this unit, the student will be able to

- identify the essential characteristics of linear differential equations with constant coefficients (L3)
- solve the linear differential equations with constant coefficients by appropriate method (L3)
- classify and interpret the solutions of linear differential equations (L3)
- formulate and solve the higher order differential equation by analyzing physical situations (L3)

UNIT 2:Partial Differential Equations
8hrs

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order equations using Lagrange's methodand non-linear PDEs (Standard Forms)

Learning Outcomes:
At the end of this unit, the student will be able to
- apply a range of techniques to find solutions of standard PDEs (L3)
- outline the basic properties of standard PDEs (L2)

UNIT 3: Applications of Partial Differential Equations **10hrs**

Classification of PDE, method of separation of variables for second order equations. Applications of Partial Differential Equations: One dimensional Wave equation, One dimensional Heat equation.

Learning Outcomes:
At the end of this unit, the student will be able to
- calcify the PDE (L3)
- learn the applications of PDEs(L2)

UNIT4: Vector differentiation **6hrs**
Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

Learning Outcomes:
At the end of this unit, the student will be able to
- apply del to Scalar and vector point functions (L3)
- illustrate the physical interpretation of Gradient, Divergence and Curl (L3)

UNIT 5: Vector integration **8hrs**
Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

Learning Outcomes:
At the end of this unit, the student will be able to
- find the work done in moving a particle along the path over a force field (L4)
- evaluate the rates of fluid flow along and across curves (L4)
- apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals (L3)

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

Reference Books:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.

2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3. George B.Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
6. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
7. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
8. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
9. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, Pearson Education
10. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education.
11. H. k Das, Er. RajnishVerma, Higher Engineering Mathematics, S. Chand.
12. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

Course Outcomes:

At the end of the course, the student will be able to

- solve the differential equations related to various engineering fields (L6)
- Identify solution methods for partial differential equations that model physical processes (L3)
- interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- estimate the work done against a field, circulation and flux using vector calculus (L6)

B. Tech (E.C.E) I-Year II-sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A15303	**CHEMISTRY**	**3**	**0**	**0**	**3**

Common to EEE, ECE & CSE

Course Objectives:

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches

COURSE OUTCOMES	
CO1	**Apply** Schrodinger wave equation to hydrogen atom, **Illustrate** the molecular orbital energy level diagram of different molecular species, **Explain** the band theory of solids for conductors, semiconductors and insulators **Discuss** the magnetic behaviour and colour of complexes.
CO2	**Explain** splitting in octahedral and tetrahedral geometry of complexes **Discuss** the magnetic behaviour and colour of coordination compounds **Explain** the band theory of solids for conductors, semiconductors and insulators **Demonstrate** the application of Fullerenes, carbon nano tubes and Graphines nanoparticles
CO3	**Apply** Nernst equation for calculating electrode and cell potentials, **Differentiate** between pH metry, potentiometric and conductometric titrations, **Explain** the theory of construction of battery and fuel cells, **Solve** problems based on cell potential
CO4	**Explain** the different types of polymers and their applications, **Explain** the preparation, properties and applications of PVC, Bakelite**Describe**the mechanism of conduction in conducting polymers, **Discuss** Buna-S and Buna-N elastomers and

	their applications
CO5	**Explain** the different types of spectral series in electromagnetic spectrum, **Understand** the principles of different analytical instruments, **Explain** the different applications of analytical instruments

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

Unit 1: Structure and Bonding Models: (10 hrs)
Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2, applications to hydrogen, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

Learning Outcomes:
At the end of this unit, the students will be able to

- **apply** Schrodinger wave equation to hydrogen atom (L3)
- **illustrate** the molecular orbital energy level diagram of different molecular species (L2)
- **explain** the calculation of bond order of O2 and CO molecules (L2)

iscussthe basic concept of molecular orbital theory (L3)

Unit 2: Modern Engineering materials: (10 hrs)

i). Coordination compounds: Crystal field theory – salient features – splitting in octahedral and tetrahedral geometry. Properties of coordination compounds-Oxidation state, coordination, magnetic and colour.

ii). Semiconductor materials, super conductors- basic concept, band diagrams for conductors, semiconductors and insulators, Effect of doping on band structures.

iii). Nanochemistry: Introduction, classification of nanometerials, properties and applications of Fullerenes, carbon nanotubes and Graphenes nanoparticles

iv). Super capacitors: Introduction, Basic concept-Classification – Applications.

Learning Outcomes:
At the end of this unit, the students will be able to

- **Explain** splitting in octahedral and tetrahedral geometry of complexes (L2).
- **Discuss** the magnetic behaviour and colour of coordination compounds (L3).
- **Explain** the band theory of solids for conductors, semiconductors and insulators (L2)
- **Demonstrate** the application of Fullerenes, carbon nanotubes and Graphines nanoparticles (L2).

Unit 3: Electrochemistry and Applications: (10 hrs)

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode); Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (Ni-Cad),and lithium ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

Learning Outcomes:

At the end of this unit, the students will be able to

- **apply** Nernst equation for calculating electrode and cell potentials (L3)
- **differentiate** between pH metry, potentiometric and conductometric titrations (L2)
- **explain** the theory of construction of battery and fuel cells (L2)
- **solve** problems based on cell potential (L3)

Unit 4: Polymer Chemistry: (10 hrs)

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.

Plastics - Thermoplastic and Thermosetting plastic, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, polypyrroles – mechanism of conduction and applications.

Learning Outcomes:

At the end of this unit, the students will be able to

- **explain** the different types of polymers and their applications (L2)
- **explain** the preparation, properties and applications of Bakelite, Nylon-6,6, and carbon fibres (L2)
- **describe** the mechanism of conduction in conducting polymers (L2)
- **discuss** Buna-S and Buna-N elastomers and their applications (L2)

Unit 5: Instrumental Methods and Applications (10 hrs)

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law, Principle and applications of UV-VisibleandIR Spectroscopies. Solid-Liquid Chromatography–TLC, retention time and pH metry.

Learning outcomes:

After completion of Unit IV, students will be able to:

- **explain** the different types of spectral series in electromagnetic spectrum (L2)
- **understand** the principles of different analytical instruments (L2)
- **explain** the different applications of analytical instruments (L2)

Text Books:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. G.V.Subba Reddy, K.N.Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020.
2. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
3. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

4. J.M.Lehn, Supra Molecular Chemistry, VCH Publications

Course Outcomes:

At the end of the course, the students will be able to:

- **compare**the materials of construction for battery and electrochemical sensors (L2)
- **explain**the preparation, properties, and applications of thermoplastics &thermosetting, elastomers& conducting polymers. (L2)
- **explain** the principles of spectrometry, SLC in separation of solid and liquid mixtures (L2)

apply the principle of Band diagrams in application of conductors and semiconductors (L

B. Tech (E.C.E) I-Year II-Sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A10506	**C-PROGRAMMING & DATA STRUCTURES**	**3**	**0**	**0**	**3**

Common to EEE & ECE

Course Objectives:

- To illustrate the basic concepts of C programming language.
- To discuss the concepts of Functions, Arrays, Pointers and Structures.
- To familiarize with Stack, Queue and Linked lists data structures.
- To explain the concepts of non-linear data structures like graphs and trees.
- To learn different types of searching and sorting techniques.

Unit-1

Introduction to C Language - C language elements, variable declarations and data types, operators and expressions, decision statements - If and switch statements, loop control statements - while, for, do-while statements, arrays.

At the end of the Unit, students should be able to:

- Use C basic concepts to write simple C programs. (L3)
- Use iterative statements for writing the C programs (L3)
- Use arrays to process multiple homogeneous data. (L3)
- Test and execute the programs and correct syntax and logical errors. (L4)
- Translate algorithms into programs. (L4)
- Implement conditional branching, iteration and recursion. (L2)

Unit – 2

Functions, types of functions, Recursion and argument passing, pointers, storage allocation, pointers to functions, expressions involving pointers, Storage classes – auto, register, static, extern, Structures, Unions, Strings, string handling functions, and Command line arguments.

At the end of the Unit, students should be able to:

- Writing structured programs using C Functions. (L5)
- Writing C programs using various storage classes to control variable access. (L5)
- Apply String handling functions and pointers. (L3)
- Use arrays, pointers and structures to formulate algorithms and write programs.(L3)

Unit-3

Data Structures, Overview of data structures, stacks and queues, representation of a stack, stack related terms, operations on a stack, implementation of a stack, evaluation of arithmetic expressions, infix, prefix, and postfix notations, evaluation of postfix expression, conversion of expression from infix to postfix, recursion, queues - various positions of queue, representation of queue, insertion, deletion, searching operations.

At the end of the Unit, students should be able to:

- Describe the operations of Stack. (L2)
- Explain the different notations of arithmetic expression. (L5)
- Develop various operations on Queues. (L6)

Unit – 4

Linked Lists – Singly linked list, dynamically linked stacks and queues, polynomials using singly linked lists, using circularly linked lists, insertion, deletion and searching operations, doubly linked lists and its operations, circular linked lists and its operations.

At the end of the Unit, students should be able to:

- Analyze various operations on singly linked list. (L4)
- Interpret operations of doubly linked lists. (L2)
- Apply various operations on Circular linked lists. (L6)

Unit-5

Trees - Tree terminology, representation, Binary trees, representation, binary tree traversals. binary tree operations, **Graphs** - graph terminology, graph representation, elementary graph operations, Breadth First Search (BFS) and Depth First Search (DFS), connected components, spanning trees. **Searching and Sorting** – sequential search, binary search, exchange (bubble) sort, selection sort, insertion sort.

At the end of the Unit, students should be able to:

- Develop the representation of Tress. (L3)
- Identify the various Binary tree traversals. (L3)
- Illustrate different Graph traversals like BFS and DFS. (L2)
- Design the different sorting techniques (L6)
- Apply programming to solve searching and sorting problems. (L3)

Text Books:

1. The C Programming Language, Brian W Kernighan and Dennis M Ritchie, Second Edition, Prentice Hall Publication.
2. Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni, Susan Anderson-Freed, Computer Science Press.
3. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. AnandaRao, Pearson Education.
4. B.A. Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016.
5. Richard F. Gilberg& Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, CENGAGE Learning, 2011.

Reference Books:

1. PradipDey and Manas Ghosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2. E. Balaguruswamy, "C and Data Structures", 4th Edition, Tata Mc Graw Hill.
3. A.K. Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.
4. M.T. Somashekara, "Problem Solving Using C", PHI, 2nd Edition 2009.

Course Outcomes:

1. Analyse the basicconcepts of C Programming language. (L4)

2. Design applications in C, using functions, arrays, pointers and structures. (L6)
3. Apply the concepts of Stacks and Queues in solving the problems. (L3)
4. Explore various operations on Linked lists. (L5)
5. Demonstrate various tree traversals and graph traversal techniques. (L2)
6. Design searching and sorting methods (L3)

B. Tech (E.C.E) I-Year II-sem – R20 Regulation

Electronic Devices and Circuits

20A12402 (Common for ECE and EEE branches)

Course Objectives:

- To understand the basic principles of all semiconductor devices.
- To be able to solve problems related to diode circuits, and amplifier circuits.
- To analyze diode circuits, various biasing and small signal equivalent circuits of amplifiers.
- To be able to compare the performance of BJTs and MOSFETs
- To design rectifier circuits and various amplifier circuits using BJTs and MOSFETs.

Unit – 1
Review of Semiconductors:
Intrinsic semiconductors, Doped Semiconductors, Current Flow in Semiconductors, PN Junction with Open Circuit, PN Junction with Applied Voltage, Capacitive Effects in PN Junction.

Diodes: Introduction, The Ideal Diode – current voltage characteristic, rectifier, diode logic gates, Terminal Characteristics of Junction Diodes– forward bias, reverse bias, and breakdown regions, Modeling the Diode Forward Characteristics- exponential model, graphical analysis and Iterative analysis using the exponential model, constant voltage drop model, the small signal model.

Learning outcomes:
1. Remember and understand the basic characteristics of semiconductor diode (L1)
2. Understand iterative and graphical analysis of simple diode circuits (L1)

Unit – 2

Zener Diodes– Zener diode Characteristics, Voltage shunt regulator, Temperature Effects, Rectifier Circuits– half-wave, full-wave and bridge rectifier circuits, rectifier with a filter capacitor, C-L-C filter, Clipping and Clamping Circuits– limiter circuit, the clamped capacitor, voltage doubler, Special Diode Types– UJT, Schottky barrier diode, Varactor diode, photo diode, light emitting diode(LED).

Bipolar Junction Transistors(BJTs): Physical Operation - simplified structure and modes of operation, Operation of the npn, and pnp transistors: cutoff, active, and saturation modes, V-I Characteristics- of different configurations - graphical representation of transistor characteristics, dependence of collector current on collector voltage, the Early Effect.

Learning outcomes:
1. Understand principle of operation of Zener diode and other special semiconductor diodes (L1)
2. Understand the V-I characteristics of BJT and its different configurations (L1)
3. Analyze various applications of diode and special purpose diodes (L3)
4. Design rectifier and voltage regulator circuits (L4)

Unit- 3

BJT circuits at DC, Applying the BJT in Amplifier Design- Voltage Amplifier, Voltage Transfer Characteristic (VTC), Small-Signal Voltage Gain, determining the VTC by Graphical Analysis, Q-point, Small-signal operation and models- the trans conductance, input resistance at the base, input resistance at the emitter, Voltage gain, separating the Signal and the DC Quantities, The Hybrid-π Model, the T Model, Basic BJT Amplifier Configurations - Common-Emitter (CE) amplifier without and with emitter resistance, Common-Base (CB) amplifier, Common-Collector (CC) amplifier or Emitter Follower, Biasing in BJT Amplifier Circuits- Fixed bias, Self bias, voltage divider bias circuits, biasing using a Constant-Current Source, CE amplifier – Small signal analysis and design, Transistor breakdown and Temperature Effects.

Learning outcomes:
1. Solve problems on various biasing circuits using BJT (L2)
2. Analyze BJT based biasing circuits (L3)
3. Design an amplifier using BJT based on the given specifications (L4)

Unit – 4

MOS Field-Effect Transistors (MOSFETs): Introduction, Device Structure and Physical Operation – device structure, operation with zero gate voltage, creating a channel for current flow, operation for different drain to source voltages, the P-channel MOSFET,CMOS, V-I characteristics– i_D - v_{DS}characteristics, i_D – v_{GS}characteristics, finite output resistance in saturation, characteristics of the p-Channel MOSFET, MOSFET Circuits at DC, Applying the MOSFET in Amplifier Design – voltage transfer characteristics, biasing the MOSFET to obtain linear amplification, the small signal voltage gain, graphical analysis, the Q-point.

Learning outcomes:
1. Understand principle of operation of various types of MOSFET devices (L1)
2. Understand the V-I characteristics of MOSFET devices and their configurations (L1)

Unit – 5
MOSFET Small Signal Operation Models– the dc bias, separating the DC analysis and the signal analysis, Small signal equivalent circuit models, the transconductance, the T equivalent circuit model, Basic MOSFET Amplifier Configurations– three basic configurations, characterizing amplifiers, common source (CS) amplifier without and with source resistance, common gate (CG) amplifier, source follower, the amplifier frequency response, Biasing in MOSFET Amplifier Circuits– biasing by fixing V_{GS} with and without source resistance, biasing using drain to gate feedback resistor, biasing using constant current source, Common Source Amplifier using MOSFETs – Small signal analysis and design, Body Effect.

Learning outcomes:
1. Solve problems on small signal equivalent of MOSFET devices (L2)
2. Analyze various biasing circuits based on different types of MOSFETs (L3)
3. Design an amplifier using BJT based on the given specifications (L4)

Text Books:

1. Adel S. Sedra and Kenneth C. Smith, “Microelectronic Circuits – Theory and Applications”, 6th Edition, Oxford Press, 2013.
2. Donald A Neamen, “Electronic Circuits – analysis and design”, 3rd Edition, McGraw Hill (India), 2019.

References:

1. J. Milliman and C Halkias, “Integrated electronics”, 2nd Edition, Tata McGraw Hill, 1991.
2. BehzadRazavi, “Microelectronics”, Second Edition, Wiley, 2013.
3. R.L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits,” 9th Edition, Pearson, 2006.
4. Jimmie J Cathey, “Electronic Devices and Circuits,” Schaum’s outlines series, 3rd Edition, McGraw-Hill (India), 2010.

COURSE OUTCOMES:

After the completion of the course students will able to

CO1: Understand principle of operation, characteristics and applications of Semiconductor diodes, Bipolar Junction Transistor and MOSFETs.

CO2: Applying the basic principles solving the problems related to Semiconductor diodes, BJTs, and MOSFETs.

CO3: Analyze diode circuits for different applications such as rectifiers, clippers and clampers also analyze biasing circuits of BJTs, and MOSFETs.

CO4: Design of diode circuits and amplifiers using BJTs, and MOSFETs.

CO5: Compare the performance of various semiconductor devices.

B. Tech (E.C.E) I-Year II-sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A10303	**Engineering Workshop**	**0**	**0**	**3**	**1.5**

Common to EEE, ECE & CSE

Course Objective:

To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Wood Working:

Familiarity with different types of woods and tools used in wood working and make following joints

a) Half – Lapjoint
b) Mortise and Tenonjoint
c) Corner Dovetail joint or Bridlejoint

Sheet Metal Working:

Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets

a)Taperedtray b)Conicalfunnel
c)Elbowpipe d)Brazing

Fitting:

Familiarity with different types of tools used in fitting and do the following fitting exercises

a) V-fit b)Dovetailfit c) Semi-circularfit
d) Bicycle tyre puncture and change of two wheelertyre

Electrical Wiring:

Familiarities with different types of basic electrical circuits and make the following connections

a) Parallelandseries b) Twowayswitch c)Godownlighting d) Tubelight
e) Threephasemotor f) Soldering ofwires

Power tools:

Demonstration of a)Circular Sa w b) Power Planer
c) Zig Saw d) Buffing Machine

Course Outcomes:

After completion of this lab the student will be able to

1. apply wood working skills in real world applications.(L3)
2. build different objects with metal sheets in real world applications.(L3)
3. apply fitting operations in various applications.(L3)
4. apply different types of basic electric circuit connections.(L3)
5. use soldering and brazing techniques.(L2)

Note: In each section a minimum of three exercises are to be carried out.

B. Tech (E.C.E) I-Year II-sem – R20 Regulation

20A10401 Electronics& IT Workshop

Course Objectives:

1. To introduce electronic components, measuring instruments and tools used in electronic workshop.
2. To equip with the knowledge of understanding data sheets of electronic components.
3. To give practical experience on soldering the electronic components on a PCB.

4. To introduce EDA tools.
5. To know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
6. To provide training on Productivity tools like word processors, spreadsheets, presentations.
7. To provide knowledge in understanding working of various communication systems.

List of Exercises / Experiments:

1. Familiarization of commonly used Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that electronics hardware tools and instruments are learned to be used by the students

2. Familiarization of Electronic Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that electronic measuring instruments are learned to be used by the students

3. Electronic Components: Familiarization/Identification of electronic components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, color coding, package, symbol, cost etc.

4. Testing of electronic components like Resistor, Capacitor, Diode, Transistor, ICs etc.
   - Compare values of components like resistors, inductors, capacitors etc with the measured values by using electronic instruments

5. Study of Cathode Ray Oscilloscope (CRO)
   - Find the Amplitude and Frequency of a signal
   - Measure the Unknown Frequency & Phase difference of signals using Lissajous figures

6. Interpret data sheets of discrete components and IC's.
   - Write important specifications/ratings of components & ICs and submit it in the form of a report

7. Introduction to EDA Tools: MULTISIM/PSPICE/TINA schematic capture tool, learning of basic functions of creating a new project, getting and placing parts, connecting placed parts, simulating the schematic, plotting and analyzing the results.
Provide some exercise so that students are familiarized in using EDA tools

8. Assembling and Testing of simple electronic circuits on breadboards; identifying the components and its location on the PCB, soldering of the components, testing the assembled circuit for correct functionality.

9. Familiarization with Computer Hardware & Operating System:
   - Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.
   - Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps).

Students should record the process of assembling and troubleshooting a computer.

- Install Operating system on the computer. Students should record the entire installation process.

10. Familiarization with Office Tools

- Word Processor: Able to create documents using the word processor tool. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied.
- Spreadsheet: Able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells.
- Presentations: creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyper-linking, running the slide show, setting the timing for slide show.

11. Familiarization of PA system with different microphones, loud speakers, mixer etc. Represent the same in the form of diagrams, write specifications and submit it in the form of a report.

12. Understand working of various Communication Systems like Television, Satellite Transmitter & Receiver, Radio Receiver, Mobile Phone. Prepare demo boards/charts of various communication systems.

COURSE OUTCOMES:

After the completion of the course students will able to

- Identify discrete components and ICs (L3)
- Assemble simple electronic circuits over a PCB (L3)
- Testing of various components (L4)
- Interpret specifications (ratings) of the component (L5)
- Demonstrate disassembling and assembling a Personal Computer and make the computer ready to use (L2)
- Make use of Office tools for preparing documents, spread sheets and presentations (L3)
- Demonstrate working of various communication systems (L2)

Subject Code	Title of the Subject	L	T	P	C
20A10507	C-PROGRAMMING & DATA STRUCTURES LAB	**0**	**0**	**3**	**1.5**

Common to EEE & ECE

Course Objectives:

- To get familiar with the basic concepts of C programming.
- To design programs using arrays, strings, pointers and structures.
- To illustrate the use of Stacks and Queues
- To apply different operations on linked lists.
- To demonstrate Binary search tree traversal techniques.
- To design searching and sorting techniques.

Week l

Write C programs that use both recursive and non-recursive functions

i) To find the factorial of a given integer.
ii) To find the GCD (greatest common divisor) of two given integers.
iii) To solve Towers of Hanoi problem.

Week 2

a) Write a C program to find both the largest and smallest number in a list of integers.
b) Write a C program that uses functions to perform the following:
i) Addition of Two Matrices ii) Multiplication of Two Matrices

Week 3

a) Write a C program that uses functions to perform the following operations:
i) To insert a sub-string in to a given main string from a given position.
ii) To delete n characters from a given position in a given string.

Week 4

a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn‘t contain T.

b) Write a C program to count the lines, words and characters in a given text.

Week 5

a) Write a C Program to perform various arithmetic operations on pointer variables.

b) Write a C Program to demonstrate the following parameter passing mechanisms:

i) call-by-value ii) call-by-reference

Week 6

Write a C program that uses functions to perform the following operations:

i) Reading a complex number
ii) Writing a complex number
iii) Addition of two complex numbers
iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

Week 7

Write C programs that implement stack (its operations) using

i) Arrays
ii) Pointers

Week 8

Write C programs that implement Queue (its operations) using

i) Arrays
ii) Pointers

Week 9

Write a C program that uses Stack operations to perform the following:

i) Converting infix expression into postfix expression
ii) Evaluating the postfix expression

Week 10

Write a C program that uses functions to perform the following operations on singly linked list.

i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 11

Write a C program that uses functions to perform the following operations on Doubly linkedlist.

i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 12

Write a C program that uses functions to perform the following operations on circular linkedlist.

i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 13

Write a C program that uses functions to perform the following:

i) Creating a Binary Tree of integers

ii) Traversing the above binary tree in preorder, inorder and postorder.

Week 14

Write C programs that use both recursive and non-recursive functions to perform the following searching operations for a key value in a given list of integers:

i) Linear search
ii) Binary search

Week 15

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

i) Bubble sort
ii) Selection sort
iii) Insertion sort

Text Books:

1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education.

2. B.A. Forouzon and R.F. Gilberg, “COMPUTER SCIENCE: A Structured Programming Approach Using C”, Third edition, CENGAGE Learning, 2016.

3. Richard F. Gilberg& Behrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C”, Second Edition, CENGAGE Learning, 2011.

Reference Books:

1. PradipDey and ManasGhosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2. E.Balaguruswamy, “C and Data Structures”, 4th Edition, Tata Mc Graw Hill.
3. A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.
4. M.T.Somashekara, “Problem Solving Using C”, PHI, 2nd Edition 2009.

Course Outcomes

- Demonstrate basic concepts of C programming language. (L2)
- Develop C programs using functions, arrays, structures and pointers. (L6)
- Illustrate the concepts Stacks and Queues. (L2)
- Design operations on Linked lists. (L6)
- Apply various Binary tree traversal techniques. (L3)
- Develop searching and sorting methods. (L6)

B. Tech (E.C.E) I-Year II-sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A15304	**CHEMISTRY LAB**	**0**	**0**	**3**	**1.5**

Common to EEE, ECE, CSE

COURSE OBJECTIVES	
1	Verify the fundamental concepts with experiments

COURSE OUTCOMES	
CO1	**determine** the cell constant and conductance of solutions (L3)
CO2	**prepare** advanced polymer materials (L2)
CO3	**determine** the physical properties like surface tension, adsorption and viscosity (L3)
CO4	**estimate** the Iron and Calcium in cement (L3)
CO5	**calculate** the hardness of water (L4)

<u>Mapping between Course Outcomes and Programme Outcomes</u>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

List of Experiments:

1. Conductometric titration of strong acid vs. strong base
2. Conductometric titration of weak acid vs. strong base
3. Estimation of Ferrous Iron by Dichrometry.
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite and measurement of its mechanical properties (strength.).
8. Verify Lambert-Beer's law
9. Thin layer chromatography
10. Identification of simple organic compounds by IR.
11. Preparation of nanomaterial's by precipitation
12. Measurement of 10Dq by spectrophotometric method

Course Outcomes:

At the end of the course, the students will be able to

- **determine** the cell constant and conductance of solutions (L3)
- **prepare** advanced polymer Bakelite materials (L2)
- **measure** the strength of an acid present in secondary batteries (L3)
- **analyse**the IR of some organic compounds (L3)

TEXT BOOKS:

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – J. Mendham et al, Pearson Education.
2. Chemistry Practical – Lab Manual by Chandra Sekhar, GV Subba Reddy and Jayaveera

B. Tech (E.C.E) I-Year II-sem – R20 Regulation

Electronic Devices and Circuits Lab

(Common for ECE and EEE branches)

COURSE OBJECTIVES:

1. To verify the theoretical concepts practically from all the experiments.
2. To analyse the characteristics of Diodes, BJT, MOSFET, UJT.
3. To design the amplifier circuits from the given specifications.
4. To Model the electronic circuits using tools such as PSPICE/Multisim.

LIST OF EXPERIMENTS: (**Execute any 12 experiments**).

Note: All the experiments shall be implemented using both Hardware and Software.

1. Verification of Volt- Ampere characteristics of a PN junction diode and find static, dynamic and reverse resistances of the diode from the graphs obtained.
2. Design a full wave rectifier for the given specifications with and without filters, and verify the given specifications experimentally. Vary the load and find ripple factor. Draw suitable graphs.
3. Verify various clipping and clamper circuits using PN junction diode and draw the suitable graphs.
4. Design a Zener diode-based ***voltage regulator*** against variations of supply and load. Verify the same from the experiment.
5. Verification of the input and output characteristics of BJT in **Common Emitter** configuration experimentally and find required ***h – parameters*** from the graphs.
6. Study and draw the input and output characteristics of BJT in **Common Base** configuration experimentally, and determine required ***h – parameters*** from the graphs.
7. Study and draw the ***output*** and ***transfer*** characteristics of MOSFET (Enhance mode) in Common Source Configuration experimentally. Find ***Threshold voltage*** (V_T), g_m, **&** K from the graphs.
8. Study and draw the ***output*** and ***transfer*** characteristics of MOSFET (Depletion mode) or JFET in Common Source Configuration experimentally. Find I_{DSS}, g_m, **&** V_P from the graphs.

9. Study and draw the Volt Ampere characteristics of UJT and determine $\boldsymbol{\eta, I_P, I_v, V_P, \& V_v}$ from the experiment.
10. Design and analysis of voltage- divider bias/self-bias circuit using BJT.
11. Design and analysis of voltage- divider bias/self-bias circuit using JFET.
12. Design and analysis of self-bias circuit using MOSFET.
13. Design a suitable circuit for switch using CMOSFET/JFET/BJT.
14. Design a small signal amplifier using MOSFET (common source) for the given specifications. Draw the frequency response and find the bandwidth.
15. Design a small signal amplifier using BJT(common emitter) for the given specifications. Draw the frequency response and find the bandwidth.

Tools / Equipment Required: Software Tool like Multisim/ Pspice or Equivalent, DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

COURSE OUTCOMES:

After the completion of the course students will able to

CO1: Understand the basic characteristics and applications of basic electronic devices. (L1)

CO2: Observe the characteristics of electronic devices by plotting graphs. (L2)

CO3: Analyze the Characteristics of UJT, BJT, MOSFET. (L3)

CO4: Design MOSFET / BJT based amplifiers for the given specifications. (L4)

CO5: Simulate all circuits in PSPICE /Multisim. (L5)

B. Tech (E.C.E) I-Year II-sem – R20 Regulation

Subject Code	Title of the Subject	L	T	P	C
20A10803	ENVIRONMENTAL SCIENCE Common to EEE, ECE & CSE	0	0	3	1.5

COURSE OBJECTIVES: To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

UNIT – I:

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: – Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – II:

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III:

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT : Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV:

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V:

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK : Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

TEXT BOOKS :

(1) Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
(2) Environmental Studies by PalaniSwamy – Pearson education
(3) Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

REFERENCES :

(1) Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Pubilications.
(2) Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
(3) Comprehensive Environmental studies byJ.P.Sharma, Laxmi publications.
(4) Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
(5) A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Pubilishing House
(6) Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS)::ANANTAPURAMU

DEPARTMENT OF MATHEMATICS

II Year B.Tech. I-Sem (R20)

L	T	P	C
3	0	0	3

COMPLEX VARIABLES AND TRANSFORM TECHNIQUES (20A35102)

(Common to MECH, EEE & ECE)

20A35102

Course Objective:

This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables. The student develops the idea of using continuous/discrete transforms.

COURST OUTCOMES: After completion of the course a successful student is able to

CO 1: Acquire knowledge in

a. Fourier series.
b. Laplace transforms and their applications.
c. Find the derivatives of complex functions.

CO 2: To Develop skills in analyzing the

a. Properties of Fourier series for a given function.
b. Understand the analyticity of complex functions and conformal mapping.
c. Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.

CO 3: To develop skills in designing mathematical models for

a. Understand the usage of Laplace transforms.
b. Apply Cauchy's integral theorem.
c. Understand singularities of complex functions.

CO 4: To develop analytical tools in solving the problems involving

a. Fourier series
b. Laplace transforms
c. Evaluate the Fourier series expansion of periodic functions.

CO 5: Use relevant mathematical technique for evaluating

a. Evaluate improper integrals of complex functions using Residue theorem.
b. Laplace transforms

Course Outcome	Program Outcomes												Program Specific Outcomes				
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	1	-	-	-	1	-	-	2	1	-	-					
CO2	1	3	-	-	-	1	-	-	2	2	-	-					
CO3	1	3	2	-	-	1	-	-	2	2	-	-					
CO4	1	1	1	3	-	1	-	-	2	1	-	-					
CO5	1	1	1	1	-	1	-	-	2	1	-	-					

Correlation Levels: High - 3 Medium – 2 Low - 1

Unit-I: Complex Variable – Differentiation:

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions(exponential, trigonometric, logarithm), harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method-Conformal mappings-standard and special transformations(sin z, ez, cos z, z2) Mobius transformations (bilinear) and their properties.

Learning Outcomes:

Students will be able to

1. understand functions of Complex variable and its properties.
2. find derivatives of complex functions.
3. understand the analyticity of complex functions .
4. understand the conformal mappings of complex functions.

Unit-II: Complex Variable – Integration:

Line integral-Contour integration, Cauchy's integral theorem, Cauchy Integral formula, Liouville's theorem (without proof) and Maximum-Modulus theorem (without proof);power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (around unit circle, semi circle with f(z) not having poles on real axis).

Learning Outcomes:

Students will be able to

1. understand the integration of complex functions.
2. apply Cauchy's integral theorem and Cauchy's integral formula.
3. understand singularities of complex functions.
4. evaluate improper integrals of complex functions using Residue theorem.

Unit-III:Laplace Transforms

Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of

Periodic function.Differentiation and integration of transform – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

Learning Outcomes:

Studentswill be able to

1. understand the concept of Laplace transforms and find the Laplace transforms of elementary functions.
2. find the Laplace transforms of general functions using its properties.
3. understand Laplace transforms of special functions(Unit step function, Unit Impulse & Periodic).
4. apply Laplace transforms to solve Differential Equations.

Unit-IV:Fourier series

Determination of Fourier coefficients (Euler's) – Dirichlet conditions for the existence of Fourier series – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions- typical wave forms - Parseval's formula- Complex form of Fourier series.

Learning Outcomes:

Students will be able to

1. understand finding Fourier series expression of the given function.
2. determine Fourier coefficients (Euler's) and identify existence of fourier series of the given function.
3. expand the given function in Fourier series given in Half range interval.
4. apply Fourier series to establish Identities among Euler coefficients.
5. find Fourier series of wave forms.

Unit-V: Fourier transforms& Z Transforms:

Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem.

Z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

Learning Outcomes:

Students will be able to

1. find Fourier Sine and cosine integrals.

2. understand Fourier transforms.

3. apply properties of Fourier transforms.

4. understand Z transforms.

5. apply properties of Z transforms.

6. apply Z transforms to solve difference equations.

Text Books:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.

2. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India

Reference Books:

1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.

2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech I Sem (E.C.E) **L T P C**
3 0 0 3

20A30401 ANALOG CIRCUITS

Course Objectives:

- To review design and analysis of single stage amplifiers using BJT & FET at low and high frequencies
- To discuss cascading of single stage amplifiers
- To explain effect of negative feedback on amplifier characteristics

- To teach basic principles for analyzing RC & LC oscillator circuits
- To introduce different types of large signal amplifiers and tuned amplifiers

Course Outcomes (CO):

CO1: Design multistage amplifier circuits using BJT & MOSFETs
CO2: Choose particular type of feedback circuit required for a specific design application.
CO3: Derive expressions for frequency of oscillation and condition for oscillation of RC and LC oscillator circuits.
CO4: Classify power and tuned amplifiers.
CO5: Evaluate efficiency of large signal (power) amplifiers and voltage regulators

UNIT - I

Multistage and Differential Amplifiers: Introduction – Recap of Small Signal Amplifiers, Multistage Amplifiers, Cascode amplifier, Darlington pair, the MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT Differential Pair, Other Non-ideal Characteristics of the Differential Amplifier.

UNIT - II

Frequency Response: Low-Frequency Response of the CS and CE Amplifiers, Internal Capacitive Effects and the High-Frequency Model of the MOSFET and the BJT, High-Frequency Response of the CS and CE Amplifiers, High-Frequency Response of the CG and Cascode Amplifiers, High-Frequency Response of the Source and Emitter Followers, High-Frequency Response of Differential Amplifiers, Examples.

UNIT - III

Feedback Amplifiers : Feedback Amplifiers: Introduction, The General Feedback Structure, Some Properties of Negative Feedback, The Four Basic Feedback Topologies, The Feedback Voltage Amplifier (Series—Shunt), The Feedback Transconductance Amplifier (Series—Series), The Feedback Trans-resistance Amplifier (Shunt—Shunt), The Feedback Current Amplifier (Shunt—Series), Summary.

UNIT - IV

Power Amplifiers: Introduction, Classification of Output Stages, Class A Output Stage, Class B Output Stage, Class AB Output Stage, CMOS Class AB Output Stages, Power BJTs, Variations on the Class AB Configuration, MOS Power Transistors.

UNIT - V

Tuned Amplifiers: Tuned Amplifiers: Basic Principle, Use of Transformers, Single Tuned Amplifiers, Amplifiers with multiple Tuned Circuits, Stagger Tuned Amplifiers.

Oscillators: General Considerations, Phase Shift Oscillator, Wien-Bridge Oscillator, LC Oscillators, Crystal Oscillators, Illustrative Problems.

Textbooks:

1. Adel. S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits," 6th Edition, Oxford University Press, 2011.
2. Millman, C Halkias, "Integrated Electronics", 4thEdition, McGraw Hill Education (India) Private Ltd., 2015.

Reference Books:

1. BehzadRazavi, "Fundamentals of Micro Electronics", Wiley, 2010.
2. Donald A Neamen, "Electronic Circuits – Analysis and Design," 3rdEdition, McGraw Hill (India), 2019.
3. Millman and Taub, Pulse, "Digital and Switching Waveforms", 3rd Edition, Tata McGraw-Hill Education, 2011.
4. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory", 9th Edition, Pearson/Prentice Hall, 2006.
5. K.Lal Kishore, "Electronic Circuit Analysis", 2ndEdition, B S Publications, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech I Sem (E.C.E) **L T P C**
3 0 0 3

20A30402 DIGITAL DESIGN

Course Objectives:

- To discuss different simplification methods for minimizing Boolean functions
- To learn simplification of Boolean functions and their realization using logic gates.
- To gain knowledge on Verilog fundamentals, compilers, simulators and synthesis tools.
- To understand and design various combinational logic circuits.
- To study the design of sequential logic circuits in synchronous and asynchronous modes.
- To introduce programmable logic devices and to realize switching functions using them.

Course Outcomes:

CO1: Apply basic laws & De Morgan's theorems to simplify Boolean expressions (L3)
CO2: Compare K- Map&Q-M methods of minimizing logic functions (L5)

CO3: Learn the Hardware Description Language (Verilog)
CO4: Design and analyse various combinational and sequential circuits
CO5: Describe functional differences between different types of memories and PLDs

UNIT-I

Boolean Algebra and Minimization Methods: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Quine –McCluskey Tabular Minimization Method. Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

The Verilog Hardware Description Language: Design flow, program structure, libraries and packages. Structural design elements, data flow design elements, behavioral design elements.

UNIT-II

Combinational Design: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

Decoders (3 to 8, octal to decimal), Encoders, Priority Encoders, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers and their HDL models, HDL modeling of code converters. Multi-level implementation of multiplexer, demultiplexer , decoder, encoder.

UNIT-III

Sequential Logic Design: Latches, Flipflops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, flipflop conversions, set up and hold times, Ripple and Synchronous counters, Shift registers, and their HDL models.

UNIT-IV

Finite state machines: Introduction to FSM, Moore and Mealy sequence detector and its HDL model.

Programmable Logic Devices:ROM, Programmable Logic Devices (PLDs).

UNIT -V

CMOS Logic: Introduction to logic families, CMOS logic, CMOS logic families;

Bipolar Logic and Interfacing: Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families.

Textbooks:

1. Morris Mano, “Digital Design” PHI, 4th Edition,2006
2. T.R. Padmanabhan, B Bala Tripura Sundari, “Design Through Verilog HDL”, Wiley 2009.

Reference Books:

1. Thomas L. Floyd, “Digital Fundamentals”, Pearson, 11th edition, 2015.
2. ZainalabdienNavabi, “Verliog Digital System Design”,TMH, 2nd Edition.
3. John. F. Wakerly, “Digital design principles and practices”, Pearson publishers, 3rd Edition.
4. R.P. Jain, “Modern Digital Electronics”, TMH, 4th Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech I Sem (E.C.E) **L T P C 3 0 0 3**

20A30403 NETWORKS, SIGNALS AND SYSTEMS

Course Objectives:

- Able to understand the importance of two port and network functions.
- To realize the practical applications of resonance circuits.
- Able to synthesize the passive networks.
- To know different types of Signals and Systems and their properties.
- To apply and analyze the properties of Signals using Fourier series, Fourier transform, and Laplace transform.
- To understand the response of LTI systems for various types of analog signals given as input.
- Able to simulate various Signals and Systems and verify their properties

Course Outcomes (CO):

CO1: Understand the importance of two port and network functions, response of LTI systems when applied with various analog signals, understand the basic importance of resonant circuits and their applications.

CO2: Apply the basic knowledge and properties of Fourier series, Fourier transform and Laplace transform to solve for a particular response in a given network, also able to solve problems in R, L, and C based circuits.

CO3: Analyze the properties of Signals using Fourier series, Fourier transform, and Laplace transform, also to analyze the response of LTI systems for various types of analog signals given as input.

CO4: Synthesize various passive R-L, R-C, and L-C networks using Foster and Cauer forms.

Unit I

Two Port Networks: Two port network parameters - Z, Y, ABCD and h-parameters, Relationship between parameter sets, Interconnection of two port networks, Characteristic impedance, Image transfer constant, Image and Iterative impedances.

Network functions: Driving point and transfer functions using transformed variables, Concept of poles and zeros and their location on the complex S-plane.

Unit II

Resonance: Definition of Q – Factor, Bandwidth of series and parallel resonant circuits, Impedance variation with frequency, Application of resonant circuits, Illustrative problems.

Network Synthesis:Realizability concept, Hurwitz property, Properties of positive -real functions, Synthesis of R-L, R-C and L-C driving point functions, Foster and Cauer forms.

Unit III

Signals &Systems: Basic definitions and classification of Signals and Systems (Continuous time and discrete time), operations on signals, Concepts of Convolution and Correlation of signals, Analogy between vectors and signals-Orthogonality, mean square error,

Fourier series: Trigonometric & Exponential forms of Fourier series, Properties, Concept of discrete spectrum, Illustrative Problems.

Unit IV

Fourier Transform: Definition, Computation and properties of Fourier transform for different types of signals and systems, Inverse Fourier transform. Statement and proof of sampling theorem of low pass signals, Illustrative Problems.

Laplace Transform: Definition, ROC, Properties, Inverse Laplace transforms, the s-plane and BIBO stability, Transfer functions, System Response to standard signals, Solution of differential equations with initial conditions, Illustrative Problems.

Unit V

Signal Transmission through Linear Systems: Linear system, impulse response, Response of a linear system for different input signals, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between bandwidth and rise time, Energy and Power spectral densities, Illustrative Problems.

Textbooks:

1. William Hayt and Jack E Kemmerly, J. D. Philips, and S. M. Durbin, "Engineering Circuit Analysis", McGraw Hill, 9th edition, November 2020.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", PHI, 2nd Edition, 2009.

Reference Books:

1. Simon Haykin and Van Veen, "Signals & Systems", Wiley, 2nd Edition, 2005.
2. M. E. Van Valkenburg, "Network Analysis", Pearson, April 2019.
3. B P Lathi, "Principles of Linear Systems and Signals", Oxford University Press, 2nd Edition, 2015.
4. Matthew N.O. Sadiku and Warsame H. Ali, "Signals and Systems A primer with MATLAB", CRC Press, 2016.
5. Hwei Hsu, "Schaum's Outline of Signals and Systems", Fourth Edition, TMH, 2019.
6. John D. Ryder, *Networks Lines and Fields*, 2nd edition, Pearson, 2015.
7. M. E. Van Valkenburg, "Introduction to Modern Network Synthesis", 1966.

(Humanities Elective-I)

Subject Code	Title of the Subject	L	T	P	C
20A39101 a	**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**	3	0	0	3

Common to EEE, ECE & CSE

COURSE OBJECTIVES: The objective of this course is	
1	To inculcate the basic knowledge of micro economics and financial accounting
2	To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
3	To know the various types of Market Structures & pricing methods and its strategies
4	To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
5	To provide fundamental skills on Accounting and to explain the process of preparing Financial statements

SYLLABUS

UNIT-I: Managerial Economics

Introduction – Nature, meaning, significance, functions and advantages. Demand-Concept, Function, Law of Demand - DemandElasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

State the Nature of Managerial Economics and its importance

- Understand the concept of demand andits determinants
- Analyze the Elasticity and degree of elasticity
- EvaluateDemand forecasting methods
- Design the process of demand estimation for different types of demand

UNIT-II: Production and Cost Analysis

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination–Shortrun and longrun Production Function- Isoquants andIsocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale.Cost&Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) -Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

- Define the production function, Input-Output relationship and different cost concepts
- Apply the least-cost combination of inputs
- Analyze the behavior of various cost concepts
- Evaluate BEA for real time business decisions
- Develop profit appropriation for different levels of business activity

UNIT-III: Business Organizations and Markets

Introduction – Nature, meaning, significance, functions and advantages.Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises.Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition – Monopoly-Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies.

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

- Explain the structure of markets, features of different markets and forms of business organizations
- Apply the price output relationship in different markets
- Analyze the optimum output levels to maximize profit in different markets
- Evaluate price-output relationship to optimize cost,revenue and profit

UNIT- IV: Capital Budgeting

Introduction – Nature, meaning, significance, functions and advantages. Typesof Working Capital,Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals,Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

- Explain the concept of capital budgeting and its importance in business
- Contrast and compare different investment appraisal methods
- Analyze the process of selection of investment alternatives using different appraisal methods
- Evaluate methods of capital budgeting for investment decision making and for maximizing returns
- Design different investment appraisals and make wise investments

UNIT-V: Financial Accounting and Analysis

Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).***Financial Analysis -*** Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

- Discuss the concept,convention and significance of accounting
- Apply the fundamental knowledge of accounting while posting the journal entries
- Analyze the process and preparation of final accounts and financial ratios
- Evaluate the financial performance of an enterprise by using financial statements

Text Books:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

References:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

Data Books Required:

Present Value Factors table

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Define the concepts related to Managerial Economics, financial accounting and management.

CO2	Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
CO3	Apply the concepts of production, cost and revenues for effective business decisions
CO4	Analyze how to invest their capital and maximize returns
CO5	Evaluate the capital budgeting techniques
CO6	Develop theaccounting statements and evaluate the financial performance of business entity.

(Humanities Elective –I)

Subject Code	Title of the Subject	L	T	P	C
20A39101b	**ENTREPRENEURSHIP& INCUBATION**	3	0	0	3

Common to EEE, ECE & CSE

COURSE OBJECTIVES: The objective of this course is	
1	To make the student understand about Entrepreneurship
2	To enable the student in knowing various sources of generating new ideas in setting up ofnew enterprise
3	To facilitate the student in knowing various sources of finance in starting up of a business
4	To impart knowledge about various government sources which provide financial assistance to entrepreneurs/ women entrepreneurs
5	To encourage the student in creating and designing business plans

Syllabus

UNIT-I: Entrepreneurship

Introduction-Nature, meaning, significance, functions and advantages. concept, characteristics-knowledge and skills requirement - process - Factors supporting entrepreneurship - Differences between Entrepreneur and Intrapreneur - entrepreneurial mindset and personality - Recent trends.

LEARNING OUTCOMES

At the end if the Unit, the learners will be able to

- Understand theconcept of Entrepreneur and Entrepreneurship in India
- Analyzerecent trends in Entrepreneurship across the globe

- Develop a creative mind set and personality in starting a business.

UNIT-II: Women Entrepreneurship
Introduction – Nature, meaning, significance, functions and advantages. Growth of women entrepreneurship in India. - Issues & Challenges - Entrepreneurial motivations.Entrepreneurship Development and Government. Role, of Central and State Government - incentives, subsidies and grants – Export-oriented Units - Fiscal and Tax concessions.

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to

- Understand the role of government in promoting women entrepreneurship
- Analyze the role of export-oriented units
- Evaluate the tax concessions available for Women entrepreneurs

.

UNIT-III:Product Development
Introduction – Nature, meaning, significance, functions and advantages. Startup Initiatives - Generating business/ Service idea – Sources and methods –Identifying opportunities - Feasibility study - Market feasibility, technical/operational feasibility, Financial feasibility. Developing business plan, Preparing project report, Presenting business plan to investors.

LEARNING OUTCOMES

At the end if the Unit, the learners will be able to

- Analyze the sources of new methods in generating business idea
- Evaluate market feasibility, financial feasibility and technical feasibility
- Design and draw business plansin project preparation and prepare project reports

UNIT-IV:Startups
Introduction – Nature, meaning, significance, functions and advantages. Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence theType/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure - Value proposition
LEARNING OUTCOMES

At the end of the Unit, the learners will be able to:

- Understand the importance of business incubation

- Apply brilliant ideas in the process of business incubation
- Analyze the process of business incubation/incubators.
- Design their own business incubation/incubators as viable-business unit.

UNIT-V: Finance

Introduction – Nature, meaning, significance, functions and advantages. Sources - Long term and Short term - Institutional Finance – Commercial Banks, SFC's and NBFC's in India, Role in small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions supporting entrepreneurship development.

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to

- Understand the various sources of finance in Starting the new venture
- Analyze the role of banks and other financial institutions in promoting entrepreneurship in India
- Evaluatethe need and importance of MSMEs in the growth of country

TEXT BOOKS

1. D F Kuratko and T V Rao, **Entrepreneurship** - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit :login.cengage.com)
2 .Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

REFERENCES

1.Vasant Desai,Small Scale Industries and Entrepreneurship, Himalaya Publishing 2012.
2. Rajeev Roy Entrepreneurship, 2nd Edition, Oxford, 2012.
3.B.JanakiramandM.Rizwana‖ Entrepreneurship Development: Text & Cases, Excel Books, 2011.
4.Stuart Read, Effectual Entrepreneurship, Routledge, 2013.

E-RESOURCES

1. Entrepreneurship-Through-the-Lens-of-enture Capital

2.http://www.onlinevideolecture.com/?course=mba-programs&subject=entrepreneurship

3.http://nptel.ac.in/courses/122106032/Pdf/7_4.pd

4.http://freevideolectures.com/Course/3514/Economics-/-Management-/-Entrepreneurhip/50

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Define the Concepts related to the Entrepreneurship and Incubators
CO2	Understand the concept of Entrepreneurship and challenges in the world of competition.
CO3	Apply the Knowledge in generating ideas for New Ventures.
CO4	Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
CO5	Evaluate the role of central government and state government in promoting Entrepreneurship.
CO6	Create and design business plan structure through incubations.

(Humanities Elective-I)

(w.e.f Academic Year 2020-21)

Subject Code	Title of the Subject	L	T	P	C
20A39101 c	**BUSINESS ETHICS AND CORPORATE GOVERNANCE**	3	0	0	3

Common to EEE, ECE & CSE

COURSE OBJECTIVES: The objectives of this course are	
1	To make the student understand the principles of business ethics
2	To enable them in knowing the ethics in management
3	To facilitate the student's role in corporate culture
4	To impart knowledge about the fair-trade practices
5	To encourage the student in creating knowingabout the corporate governance

SYLLABUS

UNIT-I:ETHICS

Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior - Value systems - Business Ethics,Types, Characteristics, Factors, Contradictions and Ethical Practices inManagement- Corporate Social Responsibility – Issues of Management – Crisis Management.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the meaning of loyalty and ethical Behavior
- Explain various types of ethics
- Analyze the corporate social responsibility of management

UNIT-II: ETHICS IN MANAGEMENT

Introduction Ethics in production, finance, Human Resource Managementand,MarketingManagement - Technology Ethics and Professional ethics - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individual Ethics.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the meaning of Marketing Ethics
- Compare and contrasttechnical ethics and professional ethics
- Develop ethical values

UNIT-III: CORPORATE CULTURE

Introduction, Meaning,definition,Nature, Scope, Functions,andsignificance– Cross cultural issues in Ethics - - Emotional Honesty – Virtue of humility – Promote happiness – karma yoga – proactive – flexibility and purity of mind. The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individual Ethics.

LEARNING OUTCOMES: -After completion of this unit student will

- Define UniversalismUtilitarianism, Distributive
- Understand the corporate culture in business
- Analyze Ethical Value System Ethical Values in different Cultures

UNIT- IV:LEGAL FRAME WORK

Law and Ethics, Agencies enforcing Ethical Business Behavior, Legal Impact– Environmental Protection, Fair Trade Practices,legal Compliances, Safeguarding Health and wellbeing of Customers.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand Law and Ethics
- Analyze Different fair-trade practices
- Make use of Environmental Protection andFair-Trade Practices

UNIT -V: CORPORATE GOVERNANCE

Introduction, meaning – scope Nature - Issues, need, corporate governance code, transparency & disclosure, role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work, corporate scams, committees in India and abroad, corporate social responsibility. of BoDs composition, Cadbury Committee - various committees - reports - Benefits and Limitations.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand corporate governance code
- Analyze role ofauditors, board of directors and shareholders in corporate governance
- Implementing corporate socialresponsibility in India.

Text books.

1. Murthy CSV: Business Ethics and Corporate Governance, HPH
2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH.

Reference books

1. Dr. K. Nirmala, KarunakaraReddy: Business Ethics and Corporate Governance, HPH
2. H.R.Machiraju: Corporate Governance
3. K. Venkataramana, Corporate Governance, SHBP.
4. N.M.Khandelwal : Indian Ethos and Values for Managers

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Define the Ethics and Types of Ethics.
CO2	Understand business ethics and ethical practices in management
CO3	Understand the role of ethics in management
CO4	Apply the knowledge in cross cultural ethics
CO5	Analyze law and ethics
CO6	Evaluate corporate governance

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech I Sem (E.C.E)	**L T P C**
	0 0 3 1.5

20A30406 ANALOG CIRCUITS LAB

Course Objectives:

- To review analysis & design of single stage amplifiers using BJT / MOSFETs at low and high frequencies.
- To understand the characteristics of Differential amplifiers, feedback and power amplifiers.
- To categorize different oscillator circuits based on the application
- To design the electronic circuits for the given specifications and for a given application.

Course Outcomes (CO):

CO1: Know about the usage of equipment/components/software tools used to conduct the experiments in analog circuits.
CO2: Conduct the experiment based on the knowledge acquired in the theory about various analog circuits using BJT/MOSFETs to find the important parameters of the circuit (viz. Voltage gain, Current gain, bandwidth, input and output impedances etc) experimentally.
CO3: Analyze the given analog circuit to find required important metrics of it theoretically.
CO4: Draw the relevant graphs between important metrics of the system from the observed measurements.
CO5: Compare the experimental results with that of theoretical ones and infer the conclusions.
CO6: Design the circuit for the given specifications.

Note: At least 10 experiments shall be performed. BJT / MOSFET based circuits shall be implemented.
List of Experiments: Design, simulate and testing of the following:

1. Darlington pair.
2. Two stage RC coupled Amplifier
3. CE – CC multistage Amplifier
4. Cascode Amplifier.
5. Differential Amplifier
6. Voltage – Series feedback amplifier
7. Current – Shunt feedback amplifier
8. Class A power amplifier
9. Class AB amplifier
10. RC phase shift oscillator
11. LC Oscillator
12. Single Tuned amplifier

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech I Sem (E.C.E)	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

20A30407 DIGITAL DESIGN LAB

COURSE OBJECTIVES:

- To get the knowledge about functionality of various digital circuits (logic gates, adders, subtractors, converters, multiplexers and comparators.)
- To use computer-aided design tools for development of complex digital logic circuits
- To understand the functionality of various Digital ICs.

Course Outcomes:

CO1: Understand the functionality of various digital circuits

CO2: Use computer-aided design tools for development of digital logic circuits

CO3: Learn the functionality of various Digital ICs

Note: Implement using digital ICs.

List of Experiments: (Any 4 Experiments are to be conducted)

1. Realization of Boolean Expressions using Gates
2. Design and realization of logic gates using universal gates
3. Generation of clock using NAND / NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization of a 4 – bit Gray to Binary and Binary to Gray Converter
6. Design and realization of 8x1 MUX using 2x1 MUX
7. Design and realization of 4 bit comparator

List of Experiments: (Any 8 Experiments are to be conducted)

Write a Verilog code to Simulate and synthesize the following in Gate level, Data flow and Behavioral Modeling styles.

1. Logic Gates.
2. Adders and Subtractors.
3. Multiplexers and De-multiplexers.
4. Encoders, Decoders, Comparator.
5. Implementation of logic function using Multiplexers and Decoders.
6. Arithmetic and Logic Unit.
7. Flip-Flops.
8. Up, Down and UP/Down Counters.
9. Sequence Detector using Mealy and Moore type state machines.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech I Sem (E.C.E)	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

20A30408 SIMULATION AND NETWORKS LAB

Course Objectives:

To realize the concepts studied in theory
To simulate various Signals and Systems through MATLAB
To apply the concepts of signals to determine their energy, power, PSD etc.
To analyze the output of a system when it is excited by different types of deterministic and random signals.
To generate random signals for the given specifications

Course Outcomes (CO):

CO1: Learn how to use the MATLAB software and know syntax of MATLAB programming.
CO2: Understand how to simulate different types of signals and system response.
CO3: Find the Fourier Transform of a given signal and plot amplitude and phase characteristics.
CO4: Analyze the response of different systems when they are excited by different signals and plot power spectral density of signals.
CO5: Generate/Simulate different random signals for the given specifications

List of Experiments:

Part - A

1. Write a program to generate various Signals and Sequences: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc function.
2. Perform operations on Signals and Sequences: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightings- Plot the discrete spectrum of the signal.
4. Write a program to find Fourier transform of a given signal. Plot its amplitude and phase spectrum.
5. Write a program to convolve two discrete time sequences. Plot all the sequences.
6. Write a program to find autocorrelation and cross correlation of given sequences.
7. Write a program to verify Linearity and Time Invariance properties of a given Continuous/Discrete System.

8. Write a program to generate discrete time sequence by sampling a continuous time signal. Show that with sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
9. Write a program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
10. Write a program to find response of a low pass filter and high pass filter, when a speech signal is passed through these filters.
11. Write a program to generate Complex Gaussian noise and find its mean, variance, Probability Density Function (PDF) and Power Spectral Density (PSD).
12. Generate a Random data (with bipolar) for a given data rate (say 10kbps). Plot the same for a time period of 0.2 sec.
13. To plot pole-zero diagram in S-plane of given signal/sequence and verify its stability.

Note: All the experiments are to be simulated using MATLAB or equivalent software.

Part – B

1. Measure the Impedance parameters for a given passive network
2. Measure the admittance parameters for a given passive network
3. Measure the transmission parameters for a given passive network
4. Measure the inverse transmission parameters for a given passive network
5. Realize RC network for a given driving point impedance
6. Realize RC network for a given driving point admittance

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech I Sem (E.C.E)	**L T P C**
	1 0 2 2

20A30409 SKILL ORIENTED COURSE – I (PCB DESIGN AND DEVELOPMENT)

Module 1:
Introduction to PCB designing concepts
Introduction to PCB: Brief History of PCB, Difference between PWB and PCB, Types of PCBs: Single Sided (Single Layer), Multi-Layer (Double Layer), PCB Materials
Introduction to Electronic design Automation (EDA): Brief History of EDA, Latest Trends in Market, Objectives, Different EDA tools, Introduction to SPICE and PSPICE Environment, Introduction and Working of PROTEUS

Module 2:
Component Package Types
Through Hole Packages: Axial lead, Radial Lead, Single Inline Package(SIP), Dual Inline Package(DIP), Transistor Outline(TO), Pin Grid Array(PGA)
Surface Mount Packages: Metal Electrode Face(MELF), Leadless Chip Carrier(LCC), Small Outline Integrated Circuit(SOIC), Quad Flat Pack(QPF) and Thin QFP (TQFP), Ball Grid Array(BGA), Plastic Leaded Chip Carrier(PLCC)

Module 3:
Development Tools and Practical of PCB Designing
Introduction to PCB Design using OrCAD tool and PROTEUS tool
PCB Designing Flow Chart: Schematic Entry, Net listing, PCB Layout Designing, Prototype Designing, Design Rule Check(DRC), Design For Manufacturing(DFM), PCB Making, Printing, Etching, Drilling, Assembly of components
Description of PCB Layers: Electrical Layers, Top Layer, Mid Layer, Bottom Layer, Mechanical Layers o Board Outlines and Cutouts o Drill Details, Documentation Layers o Components Outlines o Reference Designation o Text

Keywords & Their Description: Footprint, Pad stacks, Vias, Tracks, Color of Layers, PCB Track Size Calculation Formula
PCB Materials: Standard FR-4 Epoxy Glass, Multifunctional FR-4, Tetra Functional FR-4, NelcoN400-6, GETEK, BT Epoxy Glass, Cyanate Aster, Plyimide Glass, Teflon
Rules for Track: Track Length, Track Angle, Rack Joints, Track Size
Study of IPC Standards: IPC Standard For Schematic Design, IPC Standard For PCB Designing, IPC Standard For PCB Materials, IPC Standard For Documentation and PCB Fabrication

Tasks: Lab practice and designing concepts
Starting the PCB designing

- Understanding the schematic Entry
- Creating Library & Components
- Drawing a Schematic
- Flat Design / hierarchical Design
- Setting up Environment for PCB
- Design a Board

Auto routing

- Introduction to Auto routing
- Setting up Rules
- Defining Constraints
- Auto router Setup

PCB Designing Practice

- PCB Designing of Basic and Analog Electronic Circuits
- PCB Designing of Power Supplies
- PCB Designing of Different Sensor modules
- PCB Designing of Electronics Projects
- PCB Designing of Embedded Projects

Post Designing & PCB Fabrication Process

- Printing the Design
- Etching
- Drilling
- Interconnecting and Packaging electronic Circuits (IPC) Standards
- Gerber Generation
- Soldering and De-soldering
- Component Mounting
- PCB and Hardware Testing

Textbooks:

1. R S Khandpur, "Printed Circuit Boards: Design-Fabrication", 1st Edition, McGraw Hill Education, 2017
2. KraigMitzner, "Complete PCB Design using OrCAD Capture and PCB Editor", 1st Edition, Newnes.

Reference:

1. Michael Dsouza, "PCB Design: Printed Circuit Board", 1st Edition, McGraw Hill Education, 2013.

(Common to EEE, ECE, CSE

Subject Code	Title of the Subject	L	T	P	C
20A19101	**Universal Human Values**	3	0	0	3

COURSE OBJECTIVES: The objectives of this course are	
1	Exposure to the value of life, society and harmony
2	Leading towards holistic perspective based on self-exploration about themselves (human being), family, and society and nature/existence.
3	Bringing transition from the present state to Universal Human Order
4	Instill commitment and courage to act.
5	Know about appropriate technologies and management patterns

SYLLABUS

Unit 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Universal Human Values-I - Self-Exploration - content and process; 'Natural Acceptance' and Experiential Validation - self-exploration - Continuous Happiness and Prosperity - Human Aspirations - current scenario - Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit 2: Understanding Harmony among Human Beings & Self Harmony!

human being as a co-existence of the sentient 'I' and the material' Body' - the needs - happiness and physical facility -the Body as an instrument of 'I' - the characteristics and activities of 'I' and harmony in 'I' - the harmony of I with the Body

Unit 3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

Values in human relationship; meaning of Justice; Trust and Respect; Difference between intention and competence; the other salient values in relationship - the harmony in the society: Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals - Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Unit 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

the harmony in the Nature - Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature - Understanding Existence as Co-existence of mutually interacting units in all- pervasive space - Holistic perception of harmony at all levels of existence.

Unit 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

Humanistic Education - Competence in professional ethics: professional competence - people friendly and eco-friendly production systems - appropriate technologies and management patterns for above production systems. Individuals as socially and ecologically responsible engineers, technologists and managers

Prescribed Text Book

A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

Teachers' Manual for *A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

ReferenceBooks

.Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999

1. HumanValues, A.N.Tripathi, NewAge Intl.Publishers, NewDelhi,2004.

2. The Story of Stuff (Book).

3. Economy of Permanence - J C Kumarappa 8. Bharat Mein Angreji Raj - PanditSunderlal 9. Rediscovering India - byDharampal

4. Hind Swaraj or Indian Home Rule - by Mohandas K.Gandhi

5. India Wins Freedom - Maulana Abdul Kalam Azad 12. Vivekananda - Romain Rolland (English)

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	Define terms like Natural Acceptance, Happiness and Prosperity
CO2	Understand awareness of oneself, and one's surroundings (family, society nature)
CO3	Apply what they have learnt to their own self in different day-to-day settings in real life
CO4	Relate human values with human relationship and human society.
CO5	Justify the need for universal human values and harmonious existence
CO6	Develop as socially and ecologically responsible engineers

Online Resources:

<table>
<tr><td>Course Code</td><td rowspan="2">Probability Theory and Stochastic Process (ELCTRONICS AND COMMUNICATION ENGINEERING)</td><td colspan="2"></td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>20A45102</td><td colspan="2"></td><td></td><td>3</td><td></td><td>3</td></tr>
<tr><td>Pre-requisite</td><td></td><td colspan="2">Semester</td><td colspan="4">II</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">Course Objectives:</td></tr>
<tr><td colspan="8">To gain the knowledge of the basic probability concepts and acquire skills in handling situations involving more than one random variable and functions of random variables.To understand the principles of random signals and random processes.To be acquainted with systems involving random signals.To gain knowledge of standard distributions that can describe real life phenomena.</td></tr>
<tr><td colspan="8">Course Outcomes (CO): Student will be able to</td></tr>
<tr><td colspan="8">• Understanding the concepts of Probability, Random Variables, Random Processes and their characteristics learn how to deal with multiple random variables, conditional probability, joint distribution and statistical independence. (L1)</td></tr>
</table>

- Formulate and solve the engineering problems involving random variables and random processes. (L2)
- Analyze various probability density functions of random variables. (L3)
- Derive the response of linear system for Gaussian noise and random signals as inputs. (L3)

UNIT - I	**Probability Introduced Through Sets and Relative Frequency**	**9 Hrs**

Probability Introduced Through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events, Problem Solving.
Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties, Problem Solving.

UNIT - II	**Operations on Single Random Variable, Multiple Random Variables**	**8 Hrs**

Operations on Single Random Variable: Introduction, Expectation of a random variable, moments-moments about the origin, Central moments, Variance and Skew,moment generating function, characteristic function, transformations of random variable.
Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected), Unequal Distribution, Equal Distributions

UNIT - III	**Operations on Multiple Random Variables**	**8 Hrs**

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties of Gaussian random variables, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT - IV	**Random Processes-Temporal Characteristics, Random Processes-Spectral Characteristics**	**9 Hrs**

Random Processes-Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical

Independence, First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, N-Order and Strict-Sense Stationarity. Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

Random Processes-Spectral Characteristics: The Power Density Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum and its Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

UNIT - V	Random Signal Response of Linear Systems, Noise Definitions:	9 Hrs

Random Signal Response Of Linear Systems: System Response – Convolution, Mean and Mean squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band Limited and Narrowband Processes, Properties.

Noise Definitions: White Noise, colored noise and their statistical characteristics, Ideal low pass filtered white noise, RC filtered white noise.

Textbooks:

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", 4th Edition, TMH, 2002.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4th Edition, PHI, 2002.

Reference Books:

1. Simon Haykin, "Communication Systems", 3rd Edition, Wiley, 2010.
2. Henry Stark and John W.Woods, "Probability and Random Processes with Application to Signal Processing," 3rd Edition, Pearson Education, 2002.
3. George R. Cooper, Clave D. MC Gillem, "Probability Methods of Signal and System Analysis," 3rd Edition, Oxford, 1999.

Online Learning Resources:

https://people.math.harvard.edu ›KnillProbability
https://www.wiley.com/en-us/Introduction+to+Probability+Theory+and+Stochastic+Processes-p-9781118382790

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech II Sem (E.C.E)	**L T P C**
	3 0 0 3

20A40401 ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

Course Objectives:

- To introduce fundamentals of static and time varying electromagnetic fields.

- To teach problem solving in Electromagnetic fields using vector calculus.
- To demonstrate wave concept with the help of Maxwell’s equations.
- To introduce concepts of polarization and fundamental theory of electromagnetic waves in transmission lines and their practical applications.
- To analyze reflection and refraction of electromagnetic waves propagated in normal and oblique incidences.

Course Outcomes (CO):
CO1: Explain basic laws of electromagnetic fields and know the wave concept.
CO2: Solve problems related to electromagnetic fields.
CO3: Analyze electric and magnetic fields at the interface of different media.
CO4: Derive Maxwell’s equations for static and time varying fields.
CO5: Analogy between electric and magnetic fields.
C06: Describes the transmission lines with equivalent circuit and explain their characteristic with various lengths.

UNIT - I
Recap of Vector Analysis & Calculus: Coordinate systems and transformation-Cartesian, Cylindrical and Spherical coordinates, Differential length area and volume, line surface and volume integrals, Del operator, gradient, divergence and curl operations.
Static Electric Fields
Coulomb’s Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Divergence Theorem, Electric Potential, Relations Between E and V, Maxwell’s Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson’s and Laplace’s Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT - II
Magnetic Fields: Biot-Savart Law, Ampere’s Circuital Law and Applications, Magnetic Flux Density, Maxwell’s Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Magnetic dipole, Ampere’s Force Law, Inductances and Magnetic Energy, Illustrative Problems.
Time varying Fields: Faraday’s Law and Transformer e.m.f, Inconsistency of Ampere’s Law and Displacement Current Density, Maxwell’s equations for time varying fields, Maxwell’s Equations in Different Final Forms and Word Statements, Illustrative Problems
UNIT - III
Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Wave Equations for Conducting and Perfect Dielectric Media.
Uniform Plane Wave: Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

UNIT - IV

Reflection and Refraction of Plane Waves: Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

UNIT - V

Transmission Lines: Introduction, Transmission line parameters, Transmission line equivalent circuit, Transmission line equations and their solutions in their phasor form, input impedance, standing wave ratio, Transmission of finite length- half wave, quarter wave transmission line, Smith chart, graphical analysis of transmission lines using Smith chart, stub matching- single and double stub matching, Illustrative Problems.

Textbooks:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics", 4th edition. Oxford Univ. Press, 2008.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics", 7thedition.,TMH, 2006.

Reference Books:

1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2000.
2. John D. Krauss, "Electromagnetics", 4th Edition, McGraw- Hill publication, 1999.
3. Electromagnetics, Schaum's outline series, 2nd Edition, Tata McGraw-Hill publications, 2006.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech II Sem (E.C.E) **L T P C**
3 0 0 3

20A40402 ANALOG COMMUNICATIONS

Prerequisite Courses: **Signals and Systems, Probability Theory and Stochastic Processes**

COURSE OBJECTIVES:

Students undergoing this course, are expected to

- Understand the basics of Analog Signal transmission in a Communication Channel.
- Understand the principles of operation of AM, DSB, SSB, FM and Pulse modulation and demodulation schemes.
- Solve problems related to analog modulation and demodulation techniques.
- Analyse analog modulation schemes especially AM and FM in the presence of Noise.
- Differentiate the performance of AM and FM receivers
- Compare various analog and pulse modulation schemes in respect of Communication metrics.

Course Outcomes:

1. *Remember* the basic definitions of various analog modulation schemes.
2. *Understand* the principles of operation of AM, DSB, SSB, FM and Pulse modulation and demodulation schemes.
3. *Solve problems* related to analog modulation and demodulation techniques.
4. *Analyse* analog modulation schemes especially AM and FM in the presence of Noise.
5. *Differentiate* the performance of AM and FM receivers &*Compare* various analog and pulse modulation Schemes in respect of bandwidth and power utilization.

Unit I

Introduction to Communication Engineering, Communication Channel, Brief Review of Signals and Systems, the Hilbert Transform, Analytic Representation of band pass Signals, Fundamentals of Analog Signal Transmission.

Unit II

Introduction to Analog Modulation of Carriers, Amplitude Modulation (AM), Spectrum of AM, Envelope detection, Power efficiency, DSB-SC modulation, Quadrature amplitude modulation (QAM), Single Sideband Modulation (SSB), Vestigial Sideband Modulation, Super Heterodyne Receiver, Practical Mixers.

Unit III

Angle Modulation, Generation of FM signals, Spectrum of FM signals, Carson's rule for FM signals, Narrow and Wideband FM signals, FM demodulation, Feedback Modulators, the Phased Locked Loop, FM receivers, TV transmission.

Unit IV

Review of Probability theory and Random Process – Random Variable, Additive White Gaussian Noise (AWGN) and its properties, Behaviour of Communication System, Performance of AM & FM systems in Noise, Pre-emphasis and de-emphasis, Radio Receiver Parameters – Sensitivity, Selectivity, and Fidelity.

Unit V

Pulse Modulation Schemes – Sampling Theorem, Natural sampling, flat top sampling, Pulse Amplitude Modulation (PAM), Pulsed Width Modulation (PWM), Frequency Division Multiplexing (FDM).

Textbooks:

1. Simon Haykin, John Wiley &Sons , "Communication Systems" 4th Edition, 2001.

2. Sham Shanmugam, “Digital and Analog Communication Systems”, Wiley-India edition, 2006.

Reference Books:

1. Bruce Carlson, & Paul B. Crilly, “Communication Systems – An Introduction to Signals & Noise in Electrical Communication”, McGraw-Hill International Edition, 5th Edition, 2010.
2. Herbert Taub& Donald L Schilling, “Principles of Communication Systems”, Tata McGrawHill, 3rd Edition, 2009.
3. R.E. Ziemer& W.H. Tranter, “Principles of Communication-Systems Modulation & Noise”, Jaico Publishing House, 2001.
4. George Kennedy and Bernard Davis, “Electronics & Communication System”, TMH, 2004.
5. B. P. Lathi, “Modern Digital and Analog Communication Systems,” Oxford Univ. press, 3rd Edition, 2006.

II B.Tech II Sem (E.C.E) **L T P C**

3 0 0 3

20A40403 MICROCONTROLLERS AND INTERFACING

COURSE OBJECTIVES:

- To study the concepts of RISC Architecture and Assembly language programming of ARM Processor
- To study the concepts of Architectural Support for High level language and memory hierarchy
- To study the concepts of Architectural support for system Development and Operating system

COURSE OUTCOMES:

CO1: Understand microprocessors and Microcontrollers

CO2: Analyse the architecture of ARM processors and Internal Features.

CO3: Develop assembly and C programming for ARM processor (STM32).

CO4: Understanding GPIO and interfacing various devices.

CO5: Develop societal applications using CAN and I2C protocols.

UNIT – I

Introduction: Introduction to Microprocessor and Microcontrollers, Differences between microprocessor and microcontroller, Different types of Microcontrollers.

ARM Micro-controller: History and Features, Importance of 32-bit Microcontrollers, Introduction to ARM, Difference between ARM & MIPS, Brief description of ARM Family Microcontrollers, Introduction to ARM Cortex M Series (M0 & M3),Description of STM32Fxxx Microcontrollers (STM32F0xxx & STM32F1xxx)

UNIT – II

Architecture description of ARM: Pin Diagram, Memory Organization, SFRs description, Introduction to general microcontroller terms, Program Counter, Accumulator (or Working Register), Reset, Clock Cycle, Machine Cycle, Instruction Cycle, Interrupts, SFRs & GPRs, Stack, Stack Pointer, Stack Operation, *Internal features:* General Purpose Input-Output PORTs, Interrupt, Timers, Analog to Digital Convertors, USART, EEPROM, Device Protection features – Watchdog Timer, BOR, Power up Timer

UNIT – III

ARM Programming: Arithmetic and Logic Instructions, Branch, Call, and Stack in Arm, Signed Integer Numbers Arithmetic, ARM Addressing Modes; Embedded C Programming.

UNIT – IV

Interfacing of GPIO and Basic Internal Peripherals of ARM: LED Interfacing with Microcontroller, LED Patterns programming, switches Interfacing with Microcontroller, Interfacing of Solid State Devices with Microcontroller, Programming concept of SSD, Interfacing of Keypad with Microcontroller, Programming Concept of Keypad Matrix, Liquid crystal display, Understanding the Timer/Counter Concepts, Introduction to Timer2 &Timer3

Concepts, Introductions to Timer SFRs and their access, Programming concept of Timers to Generate delays.

UNIT – V

Programming of Advanced Internal Peripherals: ADC*:* Introduction to ADC Process, Need of ADC, ADC Resolutions & Relation between Vin & Digital Output, Introduction to STM32Fxxx internal ADC and its SFRs, Programming Concept of ADC, *DAC:* Concept & Description to STM32Fxxx DAC, Description to SFRs & their Access, Programming Concept of DAC. *UART:* Introduction to Serial & Parallel Communication, Introduction to Synchronous & Asynchronous Communication, Introduction to UART and its SFRs, Programming concept of Serial Transmitter & Receiver using UART.

Interrupts and Applications

Interrupts: Introduction to Interrupt, Polling Vs. Interrupt, Types of Interrupts (Maskable& Non-Maskable, Internal & External), Description to NVIC Interrupt Logic Diagram of STM32Fxxx, Introduction to SFRs related to Interrupts, Programming Concept of Interrupts.

Applications: Design and development of a closed loop system for health applications, Agriculture applications, Automobile applications, Domestic applications including design of signal conditioning circuits and programming, Robotic applications, Motors (PMDC, Stepper & Servo) and utilisation CAN, I^2C and SPI protocols.

Textbooks:

1. SarmadNaimi, Muhammad Ali Mazidi, SepehrNaimi, "The STM32F103 Arm Microcontroller & Embedded Systems: Using Assembly & C", MicroDigitalEd publishing, 2020
2. Geoffrey Brown, "Discovering the STM32 Microcontroller", Indiana University, 2016

Reference Books:

1. Shujen Chen, Muhammad Ali Mazidi, EshraghGhaemi, "STM32 ARM Programming for Embedded Systems: Using C Language with STM32 Nucleo", MicroDigitalEd., 2018.
2. Warren Gay, "Beginning STM32: Developing with FreeRTOS, libopencm3 and GCC", Apress, 2018
3. Kirk Zurell, "C Programming for Embedded Systems", Lawrence, Kansas : R&D Books, 2000.
4. Joseph Yiu, "The Definitive Guide to the ARM Cortex M3", Newnes, 2007
5. Carmine Noviello, "Mastering the STM32 Microcontroller", Leanpub, 2016

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech II Sem (E.C.E) **L T P C**
3 0 0 3

20A40404 IC APPLICATIONS

Course Objectives:

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of PLL.
- To introduce the concepts of waveform generation and introduce some special function ICs.
- Exposure to digital IC's

Course Outcomes (CO):

CO1: List out the characteristics of Linear and Digital ICs.
CO2: Discuss the various applications of linear & Digital ICs.
CO3: Solve the application based problems related to linear and digital ICs.
CO4: Analyze various applications based circuits of linear and digital ICs.
CO5: Design the circuits using either linear ICs or Digital ICs from the given specifications.

UNIT - I

Operational Amplifier Basic BJT/FET Differential amplifiers – Constant current source – current mirror. Introduction, Block diagram, characteristics and equivalent circuits of an ideal op-amp, various types of Operational Amplifiers and their applications, Power supply configurations for OP-AMP applications, inverting and non-inverting amplifier configurations. The Practical op-amp: Introduction, Input offset voltage, offset current, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio, Slew rate and its Effect, PSRR and gain – bandwidth product, frequency limitations and compensations, transient response.

UNIT – II

Applications of Operational Amplifier Amplifiers: Adder, subtractor, integrator, differentiator, current amplifier, difference amplifier, instrumentation amplifier, Converters: Current to voltage and voltage to current converters, Active Filters: First order filters, second order active finite and infinite gain low pass, high pass, band pass and band reject filters, Sine Wave Oscillators: RC phase shift oscillator, Wien bridge oscillator, Quadrature oscillator.

UNIT - III

Non-Linear Applications of Operational Amplifier Comparators: Inverting comparator, non-inverting comparator, zero crossing detector, window detector and level detector, Schmitt

Triggers: Inverting Schmitt trigger, noninverting Schmitt trigger with adjustable threshold levels, Waveform Generators: Square wave and triangular wave generator, Precision Rectifiers: Half and full wave precision rectifiers, log and antilog amplifiers, Peak detectors, sample and hold circuits, voltage to frequency converter, frequency to voltage converter.

UNIT – IV

Data Converters Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC . Dual Slope ADC, Sigma Delta ADC and Pipeline ADC. DAC and ADC Specifications.

UNIT – V

Special Purpose Integrated Circuits Functional block diagram, working, design and applications of Timer 555 (Monostable&Astable), Functional block diagram, working and applications of VCO 566, PLL 565, multiplier MPY634, waveform generator XR 2206, power amplifier LM380. Voltage Regulators: Functional block diagram, working and design of three terminal fixed (78XX, 79XX series), three terminal adjustable (LM 317, LM 337) voltage regulators and Switching regulators (LT1070).

Textbooks:

1. Sergio Franco, “Design with operational amplifiers and analog integrated circuits”, Tata McGraw Hill, 3rd Edition.

2. Ramakant A. Gayakwad, “Op-Amps and Linear Integrated Circuits”, Pearson Prentice Hall, 4 th Edition

Reference Books:

1. Roy Choudhury and S. B. Jain, “Linear Integrated Circuits”, New Age International Publishers, 4th Edition

2. Sedra A.S. & Smith K.C., “Microelectronic Circuits”, Oxford University Press 1998

3. William D. Stanley, “Operational Amplifiers with Linear Integrated Circuits”, Pearson, 4th Edition 3. D.

4. David A. Bell, “Operation Amplifiers and Linear Integrated Circuits”, Oxford University Press, Indian
Edition.

5. R. P. Jain, “Modern Digital Electronics”, Tata McGraw Hill, 3rd Edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

IIB.Tech II Sem (E.C.E)	L	T	P	C
	0	0	3	1.5

20A40405 ANALOG COMMUNICATIONS LAB

Course Objectives

- To familiarize the students with basic analog communication systems. Integrate theory with experiments so that the students appreciate the knowledge gained from the theory course.
- Understand all types of analog modulation / demodulation principles.
- Substantiate pulse modulation techniques.
- To design and implement different modulation and demodulation techniques.
- To write and execute programs in MATLAB to implement various modulation techniques.

Course Outcomes:

CO1: Understand different analog modulation techniques and Radio receiver characteristics.
CO2: Analyze different analog modulation techniques.
CO3: Design and implement different modulation and demodulation schemes.
CO4: Observe the performance of system by plotting graphs & Measure radio receiver characteristics.
CO5: Simulate various modulated signals in analog communications.

List of Experiments:

1. (a) Develop an Amplitude modulation circuit to get modulated signal for various modulation indices. Verify the Spectrum of the modulated signal experimentally and find its Bandwidth.
   (b) Design a suitable demodulated circuit to recover original information signal.
2. Generate a DSB - SC signal using suitable circuit diagram. Extract information bearing signal from DSB-SC signal. Calculate the power of the DSB-SC signal.
3. (a) Develop a Frequency modulation circuit to get modulated signal for various modulation depths. Verify the Spectrum of the modulated signal experimentally and find its Bandwidth.
   (b) Design a suitable demodulated circuit to recover original information signal.
4. (a) Design a Mixer circuit to verify the principle of operation of Mixer experimentally.
   (b) Design a Pre-emphasis & de-emphasis circuit and verify its importance experimentally and plot necessary graph.
5. Construct Pulse Amplitude Modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
6. Construct Pulse Width Modulation circuit and plot modulated signal. Extract the modulated signal by constructing suitable demodulated circuit.
7. Radio receiver measurements – Sensitivity Selectivity and Fidelity.

Conduct the following experiments using MATLAB software

1. Simulate AM and FM signals and find power spectrum of each signal. Plot the graphs.
2. Simulate PAM and PWM signals and find power spectrum of each signal. Plot the graphs.
3. Generate a complex Gaussian noise (with zero mean unit variance). And pass through an LTI system. Find the power spectral density of the noise signal available at the output of LTI system.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech II Sem (E.C.E)	L	T	P	C
	0	0	3	1.5

20A40406 MICROCONTROLLERS AND INTERFACING LAB

COURSE OBJECTIVES:

- Understand the instruction set of ARM Cortex M3, a 32 bit microcontroller and the software tool required for programming in Assembly and C language.
- Program ARM Cortex M3 using the various instructions in assembly level language for different applications.
- Interface external devices and I/O with ARM Cortex M3.
- Develop C language programs and library functions for embedded system applications.

COURSE OUTCOMES:

CO1: Write programs in ARM for a specific Application.

CO2: Interface memory and Write programs related to memory operations.

CO3: Interface A/D and D/A convertors with ARM system.

CO4: Analyze the performance of interrupt and Communication protocols.

CO5 Write programs for interfacing keyboard, display, motor and sensor.

Note:

- The experiments to be conducted using STM32 Blue Pill development board, using Keil IDE or Arduino IDE
- Minimum 12 experiments are to be conducted

List of Experiments:

1. Implementation of calculator with calculation of min, max and average.
2. Solve an equation $y = 3x^3 - 7x^2 + 10x - 11$
3. LED and Switch/ button Interfacing
4. Working with Digital I/O
   a. LCD Interfacing
   b. Keyboard Interfacing
   c. Flashing of LEDs

5. Temperature sensor Interfacing
6. Stepper Motor Interfacing
7. Working with Analog input and PWM
    a. ADC Interfacing
    b. DAC Interfacing
8. Working with UART – Serial Communication
9. Working with SPI and accessing devices/sensor based on I2C
10. Working with I2C and accessing devices/sensor based on I2C
11. Working with CAN and accessing devices/sensor based on CAN
12. Working with DHT module
13. Interrupt pooling
14. EPROM Interfacing
15. Real Time Clock Interfacing
16. Implementing Zigbee protocol with ARM.
17. Accessing a network with Ethernet module.
18. Study of one type of Real Time Operating Systems (RTOS) with ARM Processor

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech II Sem (E.C.E)	**L T P C**
	0 0 3 1.5

20A40407 IC APPLICATIONS LAB

Course Objectives:

To learn design, testing and characterizing of circuit behaviour with digital and analog ICs.

Course Outcomes (CO):

CO1: Understand the pin configuration of each linear/ digital IC and its functional diagram.
CO2: Conduct the experiment and obtain the expected results.
CO3: Analyze the given circuit/designed circuit and verify the practical observations with the analyzed results.
CO4: Design the circuits for the given specifications using linear and digital ICs.
CO5: Acquaintance with lab equipment about the operation and its use.

List of Experiments:

1. OP AMP Applications – Adder, Subtractor, Comparators.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order)
4. IC 741 Waveform Generators – Sine, Square wave and Triangular waves.
5. IC 555 Timer – Monostable and AstableMultivibrator Circuits.
6. Schmitt Trigger Circuits – using IC 741
7. IC 565 – PLL Applications.
8. Voltage Regulator using IC 723, Three Terminal Voltage Regulators – 7805, 7809, 7912.
9. 3-8 decoder using 74138
10. 4-bit comparator using 7485.
11. 8*1 Multiplexer using 74151 and 2*4 Demultiplexer using 74155.
12. D, JK Flip Flops using 7474, 7483.
13. Decade counter using 7490.

14. UP/DOWN counter using 74163
15. Universal shift registers using 74194/195.
16. RAM (16*4) using 74189 (Read and Write operations).

Note: At least 12 experiments shall be performed.

References:

1. D. Roy Choudhury, Shail B. Jain, "Linear Integrated Circuit", 4th edition (2012), New Age International Pvt.Ltd., New Delhi, India
2. Ramakant A. Gayakwad, "OP-AMP and Linear Integrated Circuits", 4th edition (2012), Prentice Hall / Pearson Education, New Delhi.
3. Floyd, Jain, "Digital Fundamentals", 8th edition (2009), Pearson Education, New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), ANANTHAPURAMU
ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech II Sem (E.C.E)	**L T P C**
	1 0 2 2

SKILL ORIENTED COURSE – II (OBJECT ORIENTED PROGRAMMING THROUGH JAVA) 20A40408

Course Objectives:

- To introduce the concepts of Java.
- To Practice object-oriented programs and build java applications.
- To implement java programs for establishing interfaces.
- To implement sample programs for developing reusable software components.

Course Outcomes:

- Recognize the Java programming environment.
- Develop efficient programs using multithreading.
- Design reliable programs using Java exception handling features.
- Extend the programming functionality supported by Java.
- Select appropriate programming constructs to solve a problem.

MODULE - I :

The Java Language, The key attributes of object oriented programming language, JDK, simple program, Java keywords, identifiers in java, the java class libraries.

TASK-I:

1. Use Eclipse or Netbean platform and acquaint with the various menus. Create a test project, add a test class and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods and classes. Try debug step by step with java program to find prime numbers between 1 to n.

2. Write a Java program that prints all real and imaginary solutions to the quadratic equationax2 + bx + c = 0. Read in a, b, c and use the quadratic formula.
3. Write a java program to accept a string from user and display number of vowels, consonants, digits and special characters present in each of the words of the given text

MODULE – II:

Introducing classes, objects, and methods, Arrays, multidimensional arrays, strings, a closer look at methods and classes, Inheritance.

TASK-II:

1. Write Java program(s) on use of inheritance, preventing inheritance using final, abstract classes.
2. Write a java program to convert an Array List to an Array.
3. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display there result.
4. Write java program to create a super class called Figure that receives the dimensions of two dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub class overridden area() so that it returns the area of a rectangle and a triangle respectively.

5. Write a java program to create a super class called Figure that receives the dimensions of two dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub classes override area() so that it returns the area of a rectangle and triangle respectively.

MODULE – III :

Interface fundamentals, creating and implementing an interface, using interface references, implementing multiple interfaces, constants in interfaces, interfaces can be extended, nested interfaces, final thoughts on interface, packages, Exception handling.

TASK-III:

1. Use inheritance to create an exception super class called ExceptionA and exception sub class ExceptionB and ExceptionC, where ExceptionB inherits from ExceptionA and ExceptionC inherits from ExceptionB. Write a java program to demonstrate that the catch block for type ExceptionA catches exception of type ExceptionB and ExceptionC.
2. Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.
3. Write Java program(s) which uses the exception handling features of the language, creates exceptions and handles them properly, uses the predefined exceptions, and create own exceptions.
4. Write a java program that creates menu which appears similar to the menu of notepad application of the Microsoft windows or any editor of your choice.

MODULE – IV :

Multi threaded programming, Applet basics, a complete applet skeleton, applet initialization and termination, requesting repainting, using the status window, passing parameters to applets.

TASK-IV:

1. Write Java program(s) on ways of implementing interface.
2. Write a program for the following
   a) Develop an applet that displays a simple message
   b) Develop an applet for waving a Flag using Applets and Threads.
3. Write Java program(s) on creating multiple threads, assigning priority to threads, synchronizing threads, suspend and resume threads
4. Write a Java program that creates three threads. First thread displays ―Good Morning‖ every one second, the second thread displays ―Hello‖ every two seconds and the third thread displays ―Welcome‖ every three seconds.
5. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

MODULE – V : Swings – the origin and design philosophy of swing, components and containers, layout managers, event handling, using a push button, jtext field, jlabel and image icon, the swing buttons, jtext field, jscrollpane, jlist, jcombobox, trees, jtable, an overview of jmenubar, jmenu and jmenuitem, creating a main menu, show message dialog, show confirm dialog, show input dialog, show option dialog, jdialog, create a modeless dialog.

TASK-V:

1. Create an interface for stack with push and pop operations. Implement the stack in two ways: fixed size stack and Dynamic stack (stack size is increased when stack is full).
2. Write a java program that allows conduction of object type examination containing multiple choice questions, and true/false questions. At the end of the examination when the user clicks a button the total marks have to be displayed in the form of the message.
3. Write a java program that creates dialog box which is similar to the save dialog box of the Microsoft windows or any word processor of your choice.
4. Create multiple threads to access the contents of a stack. Synchronize thread to prevent simultaneous access to push and pop operations.

Textbooks:

1. Java Fundamentals A Comprehensive Introduction, Herbert Schildt and Dale Skrien, McGraw Hill.
2. Java – How to Program‖, Paul Deitel, Harvey Deitel, PHI

Reference Books:

1. Introduction to Java programming, Sixth edition, Y.Daniel Liang, Pearson Education.
2. Programming in java Sachine
3. Big Java, 2ndedition, Cay Horstmann, Wiley Student Edition, Wiley India Private Limited.
4. Introduction to Programming with Java, J.Dean&R.Dean, McGraw Hill education.
5. Java Programming, D S Malik, cengage learning, India Edition.

(Mandatory Course-I -III/IV SEMESTER)

Course Code Design Thinking for Innovation L T P C

3 0 0 0

Pre-requisite NIL Semester

Course Objectives:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes (CO):

- Define the concepts related to design thinking.
- Explain the fundamentals of Design Thinking and innovation
- Apply the design thinking techniques for solving problems in various sectors.
- Analyse to work in a multidisciplinary environment
- Evaluate the value of creativity
- Formulate specific problem statements of real time issues

UNIT - I Introduction to Design Thinking 10 Hrs

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT - II Design Thinking Process 10 Hrs

Design thinking process (empathize, analyze, idea & prototype), implementing the process in

driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development
Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT - III Innovation 8 Hrs
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.
Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT - IV Product Design 8 Hrs

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.
Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT - V Design Thinking in Business Processes 10 Hrs
Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.
Activity: How to market our own product, About maintenance, Relibility and plan for startup.

Textbooks:
1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons.
Reference Books:
1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design- William Lidwell, Kritinaholden, Jill Butter.
4. The era of open innovation – Chesbrough.H
Online Learning Resources:
https://nptel.ac.in/courses/110/106/110106124/
https://nptel.ac.in/courses/109/104/109104109/
https://swayam.gov.in/nd1_noc19_mg60/preview

Course Code	DIGITAL COMMUNICATIONS	L	T	P	C
20A50401		3	0	0	3
Pre-requisite	**Semester**	**V**			

Analog Communications

Course Objectives:

- To know about sampling, quantization and various source coding techniques.
- To understand the concepts of baseband pulse transmission.
- To analyze representation, conversion and detection of signal space diagram.
- To gain knowledge about various digital modulation techniques and their error probabilities.
- To get familiar with channel coding techniques and multiple access techniques.

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the concepts of sampling, quantization and various coding techniques.
- Summarize the concepts of baseband pulse transmission.
- Analyze representation, conversion and detection of signal space diagram.
- Compare various digital modulation techniques and their error probabilities.
- Understand channel coding techniques and multiple access techniques.

UNIT - I

Source Coding Systems: Introduction to digital communications, sampling process, quantization, Pulse-Code Modulation (PCM), Quantization Process, Noise considerations in PCM systems, Line codes, Time-Division Multiplexing (TDM), Delta modulation, Differential pulse-code modulation, Adaptive Differential pulse-code modulation, Comparison of the above systems.

UNIT - II

Baseband Pulse Transmission: Introduction, Matched filter, Properties of Matched filter, Matched filter for Rectangular pulse, Error rate due to noise, Inter-symbol Interference (ISI), Nyquist criterion for distortion less baseband binary transmission, ideal Nyquist channel, Raised cosine filter & its spectrum, Correlative coding – Duo binary & Modified duo binary signaling schemes, Baseband M-array PAM transmission, Eye diagram.

UNIT - III

Signal Space Analysis: Introduction, Geometric representation of signals, Gram-Schmidt orthogonalization procedure, Conversion of the Continuous AWGN channel into a vector channel, Coherent detection of signals in noise, Correlation receiver, Equivalence of correlation and Matched filter receivers, Probability of error, Signal constellation diagram.

UNIT - IV

Digital Modulation Techniques: Introduction, Pass Band Transmission Model, Method of generation and detection of coherent Binary ASK, FSK & PSK, Differential phase shift keying, Quadrature modulation techniques (QAM, QPSK and MSK), M-array PSK, M-array QAM, Comparison of bandwidth requirements and probability of bit error for the above schemes

UNIT - V

Channel Coding: Error Detection & Correction - Repetition & Parity Check Codes, Code Vectors and Hamming Distance, Forward Error Correction (FEC) Systems, Automatic Retransmission Query (ARQ) Systems, Linear Block Codes – Matrix Representation of Block Codes, Syndrome Decoding, Convolutional Codes – Convolution Encoding, Decoding Methods.

Introduction to OFDM

Textbooks:

1. Simon Haykin, "Communication Systems", 4th Edition, John Wiley & Sons INC, 2000
2. Bernard Sklar, "Digital Communications", 2nd edition, Prentice-Hall PTR, 2001.

Reference Books:

1. J. G. Proakis, M Salehi and Gerhard Bauch, "Digital Communications", 5thEdition, McGraw-Hill Education private limited 2008.
2. A. Bruce Carlson and Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", 4th Edition, McGraw-Hill International Edition, 2002.
3. T. S. Rappaport, "Wireless Communications, Principles and Practice", 2nd Edition, Prentice Hall, 2002
4. B.P.Lathi, Zhi Ding, "Modern Digital and Analog Communication Systems", 4th Edition, Oxford University Press.

Online Learning Resources:

Course Code	ANTENNAS AND WAVE PROPAGATION	L	T	P	C
20A50402		3	0	0	3
Pre-requisite	**Semester**	**V**			

Electromagnetic Waves and Transmission Lines

Course Objectives:

- To learn the antennas basic terminology, radiation mechanism of antennas and dipole antennas.
- To gain knowledge on few types of antennas, their operation and applications.
- Analyze the working, radiation patterns and applications of microstrip, reflector and lens antennas.
- To understand different techniques involved in the design of antenna arrays and antenna parameter measurements.
- To study the various types of radio wave propagation methods.

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the antennas basic terminology and radiation mechanism of antennas.
- Gain knowledge on few types of antennas, their operation and applications.
- Design and analyze the working and applications of microstrip, reflector and lens antennas.
- Analyze different techniques involved in the design of antenna arrays and antenna parameter measurements.
- Gain a comprehensive knowledge about the types of radio wave propagation methods.

UNIT - I

Antenna Basics & Dipole antennas: Definition of antenna, Radiation Mechanism – single wire, two wire, dipoles, Antenna Parameters - Radiation Patterns, Main Lobe and Side Lobes, Beam widths, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Aperture Efficiency, Effective Height and length, Antenna Theorems. Radiation – Basic Maxwell's equations, Retarded potential-Helmholtz Theorem, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Field Components, Radiated power, Radiation Resistance, Beam width, Natural current distributions, far fields and patterns of Thin Linear Centre-fed Antennas of different lengths, Illustrative problems.

UNIT - II

HF, VHF and UHF Antennas: Loop Antennas - Introduction, Small Loop, Comparison of far fields of small loop and short dipole, Radiation Resistances and Directives of small and large loops (Qualitative Treatment), Arrays with Parasitic Elements - Yagi - Uda Arrays, Folded Dipoles & their characteristics. Helical Antennas-Helical Geometry, Helix modes, Practical Design considerations for Monofilar Helical Antenna in Axial and Normal Modes. Horn Antennas- Types, Fermat's Principle, Optimum Horns, Design considerations of Pyramidal Horns, Illustrative Problems.

UNIT - III

Microwave Antennas : Micro strip Antennas- Introduction, features, advantages and limitations, Rectangular patch antennas- Geometry and parameters, characteristics of Micro strip antennas, Impact of different parameters on characteristics, reflector antennas - Introduction, Flat sheet and corner reflectors, parabola reflectors- geometry, pattern characteristics, Feed Methods, Reflector Types - Related Features, Lens Antennas - Geometry of Non-metallic Dielectric Lenses, Zoning , Tolerances, Applications, Illustrative Problems.

UNIT - IV

Antenna Arrays: Point sources - Definition, Patterns, arrays of 2 Isotropic sources-Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison, BSAa with Non-uniform Amplitude Distributions - General considerations and Binomial Arrays, Illustrative problems.

Antenna Measurements: Introduction, Concepts- Reciprocity, Near and Far Fields, Coordination system, sources of errors, Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by comparison, Absolute and 3-Antenna Methods).

UNIT - V

Wave Propagation: Introduction, Definitions, Characterizations and general classifications, different modes of wave propagation, Ray/Mode concepts, Ground wave propagation (Qualitative treatment) - Introduction, Plane earth reflections, Space and surface waves, wave tilt, curved earth reflections, Space wave propagation - Introduction, field strength variation with distance and height, effect of earth's curvature, absorption, Super refraction, M-curves and duct propagation, scattering phenomena, tropospheric propagation, fading and path loss calculations, Sky wave propagation - Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-HOP propagation, Energy loss in Ionosphere, Summary of Wave Characteristics in different frequency ranges, Illustrative problems.

Textbooks:

1. John D. Krauss, Ronald J. Marhefka and Ahmad S. Khan, "Antennas and wave propagation", TMH, New Delhi, 4th Ed., 2010.
2. C.A. Balanis, "Antenna Theory- Analysis and Design", John Wiley & Sons, 2nd Edn., 2001.

Reference Books:

1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, PHI, 2000.
2. G.S.N Raju, "Antenna and Wave Propagation", Pearson Education India, 3rd Edition 2009.
3. K.D. Prasad and SatyaPrakashan, "Antennas and Wave Propagation", New Delhi, Tech. India Publications, 2001.

Online Learning Resources:

Course Code	DIGITAL SIGNAL PROCESSING	L	T	P	C
20A50403		3	0	0	3
Pre-requisite	Semester	V			

Networks, Signals and Systems

Course Objectives:

- To describe discrete time signals and systems.
- To teach importance of FFT algorithm for computation of Discrete Fourier Transform.
- To expose various implementations of digital filter structures.
- To present FIR and IIR Filter design procedures.
- To understand basic features and architecture of DSP processors

Course Outcomes (CO): At the end of this course, the students will be able to

- Formulate difference equations for the given discrete time systems
- Apply FFT algorithms for determining the DFT of a given signal
- Compare FIR and IIR filter structures
- Design digital filter (FIR & IIR) from the given specifications
- Understand basic features and architecture of DSP processors

UNIT - I

Introduction to discrete time signals and systems:

Introduction to digital signal processing,

Review of discrete-time signals and systems: Analysis of discrete-time linear time invariant systems, frequency domain representation of discrete time signals and systems

Z–Transform: Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z-Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals, Solution of difference equations with initial conditions, Illustrative Problems.

UNIT - II

Discrete Fourier Transform: Introduction, Discrete Fourier Series, properties of DFS, Discrete Fourier Transform, Inverse DFT, properties of DFT, Linear and Circular convolution, convolution using DFT.

Fast Fourier Transform: Introduction, Fast Fourier Transform, Radix-2 Decimation in time and Decimation in frequency FFT, Inverse FFT (Radix-2).

UNIT - III

IIR Filters: Introduction to digital filters, Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters by Impulse invariant and bilinear transformation methods, Frequency transformations,

Realization of IIR Filters - Direct form-I, Direct form-II, Cascade form and Parallel form realizations.

UNIT - IV

FIR Filters: Introduction, Characteristics of FIR filters with linear phase, Frequency response of linear phase FIR filters, Design of FIR filters using Fourier series and windowing methods (Rectangular, Triangular, Raised Cosine, Hanging, Hamming, Blackman), Comparison of IIR & FIR filters

Realization of FIR Filters – Direct form-I, Direct form-II, Cascade form and Parallel form realizations.

UNIT - V

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues.

Introduction to Architecture of TMS320C54XX DSPs

Textbooks:

1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education, 2007.
2. A.V. Oppenheim and R.W. Schaffer, Discrete Time Signal Processing, PHI.

Reference Books:

1. S.K. Mitra, Digital Signal Processing – A practical approach, 2nd Edition, Pearson Education, New Delhi, 2004.
2. MH Hayes, Digital Signal Processing, Schaum's Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling, Sandra L. Harris, Fundamentals of Digital Signal Processing using MATLAB, Thomson, 2007.
4. Avtar Singh and S. Srinivasan, "Digital Signal Processing", Thomson Publications, 2004.
5. B.VenkataRamani and M.Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", TMH, 2004.

PROFESSIONAL ELECTIVE – I

Course Code	**CONTROL SYSTEMS ENGINEERING**	**L**	**T**	**P**	**C**
20A50404a		3	0	0	3
Pre-requisite	**Semester**	**V**			

Basic Electrical Engineering
Networks, Signals and Systems

Course Objectives:

- To introduce concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems and concept of feedback.
- To describe characteristics of the given system in terms of the transfer function.
- To provide knowledge in analyzing the system response in time-domain and frequency domain
- To impart skills for designing different control systems for different applications as per given specifications.
- To introduce concepts of state variable analysis and design.

Course Outcomes (CO): At the end of this course, the students will be able to

- Identify open and closed loop control system
- Formulate mathematical model for physical systems
- Use standard test signals to identify performance characteristics of first and second-order systems
- Analyze stability of the closed and open loop systems
- Design closed-loop control system to satisfy dynamic performance specifications using frequency response, root-locus, and state-space techniques

UNIT - I

Introduction: Overview of System, Control System, Open Loop Control System, Closed loop Control System, Different Examples, Mathematical models of Physical Systems, Differential equations of physical systems, Transfer functions, Block diagram Algebra, Signal flow graphs with illustrative examples Effects of Feedback, Feedback Characteristics and its advantages, Line arising effect of feedback.

UNIT - II

Time Response Analysis: Controller Components, DC Servomotor (Armature Controlled and Field Controlled) with necessary derivation for transfer function, AC Servomotor and its transfer function, AC Tachometer, Potentiometer, Synchros, AC Position Control Systems. Standard test Signals, Time response of first and second order systems, steady state errors and error constants, Effect of adding a zero to a system, Design specifications of second order systems, Performance indices.

UNIT - III

Concepts of Stability: Concepts of Stability and Algebraic Criteria - The concept of Stability, Necessary Conditions for Stability, Routh-Hurwitz Stability Criterion, Relative stability analysis,

The Root Locus Technique: Introduction, The Root Locus concepts, Construction of Root Loci.

UNIT - IV

Frequency Response Analysis: Introduction, Correlation between time and frequency response, Polar Plots, Bode Plots, Nyquist Stability Criterion.

UNIT - V

State Variable Analysis and Design: Introduction, Concepts of State, State Variables and State models, State models for linear continuous-time systems, State variables and linear discrete-time systems, Solution of state equations and Concepts of Controllability and Observability.

Textbooks:

1. I. J. Nagarath and M. Gopal, "Control System Engineering," New Age International Publishers, Fifth Edition.

Reference Books:

1. Katsuhiko Ogata, Modern Control Engineering, Pearson, 5th Edition, 2010.
2. S. Salivahanan, R. Rengaraj, and G. R. Venkata Krishnan, Control Systems Engineering, Pearson, 5th edition, 2015.
3. Benjamin C. Kuo, FraridGolnaraghi, Automatic Control Systems, Wiley Student Edition, Eighth Edition 2015.

Online Learning Resources:

PROFESSIONAL ELECTIVE – I

Course Code	SENSORS AND ACTUATORS	L	T	P	C
20A50404b		3	0	0	3
Pre-requisite	**Semester**	**V**			
Applied Physics					

Course Objectives:

- To provide basic knowledge about sensors used in Process industry, manufacturing industry and Automated plants.
- To provide basic knowledge about various Actuation and Mechanical Actuation Systems, manufacturing industry and Automated plants

Course Outcomes (CO): At the end of this course, the students will be able to

- Students able to understand the various sensors and Actuators used in process Industry
- Knowledge about different types of mechanical and electromechanical sensor
- Analyze various designs of Thermal sensors – types, sensitivity and specifications
- Design the various types of radiation sensors design and Electrical Actuation Systems

UNIT - I

Definition, principle of sensing &transduction, classification, parameters-Characteristics: static and Dynamic, Characterization, performance characteristics of Instrumentation system.

Mechanical and Electromechanical sensor: Resistive (potentiometric type): Forms, material, resolution, accuracy, sensitivity. Strain gauge: Theory, type, materials, design consideration, sensitivity, gauge factor, variation with temperature, adhesive, rosettes. Inductive sensor: common types- Reluctance change type, Mutual inductance change type, transformer action type, Magneto strictive type, brief discussion with respect to material, construction and input output variable, Ferromagnetic plunger type, short analysis. LVDT: Construction, material, output input relationship, I/O curve, discussion. Proximity sensor.

UNIT - II

Capacitive sensors: variable distance-parallel plate type, variable area- parallel plate, serrated plate/teeth type and cylindrical type, variable dielectric constant type, calculation of sensitivity. Stretched diaphragm type: microphone, response characteristics.

Piezoelectric element: piezoelectric effect, charge and voltage co-efficient, crystal model, materials, natural & synthetic type, their comparison, force & stress sensing, ultrasonic sensors.

UNIT - III

Thermal sensors: Material expansion type: solid, liquid, gas & vapor, Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermistor material, shape, ranges and accuracy specification. Thermoemf sensor: types, thermoelectric power, general consideration, Junction semiconductor type IC and PTAT type.

Radiation sensors: types, characteristics and comparison. Pyroelectric type.

UNIT - IV

Magnetic sensors: Sensor based on Villari effect for assessment of force, torque, proximity, Wiedemann effect for yoke coil sensors, Thomson effect, Hall effect, and Hall drive, performance characteristics. Radiation sensors: LDR, Photovoltaic cells, photodiodes, photo emissive cell types, materials, construction, response. Geiger counters, Scintillation detectors.

UNIT - V

Actuators Pneumatic and Hydraulic Actuation Systems: Actuation systems – Pneumatic and hydraulic systems - Directional Control valves – Pressure control valves – Cylinders - Servo and proportional control valves – Process control valves – Rotary actuators. Mechanical Actuation Systems- Types of motion – Kinematic chains – Cams – Gears – Ratchet and pawl – Belt and chain drives – Bearings – Mechanical aspects of motor selection. Electrical Actuation Systems- Electrical systems -Mechanical switches – Solid-state switches Solenoids – D.C. Motors – A.C. motors – Stepper motors.

Textbooks:

1. D. Patranabis – "Sensors and Transducers" –PHI Learning Private Limited.
2. Andrzeji M. Pawlak, "Sensors and Actuators design and applications", T&F group.

Reference Books:

1. Ramon Pallas- Areny, "Sensors and Signal Conditioning", John G. Webster, 2nd Edition.
2. Jon Wilson, "Sensor Technology Handbook", Newnes, 2004.
3. Herman K.P. Neubrat, "Instrument Transducers – An Introduction to their Performance and design", Oxford University Press.
4. H.S. Kalsi, "Electronic Instrumentation", McGraw Hill Education, 3rd Edition, 2017.

Online Learning Resources:

PROFESSIONAL ELECTIVE – I

Course Code	COMPUTER ARCHITECTURE &	L	T	P	C
20A50404c	ORGANIZATION	3	0	0	3
Pre-requisite	Semester	V			

Digital Design
Microcontrollers and Interfacing

Course Objectives:

- To understand the basics of instructions sets and their impact on processor design.
- To demonstrate an understanding of the design of the functional units of a digital computer system.
- To evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
- To design a pipeline for consistent execution of instructions with minimum hazards.
- To recognize and manipulate representations of numbers stored in digital computers.

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the basics of instructions sets and their impact on processor design.
- Demonstrate an understanding of the design of the functional units of a digital computer system.
- Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
- Design a pipeline for consistent execution of instructions with minimum hazards.
- Recognize and manipulate representations of numbers stored in digital computers.

UNIT - I

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro-operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT - II

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT - III

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT - IV

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

UNIT - V

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics. Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor. Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

Textbooks:

1. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.
2. Computer Organization – Car Hamacher, ZvonksVranesic, SafeaZaky, V th Edition, McGraw Hill.

Reference Books:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

Online Learning Resources:

OPEN ELECTIVE – I

Course Code	BASICS OF ELECTRONICS AND	L	T	P	C
20A50405	COMMUNICATION ENGINEERING	3	0	0	3
Pre-requisite	Semester	V			

Applied Physics

Course Objectives:

- To study the basic principle, construction and operation of semiconductor devices.
- To learn the real time applications of semiconductor devices.
- To introduce binary number systems, logic gates and digital logic circuits.
- To get an idea about the basic principles of communication systems and their applications.
- To learn the measurement of physical parameters using Sensors and Transducers.

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the basic principle, construction and operation of semiconductor devices.
- Learn the real time applications of semiconductor devices.
- Comprehend the binary number systems, logic gates and digital logic circuits.
- Understand the basic principles of communication systems and their applications.
- Measure the physical parameters using Sensors and Transducers.

UNIT - I

Introduction to Electronics Engineering: Overview, scope and objective of studying Electronics Engineering. Introduction to semiconductor devices: Bond structure of semiconductors, intrinsic and extrinsic semiconductors; Basic principle and operation of semiconductor devices – diode, bipolar junction transistor, field effect transistors; Introduction to VLSI.

UNIT - II

Applications of semiconductor devices: Basic concepts of rectifiers, voltage regulators, amplifiers and oscillators; Basic concepts of operational amplifier and their applications.

UNIT - III

Introduction to digital systems: Binary number system, Boolean algebra, Logic gates, adders, one-bit memory, flip-flops (SR, JK), shift registers, Asynchronous counter.

UNIT - IV

Introduction to Communication Systems: Elements of a communication system – transmitter and receiver; Signal types in communication; FDM and TDM; Processing of signals for transmission – basic concepts of amplitude and frequency modulation; Examples of telecommunication systems – telephone, radio, television, mobile communication and satellite communication.

UNIT - V

Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

Textbooks:

1. Millman J, Halkias C.C and Jit S, “Electronic Devices and Circuits”, Tata McGraw-Hill, 2nd 2007 Edition.
2. Mano M.M., “Digital Design”, Prentice-Hall, 3rd Edition. 2002
3. A.K. Sawhney, “A course in Electrical and Electronics Measurements and Instrumentation”,

DhanpatRai& Co. 3rd edition Delhi, 2010.

4. Kennedy G. and Davis B., “Electronic Communication Systems”, Tata McGraw-Hill, 4th 2008 Edition.

Reference Books:

1. Tomasi W., “Advanced Electronic Communication Systems”, Pearson/Prentice-Hall, 6th 2004 Edition.
2. Boylstead R.L. and Nashelsky L., “Electronic Devices and Circuit Theory”, Pearson, 10th 2009 Edition.

Online Learning Resources:

Course Code	DIGITAL COMMUNICATIONS LAB	L	T	P	C
20A50406		0	0	3	1.5
Pre-requisite	**Semester**	**V**			

Analog Communications Lab
IC Applications Lab

Course Objectives:

- To gain an understanding of analog to digital conversion techniques.
- To understand digital modulation, Source coding and Channel coding techniques.
- To analyze different digital communications techniques using MATLAB tools.

Course Outcomes (CO): At the end of this course, the students will be able to

- Explain and demonstrate the conversion of analog to digital signals.
- Grasp the significance of digital modulation, Source coding and Channel coding techniques.
- Analyze different digital communications techniques using MATLAB tools.

List of Experiments:

Minimum of Twelve experiments to be conducted (Part A -Eight & Part B - Four)

PART-A: HARDWARE EXPERIMENTS

1. Sampling Theorem – verification.
2. Time division multiplexing.
3. Pulse code modulation.
4. Differential pulse code modulation.
5. Delta modulation.
6. Amplitude shift keying modulation and demodulation.
7. Frequency shift keying modulation and demodulation.
8. Phase shift keying modulation and demodulation.
9. Differential phase shift keying.
10. QPSK modulation and demodulation.
11. Linear Block Code – Encoder and Decoder.
12. Binary Cyclic Code – Encoder and Decoder.
13. Convolution Code – Encoder and Decoder.

PART-B: SOFTWARE EXPERIMENTS

1. Sampling Theorem – verification.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Phase shift keying.
7. Differential phase shift keying.

8. QPSK modulation and demodulation.

References:

Online Learning Resources/Virtual Labs:

Course Code	DIGITAL SIGNAL PROCESSING LAB	L	T	P	C
20A50407		0	0	3	1.5
Pre-requisite	Semester	V			

Simulation and Networks Lab

Course Objectives:
- To implement various DSP Algorithms using software packages.
- To implement DSP algorithms with Digital Signal Processor.
- To analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters.
- To analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques.
- To analyze digital filters using Software Tools.

Course Outcomes (CO): At the end of this course, the students will be able to
- Implement various DSP Algorithms using software packages.
- Implement DSP algorithms with Digital Signal Processor.
- Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters.
- Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques.
- Analyze digital filters using Software Tools.

List of Experiments:
The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

List of Experiments:
1. Generate the following standard discrete time signals.
    i) Unit Impulse ii) Unit step iii) Ramp iv) Exponential v) Sawtooth
2. Generate sum of two sinusoidal signals and find the frequency response (magnitude and phase).
3. Implement and verify linear and circular convolution between two given signals.
4. Implement and verify autocorrelation for the given sequence and cross correlation between two given signals.
5. Compute and implement the N-point DFT of a given sequence and compute the power density spectrum of the sequence.
6. Implement and verify N-point DIT-FFT of a given sequence and find the frequency response (magnitude and phase).

7. Implement and verify N-point IFFT of a given sequence.
8. Design IIR Butterworth filter and compare their performances with different orders (Low Pass Filter /High Pass Filter)
9. Design IIR Chebyshev filter and compare their performances with different orders (Low Pass Filter /High Pass Filter).
10. Design FIR filter (Low Pass Filter /High Pass Filter) using windowing technique.
    i. Using rectangular window
    ii. Using hamming window
    iii. Using Kaiser window
11. Design and verify Filter (IIR and FIR) frequency response by using Filter design and Analysis Tool.
12. Compute the Decimation and Interpolation for the given signal.
13. Real time implementation of an audio signal using a digital signal processor.
14. Compute the correlation coefficient for the two given audio signals of same length using a digital signal processor.

Note: Any TWELVE of the experiments are to be conducted.

References:

1. Digital Signal Processing: Alon V. Oppenhelm, PHI
2. Digital Signal processing (II-Edition): S.K. Mitra, TMH

Online Learning Resources/Virtual Labs:

1. **http://vlabs.iitkgp.ac.in/dsp/#**

(**Mandatory Non-Credit Course**) (CIVIL, ME, CHEM))

INTELLECTUAL PROPERTY RIGHTS AND PATENTS

20A69901

Course code

L	T	P	C
2	0	0	0

CourseObjectives:

This course introduces the student to the basics of Intellectual Property Rights, Copy Right Laws,

Cyber Laws, Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations.

CourseOutcomes: At the end of the course the students will be able to

UnderstandIPRlaw&Cyberlaw

Discussregistration process,maintenance andlitigations associatedwith trademarks

Illustrate thecopyright law

Enumerate thetrade excretal.

UNIT I

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory – Overuse or Misuse of Intellectual Property Rights – Compliance and Liability Issues.

UNIT II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration–Limitations–Infringement of Copyright –International Copyright Law-Semiconductor Chip Protection Act.

UNIT III

IntroductiontoPatentLaw–RightsandLimitations–RightsunderPatentLaw–Patent Requirements

–Ownership and Transfer –Patent Application Process and Granting of Patent –Patent InfringementandLitigation–InternationalPatentLaw–DoublePatenting–PatentSearching–Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

UNIT IV

Introduction to Trademark – Trademark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trademark– Likelihood of confusion –Trademark claims – Trademarks Litigation – International Trade Mark Law.

UNIT V

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law. Introduction to Cyber Law – Information Technology Act – Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy – International aspects of Computer and Online Crime.

Textbooks:

Deborah E. Bouchoux: “Intellectual Property”. Cengage learning, New Delhi
ompalBansal&ParishitBansal "Fundamentals of IPR for Engineers" S Publications
(Press)Cyber Law. Texts& Cases, South-Western"s Special Topics Collections

References:

PrabhuddhaGanguli: „Intellectual Property Rights" Tata Mc-Graw–Hill, New Delhi

Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.

R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights",

Excel Books. New Delhi.

M.Ashok Kumar and Mohd. Iqbal Ali: "Intellectual property Right "Serials Pub

Course Code	Soft Skills	L T P C
20A55502		1 0 2 2

Pre-requisite Semester v/vi

Course Objectives:

➢ To encourage all round development of the students by focusing on soft skills
➢ To make the students aware of critical thinking and problem solving skills
➢ To develop leadership skills and organizational skills through group activities
➢ To function effectively with heterogeneous teams

Course Outcomes (CO):

By the end of the program students should be able to

- Memorize various elements of effective communicative skills
- Interpret people at the emotional level through emotional intelligence
- apply critical thinking skills in problem solving
- analyse the needs of an organization for team building
- Judge the situation and take necessary decisions as a leader
- Develop social and work-life skills as well as personal and emotional well-being

UNIT – I Soft Skills & Communication Skills Lecture Hrs

Introduction, meaning, significance of soft skills – definition, significance, types of communication skills - Intrapersonal & Inter-personal skills - Verbal and Non-verbal Communication

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity
(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)
Inter personal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups -
Group leader presenting views (non- controversial and secular) on contemporary issues or on a giventopic. Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.
Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation
UNIT – II

Critical Thinking Lecture Hrs

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking
Activities
:
Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues
–placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis
UNIT – III

Problem Solving & Decision Making Lecture Hrs
Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Methods of decision making – Effective decision making in teams – Methods & Styles
Activities:
Placing a problem which involves conflict of interests, choice and views – formulating the problem –
exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.
Case Study & Group Discussion
UNIT – IV Emotional Intelligence & Stress

Management

Lecture Hrs
Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:
Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude,
sympathy, and confidence, compassion in the form of written or oral presentations.
Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT – V Leadership Skills Lecture Hrs

Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – Risk-Taking - Team Building - Time Management

Activities
Forming group with a consensus among the participants- choosing a leader- encouraging the group
members to express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment – vision – accommodating nature- eliciting views on successes and failures of leadership
using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making , Group discussion etc.

NOTE-:
1. The facilitator can guide the participants before the activity citing examples from the lives of the
great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to
the prescribed skill.

2. Case studies may be given wherever feasible for example for Decision Making- The decision of King
Lear or for good Leadership – Mahendar Singh Dhoni etc.

Textbooks:
1. Personality Development and Soft Skills (English, Paperback, Mitra Barun K.) Publisher : Oxford University Press; Pap/Cdr edition (July 22, 2012)
2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha Kapoor Publisher : I K International Publishing House; 0 edition (February 28, 2018)
1. Reference Books: Soft skills: personality development for life success by prashant sharma, BPB publications 2018.
2. Soft Skills By Alex K. Published by S.Chand
3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeetha Sharma Published by Wiley.

4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books
5. SOFT SKILLS for a BIG IMPACT (English, Paperback, Renu Shorey) Publisher: Notion Press
6. Life Skills Paperback English Dr. Rajiv Kumar Jain, Dr. Usha Jain Publisher : Vayu Education Of India

Online Learning Resources:

1.https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2.https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ

3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc

Course Code	VLSI DESIGN		L	T	P	C
20A60401			3	0	0	3
Pre-requisite		**Semester**	**VI**			

Electronic Devices & Circuits
Digital Design

Course Objectives:

- To give exposure to different steps involved in fabrication of ICs using MOS transistor, CMOS/BICMOS transistors and passive components.
- To provide knowledge on electrical properties of MOS &BICMOS devices to analyze the behavior of inverters designed with various loads.
- To provide concepts to design building blocks of data path of any system using gates.
- To teach about basic programmable logic devices and testing of CMOS circuits.

Course Outcomes (CO): At the end of this course, the students will be able to

- Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors,
- Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit
- Design building blocks of data path using gates.
- Design simple memories using MOS transistors and can understand design of large memories
- Understand the concept of testing and adding extra hardware to improve testability of system

UNIT - I

Introduction: Brief Introduction to IC technology MOS, PMOS, NMOS, CMOS &BiCMOS Technologies Basic Electrical Properties of MOS and BiCMOS Circuits: IDS - VDS relationships, MOS transistor Threshold Voltage-VT, figure of merit-ω0, Transconductance - gm, gds; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT - II

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Lambda(λ)-based design rules for wires, contacts and Transistors, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT - III

Gate level Design: Logic gates and other complex gates, Switch logic, Alternate gate circuits. Basic Circuit Concepts: Sheet Resistance Rs and its concepts to MOS, Area Capacitances calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out

UNIT - IV

Subsystem Design: Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Counters.

VLSI Design styles: Full-custom, Standard Cells, Gate-arrays, FPGAs, CPLDs and Design Approach for Full-custom and Semi-custom devices, parameters influencing low power design.

UNIT - V

CMOS Testing: Need for testing, Design for testability - built in self-test (BIST) – testing combinational logic –testing sequential logic – practical design for test guidelines – scan design techniques.

Textbooks:

1. Essentials of VLSI Circuits and Systems, Kamran Eshraghian, EshraghianDougles, A. Pucknell, 2005, PHI.
2. Modern VLSI Design – Wayne Wolf, 3 Ed., 1997, Pearson Education.

Reference Books:

1. CMOS VLSI Design-A Circuits and Systems Perspective, Neil H.E Weste, David Harris, Ayan Banerjee, 3rd Edn, Pearson, 2009.
2. BehzadRazavi, “Design of Analog CMOS Integrated Circuits”, McGraw Hill, 2003.
3. Jan M. Rabaey, “Digital Integrated Circuits”, AnanthaChandrakasan and BorivojeNikolic, Prentice-Hall of India Pvt.Ltd, 2nd edition, 2009.

Online Learning Resources:

Course Code	MICROWAVE ENGINEERING AND OPTICAL	L	T	P	C
20A60402	COMMUNICATIONS	3	0	0	3
Pre-requisite	**Semester**	**VI**			

Antennas and Wave Propagation

Course Objectives:

- To understand the wave propagation in waveguides, principle of operation of optical sources, detectors, microwave active and passive devices.
- To apply the boundary conditions of the waveguides to solve for field expressions in waveguides.
- To derive the field expressions for different modes of the waveguides, and Scattering matrix for passive microwave devices.
- To differentiate Linear bean tubes and crossed field tubes in terms of operation and performance.
- To remember various types of fibers, modes, configurations and signal degradations.
- To analyze signal degradation in optical fibers and compare the performance of various optical sources and detectors.

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the wave propagation in waveguides, principle of operation of optical sources, detectors, microwave active and passive devices. Also remember various types of fibers, modes, configurations and signal degradations
- Apply the boundary conditions of the waveguides to solve for field expressions in waveguides.
- Derive the field expressions for different modes of the waveguides, and Scattering matrix for passive microwave devices. Analyze signal degradation in optical fibers and compare the performance of various optical sources and detectors
- Differentiate Linear bean tubes and crossed field tubes in terms of operation and performance.

UNIT - I

Waveguides (Microwave Transmission lines): Introduction, Rectangular waveguides, Field expressions for TE and TM modes, Wave propagation in the guide, Phase and group velocities, Power transmission and attenuation, Waveguide current and mode excitation, Circular waveguide – TE and TM modes, Wave propagation, waveguide resonators – problem solving.

UNIT - II

Passive Microwave Devices: Introduction to scattering parameters and their properties, Terminations, Variable short circuit, Attenuators, Phase shifters, Hybrid Tees (H-plane, E-plane, Magic Tees), Hybrid ring, Directional Couplers – Bethe hole and Two hole Couplers, Microwave propagation in Ferrites, Microwave devices employing Faraday rotation – Isolator, Circulator, Deriving Scattering matrix for Microwave passive devices.

UNIT - III

Microwave Amplifiers and Oscillators:

Microwave Tubes:(i) Linear Beam Tubes – Two cavity Klystron amplifier -velocity modulation, bunching process, output power, Reflex Klystron oscillator, power output and efficiency, Travelling Wave Tube (TWT) – Bunching process and amplification process (Qualitative treatment only).

(ii) Crossed Field Tubes – Magnetron oscillator, pi-mode operation, power output and efficiency, Hartree Condition, Mode jumping in Magnetron, Principle of operation of Cross Field Amplifier (CFA).

Microwave Semiconductor Devices: Gunn Oscillator – Principle of operation, Characteristics, Two valley model, IMPATT, TRAPATT diodes, Parametric Amplifier.

UNIT - IV

Optical Communications: Overview of Optical Fiber Communications, optical fibres – Structures, Optical fibre modes and configurations, Signal degradation in optical fibres – Signal attenuation, absorption, scattering losses, Bending Losses, Core and Cladding losses, Signal distortion in optical waveguides, Information capacity determination, Group delay, waveguide dispersion, Inter model dispersion.

UNIT - V

Optical Sources and Detectors: Introduction, LEDs – structure – Light source, Quantum efficiency, Modulation of an LED, LASER diodes, Source to Fibre power launching, LASER diode to fibre coupling, LED coupling to single mode fibres, Fiber, Splicing, Optical Fibre connectors, Photo diodes – Principle of Photo diodes, Avalanche Photodiodes, Photo detector noise, detector response time, Comparison of Photo diodes.

Textbooks:

1. Samuel Y. Liao, “Microwave Devices and Circuits”, PHI publications, Third Edition, 1997.
2. Gerd Keiser, “Optical Fiber Communications”, McGraw Hill, Third Edition, 2000.

Reference Books:

1. Matthew N. O. Sadiku, “Elements of Electromagnetics”, Oxford Publications, Third Edition, 2003.
2. R. E. Collin, “Foundations for Microwave Engineering”, Wiley Student Edition, Second Edition, 2009.
3. Om. P. Gandhi, “Microwave: Engineering and Applications”, Kai Fa Book Company, 1981.
4. Reich H. J., et al, “Microwave Principles”, MIT Press, 1972.
5. F E Terman, “Electronic and Radio Engineering”, McGraw Hill, 4th Edition, 1984.

Online Learning Resources:

Course Code	DATA COMMUNICATION AND NETWORKS	L	T	P	C
20A60403		3	0	0	3
Pre-requisite	Semester	VI			

Electronics & IT Workshop

Course Objectives:

- To understand the basics of data communication, networking, internet and their importance.
- To analyze the services and features of various protocol layers in data networks.
- To differentiate wired and wireless computer networks
- To analyze TCP/IP and their protocols.
- To recognize the different internet devices and their functions.

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the basics of data communication, networking, internet and their importance.
- Analyze the services and features of various protocol layers in data networks.
- Differentiate wired and wireless computer networks
- Analyze TCP/IP and their protocols.
- Recognize the different internet devices and their functions.

UNIT - I

Data Communications: Components, protocols and standards, Network and Protocol Architecture, Reference Model ISO-OSI, TCP/IP-Overview, topology, transmission mode, digital signals, digital to digital encoding, digital data transmission, DTE-DCE interface, interface standards, modems, cable modem, transmission media guided and unguided, transmission impairment, Performance, wavelength and Shannon capacity. Review of Error Detection and Correction codes. Switching: Circuit switching (space-division, time division and space-time division), packet switching (virtual circuit and Datagram approach), message switching.

UNIT - II

Data Link Layer: Design issues, Data Link Control and Protocols: Flow and Error Control, Stop-and-wait ARQ. Sliding window protocol, Go-Back-N ARQ, Selective Repeat ARQ, HDLC, Point-to –Point Access: PPP Point –to- Point Protocol, PPP Stack

UNIT - III

Medium Access Sub layer: Channel allocation problem, Controlled Access, Channelization, multiple access protocols, IEEE standard 802.3 & 802.11 for LANS and WLAN, high-speed LANs, Token ring, Token Bus, FDDI based LAN, Network Devices-repeaters, hubs, switches bridges.

UNIT - IV

Network Layer: Design issues, Routing algorithms, Congestion control algorithms, Host to Host Delivery: Internetworking, addressing and routing, IP addressing (class full & Classless), Subnet, Network Layer Protocols: ARP, IPV4, ICMP, IPV6 ad ICMPV6.

UNIT - V

Transport Layer: Process to Process Delivery: UDP; TCP, congestion control and Quality of service.

Application Layer: Client Server Model, Socket Interface, Domain Name System (DNS), Electronic Mail (SMTP), file transfer (FTP), HTTP and WWW.

Textbooks:

1. S. Tannenbum, D. Wetherall, ―Computer Networks‖, Prentice Hall, Pearson, 5thEd
2. Behrouz A. Forouzan, ―Data Communications and Networking‖, Tata McGraw-Hill, 4th Ed

Reference Books:

1. Fred Halsall, ―Computer Networks‖, Addison – Wesley Pub. Co. 1996.
2. Larry L, Peterson and Bruce S. Davie, ―Computer Networks: A system Approach‖, Elsevier, 4thEd
3. Tomasi, ―Introduction To Data Communications & Networking‖, Pearson 7th impression 2011
4. William Stallings, ―Data and Computer Communications‖, Prentice Hall, Imprint of Pearson, 9thEd.

Online Learning Resources:

PROFESSIONAL ELECTIVE – II (MOOCS/ Conventional)

Course Code	ELECTRONIC MEASUREMENTS AND	L	T	P	C
20A60404a	**INSTRUMENTATION**	3	0	0	3
Pre-requisite	**Semester**	**VI**			

Basic Electrical Engineering
Networks , Signals and Systems

Course Objectives:

- To introduce the fundamentals of Electronics Instruments and Measurement
- To provide an in-depth understanding of Measurement errors, Bridge measurements, Digital Storage Oscilloscope, Function Generator and Analyzer, Display devices, Data acquisition systems and transducers

Course Outcomes (CO): At the end of this course, the students will be able to

- Explain operation of various instruments required in measurements
- Apply measurement techniques for different types of tests
- Select specific instruments for specific measurement function
- Use oscilloscope to determine frequency and phase of a sinusoidal signal
- Compare different types of bridge circuits
- Analyze various measuring techniques for both electrical and nonelectrical quantities

UNIT - I

Performance characteristics of Instruments: Static characteristics, Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC ammeters, DC voltmeters, AC voltmeters Thermocouple type RF ammeter, ohm meters, series type, shunt type, multi meter for voltage, current and resistance measurements.

UNIT - II

Oscilloscopes: Standard specifications of CRO, CRT features, vertical and horizontal amplifiers, horizontal and vertical deflection systems, sweep trigger pulse, delay line, sync selector circuits, probes for CRO – active, passive, and attenuator type, dual trace/beam CRO, Principles of sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Digital frequency counters, time & Period measurements.

UNIT - III

Signal Generators and Analyzers: Fixed and variable frequency AF oscillators, function generators, pulse, random noise, sweep, and arbitrary waveform generators, their standards, specifications and principles of working (Block diagram approach); Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers.

UNIT - IV

Bridges: Wheatstone bridge, We in Bridge, errors and precautions in using bridges, AC bridges: Measurement of inductance-Maxwell's bridge, Anderson Bridge. Measurement of capacitance- Schearing Bridge, Kelvin Bridge, Q-meter, EMI and EMC, Interference and noise reduction techniques.

UNIT – V

Sensors and Transducers: Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples, and thermistors), Velocity, Acceleration, Vibration, pH measurement.

Textbooks:

1. H.S.Kalsi, Electronic Instrumentation, 3rd edition, McGraw Hill Education, 2017.
2. D. Helfrick, W.D. Cooper, Modern Electronic Instrumentation and Measurement Techniques, ,1st edition, Pearson Education India, 2015.

Reference Books:

1. David A. Bell, Electronic Instrumentation and Measurements, Oxford Univ. Press, 2007
2. B.M. Oliver, J.M. Cage, Electronic Measurements and Instrumentation, TMH Reprint 2009.
3. Ernest O. Doebelin and Dhanesh N Manik, Measurement Systems, 6th Ed., TMH,2010.

Online Learning Resources:

PROFESSIONAL ELECTIVE – II (MOOCS/ Conventional)

Course Code	SATELLITE COMMUNICATIONS		L	T	P	C
20A60404b			3	0	0	3
Pre-requisite		Semester	VI			

Antennas and Wave Propagation

Course Objectives:

- To learn the dynamics of the satellite.
- To understand the communication satellite design.
- To understand how analog and digital technologies are used for satellite communication networks.
- To learn the design of satellite links.
- To study the design of Earth station and tracking of the satellites.

Course Outcomes (CO): At the end of this course, the students will be able to

- Learn the dynamics of the satellite.
- Understand the communication satellite design.
- Understand how analog and digital technologies are used for satellite communication networks.
- Learn the design of satellite links.
- Study the design of Earth station and tracking of the satellites.

UNIT - I

Elements of orbital mechanics: Equations of motion, Tracking and orbit determination, Orbital correction/control, Satellite launch systems, Multistage rocket launchers and their performance.

UNIT - II

Elements of communication satellite design: Spacecraft subsystems, Reliability considerations, Spacecraft integration.

UNIT - III

Multiple access techniques: FDMA, TDMA, CDMA. Random access techniques. Satellite onboard processing.

UNIT - IV

Satellite link design: Performance requirements and standards, Design of satellite links – DOMSAT, INSAT, INTELSAT and INMARSAT, Satellite - based personal communication links.

UNIT - V

Earth station design: Configurations, Antenna and tracking systems, Satellite broadcasting.

Textbooks:

1. D. Roddy, Satellite Communication (4/e), McGraw- Hill, 2009.
2. T. Pratt & C.W. Bostain, Satellite Communication, Wiley 2000.

Reference Books:

1. B.N. Agrawal, Design of Geosynchrons Spacecraft, Prentice- Hall,1986.

Online Learning Resources:

PROFESSIONAL ELECTIVE – II (MOOCS/ Conventional)

Course Code	SYSTEM VERILOG		L	T	P	C
20A60404c			3	0	0	3
Pre-requisite		**Semester**	**VI**			

Digital Design

Course Objectives:

- To understand the principles of verification, and usage of System Verilog for verification
- To write test benches different layered architectures using system Verilog
- To verify the functionality of different complex logics

Course Outcomes (CO): At the end of this course, the students will be able to

- Get complete knowledge on principles of verification, and usage of System Verilog for verification
- Write test benches different layered architectures using system Verilog
- Verify the functionality of different complex logics

UNIT - I

Verification Concepts: Importance of Verification, Concepts of Verification. Functional Verification process. Verification plan, Stimulus Generation. Test bench Generation, components and their performance, Coverage: Code and Functional coverage

UNIT - II

System Verilog – 1: Introduction to SV: Language evolution. Classes and objects. Class Variables and Methods. Class instantiation. Constructors. Inheritance. Derived classes. Data hiding and encapsulation. Polymorphism. System Verilog constructs - Data types: bit data, strings, arrays: queues, dynamic and associative arrays. New type creation. Structs, enumerated types. Routines for enumerated types. Statements. Procedural, continue and break statements. Tasks and functions. Structures and unions, casting, Operators, Loops, Jumps, Program blocks. Processes and threads. IPC. Mailboxes and semaphore

UNIT - III

System Verilog – 2: Modules, ports and interfaces. Communication with ports. Grouping signals.

Clocking Blocks. Classes, Class Variables. Directed Vs Random Testing. Randomization. Constraint Driven Randomization. Coverage driven verification: Motivation, Types of coverage, Cover Group, Cover Point, Cross Coverage, Concepts of Binning and event sampling.

UNIT - IV

Layered Test bench Architecture for Verification: Layered Test benches. Stimulus and Response. Necessity for methodology. Verification Planning. Test bench architecture & Environment configuration: Generator, Driver, Receiver, Score board. assertions: Introduction to Assertion based verification, Immediate and concurrent assertions. Sequences and Assertion coverage

UNIT - V

Verification of Architectural Building Blocks / Sub-Systems: Verification of Architectural building blocks and sub systems using system Verilog: arbitration modules, arithmetic circuits, combinational and sequential blocks, data integrity, CDC, registers and memories

Textbooks:

1. Janick Bergeron, Writing Testbenches Using SystemVerilog, Springer.

2. Chris Spear, “SystemVerilog for Verification: A Guide to Learning the Testbench Language Features”, Springer, 2nd Edition.

Reference Books:

1. Janick Bergeron, Eduard Cerny, Alan Hunter, and Andy Nightingale, “Verification, Methodology Manual for SystemVerilog”, Springer.

Online Learning Resources:

OPEN ELECTIVE – II

Course Code	BASICS OF INTEGRATED CIRCUITS		L	T	P	C
20A60405	APPLICATIONS		3	0	0	3
Pre-requisite		**Semester**	**VI**			

Basics of Electronics and Communication Engineering

Course Objectives:

- To introduce the basic building blocks of linear & digital integrated circuits.
- To learn the linear and non - linear applications of operational amplifiers.
- To introduce the theory and applications of 555 and PLL.
- To learn the theory of ADC and DAC
- To understand different families of digital integrated circuits and their characteristics.

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the basic concepts of Op -AMPs, characteristics and specifications.
- Design circuits using operational amplifiers for various applications.
- Develop, apply and analyze circuits for advanced applications using Op-Amps, PLL, VCO and Analog multipliers.
- Understand different families of digital integrated circuits and their characteristics
- Design various and sequential circuits using digital ICs.

UNIT - I

Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT - II

Op-Amp, IC-555 & IC 565 Applications: Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

UNIT - III

Data Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT - IV

Digital Integrated Circuits: Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing- TTL Driving CMOS & CMOS Driving TTL

Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT - V

Sequential Logic ICs and Memories: Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers. Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

Textbooks:

1. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", PHI, 2003.
2. Floyd and Jain, "Digital Fundamentals", Pearson Education, 8th Edition, 2005.

Reference Books:

1. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (p) Ltd, Second Edition, 2003.
2. James M. Fiore, "Op Amps and Linear Integrated Circuits-Concepts and Applications", Cengage Learning/ Jaico, 2009.
3. K.Lal Kishore, "Operational Amplifiers with Linear Integrated Circuits", Pearson, 2009.
4. John. F. Wakerly, "Digital Design Principles and Practices", Pearson, Third Edition, 2005.

Online Learning Resources:

Course Code	VLSI DESIGN LAB		L	T	P	C
20A60406			0	0	3	1.5
Pre-requisite		**Semester**	**VI**			

Digital Design Lab

Course Objectives:

- To design any logic circuit using CMOS transistor.
- To use different software tools for analysis of circuits.
- To design layouts to the CMOS circuits.
- To use different software tools for analog layout

Course Outcomes (CO): At the end of this course, the students will be able to

- Design any logic circuit using CMOS transistor.
- Use different software tools for analysis of circuits.
- Design layouts to the CMOS circuits.
- Use different software tools for analog layout

List of Experiments:

1. Design and analysis of CMOS Inverter
   a) Implement CMOS inverter schematic using 180 nm technology and design its symbol.
   b) Implement test bench for CMOS Inverter and check its output response.
   c) Perform DC and AC analysis for CMOS inverter.
   d) Check the performance of CMOS inverter using parametric sweep.

2. Design and analysis of NAND and NOR Logic gates
   a) Implement NAND/NOR schematic using 180 nm technology and design its symbol.
   b) Implement test bench for NAND/NOR and check its output response.
   c) Perform DC and AC analysis for NAND/NOR.
   d) Check the performance of NAND/NOR using parametric sweep.

3. Design and analysis of XOR and XNOR Logic gates
   a) Implement XOR/XNOR schematic using 180 nm technology and design its symbol.
   b) Implement test bench for XOR/XNOR and check its output response.
   c) Perform DC and AC analysis for XOR/XNOR.
   d) Check the performance of XOR/XNOR using parametric sweep.

4. Design of AOI logic
   a) Design Schematic for AB+C‘D and check its output response.
   b) Design Schematic for AB‘+C‘D and check its output response.
   c) Design Schematic for (A+B‘)(C+D) and check its output response.
   d) Design Schematic for (A+B‘)(C‘+D) and check its output response.

5. Design and analysis of Full adder
   a) Design full adder using Full custom IC design.
   b) Design full adder using Semi custom IC design.

6. Analysis of NMOS and PMOS characteristics
   a) Implement test bench for NMOS/PMOS transistor.

b) Perform DC and AC analysis for NMOS/PMOS transistor
c) Check the performance of NMOS/PMOS transistor using parametric sweep.

7. Design and analysis of Common source amplifier
a) Implement CS amplifier schematic using 180 nm technology and design its symbol.
b) Implement test bench for CS amplifier and check its output response.
c) Perform DC and AC analysis for CS amplifier.
d) Check the performance of CS amplifier using parametric sweep.

8. Design and analysis of Common drain amplifier
a) Implement CD amplifier schematic using 180 nm technology and design its symbol.
b) Implement test bench for CD amplifier and check its output response.
c) Perform DC and AC analysis for CD amplifier.
d) Check the performance of CD amplifier using parametric sweep.

9. Design of MOS differential amplifier
a) Design differential amplifier schematic using 180 nm technology and its symbol.
b) Implement test bench for differential amplifier and check its output response.
c) Perform DC and AC analysis for differential amplifier.
d) Check the performance of differential amplifier using parametric sweep.

10. Design of two stage differential amplifier
a) Design two stage differential amplifier schematic using 180 nm technology and its symbol. b) Implement test bench for two stage differential amplifier and check its output response.
c) Perform DC and AC analysis for two stage differential amplifier.
d) Check the performance of two stage differential amplifier using parametric sweep.

11. Design of Inverter Layout
a) Design and implement inverter schematic.
b) Design the layout for inverter using 180 nm tech file.
c) Perform LVS for schematic and layout
d) Check and remove all DRC violations.
e) Extract parasitic R and C in layout.

12. Design of NAND/NOR Layout
a) Design and implement NAND/NOR schematic.
b) Design the layout for inverter using 180 nm tech file.
c) Perform LVS for schematic and layout
d) Check and remove all DRC violations.
e) Extract parasitic R and C in layout

Note: Any TEN of the experiments are to be conducted

The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the experiments with the Industry standard EDA Tools.
Software Required: i. Mentor Graphics Software / Equivalent Industry Standard Software. ii. Personal computer system with necessary software to run the programs and to implement.
References:

Online Learning Resources/Virtual Labs:

Course Code	MICROWAVE AND OPTICAL	L	T	P	C
20A60407	COMMUNICATIONS LAB	0	0	3	1.5
Pre-requisite	**Semester**	**VI**			

Antennas and Wave Propagation

Course Objectives:

- To understand the mode characteristics of Reflex Klystron oscillator and Gunn Oscillator.
- To determine the Scattering matrix of given passive device experimentally and verify the same theoretically. Also determine numerical aperture and bending losses of a given optical fiber
- To analyze the radiation characteristics to find the directivity and HPBW of a given antenna.
- To establish optical link between transmitter and receiver experimentally to find attenuation and signal strength of the received signal.

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the mode characteristics of Reflex Klystron oscillator and Gunn Oscillator.
- Determine the Scattering matrix of given passive device experimentally and verify the same theoretically. Also determine numerical aperture and bending losses of a given optical fiber
- Analyze the radiation characteristics to find the directivity and HPBW of a given antenna.
- Establish optical link between transmitter and receiver experimentally to find attenuation and signal strength of the received signal.

List of Experiments:

Note: All the experiments shall be conducted and there is no choice.

Microwave Engineering:

1. Set up the Full Microwave bench and know the importance of each block. Identify the pin configuration of Reflex Klystron with the help of its power supply cable connected from the power supply unit. Also identify the Microwave signal coupling from Klystron Oscillator to the waveguide.
2. Make use of the bench set up and conduct the experiment to find mode characteristics of Reflex Klystron: (i) Repeller voltage vs output power (ii) Repeller voltage vs Frequency.
3. Measurement of Frequency and wavelength of generated Microwave signal using Reflex Klystron oscillator.
4. Verify the negative resistance characteristics of Gunn oscillator using the Microwave bench set up with Gunn oscillator set up.
5. Find the Scattering matrix of E-plane, H-plane, and Magic Tees experimentally.
6. Make use of Microwave bench setup to find VSWR and impedance of an unknown load that is connected at the end of the bench set up. Make use of VSWR meter for the measurement of VSWR of a given load.
7. Determine directivity, insertion loss and coupling factor of a given Directional Coupler experimentally.
8. Making use of Microwave bench set up, find the radiation characteristics in both the planes and determine HPBW and directivity of a pyramidal horn antenna.

Optical Communication:

9. Conduct the experiment to draw the DC characteristics of LED and Photo diode.
10. Make use of Fiber optic kit to determine the numerical aperture and bending losses of a given optical fiber (transmission line).
11. Establish an optical link between transmitter and receiver and determine the signal strength at the receiver. Give the comments about the experiment by transmitting
    (i) analog signal (ii) digital signal.
12. Attenuation measurement in Fibers for various lengths.

References:

Online Learning Resources/Virtual Labs:

Course Code	DATA COMMUNICATION AND NETWORKS	L	T	P	C
20A60408	**LAB**	0	0	3	1.5
Pre-requisite	**Semester**	**VI**			

Electronics & IT Workshop

Course Objectives:

- To introduce Computer Network laboratory and familiarize with the tools by simulating various aspects of networking.
- To familiarize with the network simulation tools
- To usage of the network simulators to study the various aspects that effect network performance

Course Outcomes (CO): At the end of this course, the students will be able to

- Introduce Computer Network laboratory and familiarize with the tools by simulating various aspects of networking.
- Familiarize with the network simulation tools
- Usage of the network simulators to study the various aspects that effect network performance

List of Experiments:

- Introduction to Computer Network laboratory
- Introduction to Discrete Event Simulation
- Discrete Event Simulation Tools - ns2/ns3, Omnet++

Usage of the tool ns2/ns3 to:

1. Simulate telnet and ftp between N sources - N sinks (N = 1, 2, 3).
   Evaluate the effect of increasing data rate on congestion.
2. Simulating the effect of queueing disciplines on network performance - Random Early Detection/Weighted RED / Adaptive RED (This can be used as a lead up to DiffServ / IntServ later).
3. Simulate http, ftp and DBMS access in networks
4. Effect of VLAN on network performance –i) multiple VLANs and single router ii) multiple VLANs with separate multiple routers
5. Implementation of IP address configuration.
6. To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
7. Implementation of a routing algorithm
8. Simulation of Congestion Control Algorithms
9. Simulating the effect of DiffServ / IntServ in routers on throughput enhancement.
10. Simulating the performance of wireless networks
11. Case Study I: Evaluating the effect of Network Components on Network Performance to Design and Implement LAN With Various Topologies and To Evaluate Network Performance Parameters for DBMS etc.)
12. Case Study II: Evaluating the effect of Network Components on Network Performance to Design and Implement LAN Using Switch/Hub/Router as Interconnecting Devices for Two Different LANs and To Evaluate Network Performance Parameters.

Note: At least 10 Experiments out of the list must be done in the semester.

References:

Online Learning Resources/Virtual Labs:

Skill Oriented Course - IV

Course Code	SCRIPTING LANGUAGES		L	T	P	C
20A60409			1	0	2	2
Pre-requisite		Semester	VI			

C Programming & Data Structures Lab

Course Objectives:

- To Understand the concepts of scripting languages for developing web-based projects
- To understand the applications the of Ruby, TCL, Perl scripting languages

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the differences between Scripting languages and programming languages
- Gain some fluency in programming Linux, Python, Perl, TCL

MODULE - I

Linux Basics: Introduction to Linux, File System of the Linux, General usage of Linux kernel & basic commands, Linux users and group, Permissions for file, directory and users, searching a file & directory, zipping and unzipping concepts.

Practice:

1. a) Write a shell script that displays a list of all the files in the current directory

b) Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file or directory

2. Write a shell script that accept a list of file names as arguments count and report the occurrence of each word. 12

3. a) write a shell script to find the factorial of given integer

b) write a shell script that list all files in a directory.

MODULE – II

Perl Scripting: Introduction to Perl Scripting, working with simple values, Lists and Hashes, Loops and Decisions, Regular Expressions, Files and Data in Perl Scripting, References & Subroutines, Running and Debugging Perl, Modules, Object –Oriented Perl.

Practice:

4. Write a program to demonstrate different number datatypes in python.

5. Write a program to perform different arithmetic operations on numbers in python.

6. Write a program to create, concatenate and print a string and accessing substring from a given string

MODULE – III

Tcl / Tk Scripting: Tcl Fundamentals, String and Pattern Matching, Tcl Data Structures, Control Flow Commands, Procedures and Scope, Evel, working with Unix, Reflection and Debugging, Script Libraries, Tk Fundamentals, Tk by examples, The Pack Geometry Manager, Binding Commands to X Events, Buttons and Menus, Simple Tk Widgets, Entry and List box Widgets Focus, Grabs and Dialogs.

Practice:

7. a) Write a TCL script to find the factorial of a number

b) Write a TCL script that multiplies the numbers from 1 to 10

c)Write a TCL script for Sorting a list using a comparison function

8. Write a TCL script to

(i)create a list (ii) append elements to the list (iii)Traverse the list (iv)Concatenate the list

9. a) Write a TCL script to comparing the file modified times.

b). Write a TCL script to Copy a file and translate to native format.

MODULE - IV

Python Scripting: Introduction to Python, using the Python Interpreter, More Control Flow Tools, Data Structures, Modules, Input and Output, Errors and Exceptions, Classes, Brief Tour of the Standard Library.

Practice:

10. a) Write a Perl script to find the largest number among three numbers.

b) Write a Perl script to print the multiplication tables from 1-10 using subroutines.

11. Write a Perl program to implement the following list of manipulating functions

a) Shift. b) Unshift c) Push

12. a) Write a Perl script to substitute a word, with another word in a string.

b) Write a Perl script to validate IP address and email address.

Textbooks:

1. Python Tutorial by Guido Van Rossum, Fred L. Drake Jr. editor, Release 2.6.4
2. Practical Programming in Tcl and Tk by Brent Welch, Updated for Tcl 7.4 and Tk 4.0.
3. Teach Yorself Perl in 21 days by David Till.
4. Red Hat Enterprise Linux 4: System Administration Guide Copyright, 2005 Red Hat Inc.

Reference Books:

1. Learning Python – 2ndEd., Mark Lutz and David Ascher, 2003, O'Reilly.
2. Perl in 24 Hours – 3rdEd., Clinton Pierce, 2005, Sams Publishing.
3. Learning Perl – 4th Ed. Randal Schwartz, Tom Phoenix and Brain d foy. 2005.
4. Jython Essentials – SamuelePedroni and Noel Pappin.2002. O'Reilly.
5. Programming Perl – Larry Wall, Tom Christiansen and John Orwant, 3rd Edition, O'Reilly, 2000.

Online Learning Resources:

CONSTITUTION OF INDIA

(Mandatory course for Semester III/IV)

Common to EEE, ECE, CSE

Subject Code	Title of the Subject	L	T	P	C
	CONSTITUTION OF INDIA	3	0	0	0

COURSE OBJECTIVES : The objective of this course is	
1	To Enable the student to understand the importance of constitution
2	To understand the structure of executive, legislature and judiciary
3	To understand philosophy of fundamental rights and duties
4	To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and Election Commission of India.
5	To understand the central-state relation in financial and administrative control

Syllabus

UNIT-I Introduction to Indian Constitution

Constitution -Meaning of the term - Indian Constitution- Sources and constitutional history - Features– Citizenship – Preamble - Fundamental Rights and Duties - Directive Principles of State Policy.

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History and features of Indian constitution
- Learn about Preamble, Fundamental Rights and Duties

UNIT-II Union Government and its Administration

Structure of the Indian Union - Federalism - Centre-State relationship – President's Role, power and position - PM and Council of ministers - Cabinet and Central Secretariat –Lok Sabha - Rajya Sabha - The Supreme Court and High Court - Powers and Functions

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister

- Know the Structure of supreme court and High court

UNIT-III State Government and its Administration
Structure of the State Govt. - Governor - Role and Position -CM and Council of Ministers - State Secretariat- Organization Structure and Functions

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the structure of state government
- Analyze the role of Governor and Chief Minister
- Explain the role of State Secretariat
- Differentiate between structure and functions of state secretariat

UNIT-IV Local Administration
District's Administration Head - Role and Importance - Municipalities - Mayor and role of Elected Representatives -CEO of Municipal Corporation Panchayati Raj - Functions– PRI –Zilla Parishath - Elected officials and their roles – CEO, ,Zilla Parishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy

LEARNING OUTCOMES: -After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration's role and importance
- Analyze the role of Mayor and elected representatives of Municipalities
- Learn about the role of Zilla Parishath block level organization

UNIT-V Election Commission
Election Commission- Role of Chief Election Commissioner and Election Commissionerate - State Election Commission -Functions of Commissions for the welfare of SC/ST/OBC and Women

LEARNING OUTCOMES: -After completion of this unit student will

- Know the role of Election Commission
- Contrast and compare the role of Chief Election commissioner and Commissionerate
- Analyze the role of state election commission
- Evaluate various commissions viz SC/ST/OBC and women

TEXT BOOKS

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi

2. Subash Kashyap, Indian Constitution, National Book Trust

REFERENCES:

1. J.A. Siwach, Dynamics of Indian Government & Politics,

2. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

3. .J.C. Johari, Indian Government and Politics, Hans India

4. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

E-RESOURCES:

1.nptel.ac.in/courses/109104074/8
2.nptel.ac.in/courses/109104045/
3.nptel.ac.in/courses/101104065/
4.www.hss.iitb.ac.in/en/lecture-details
5.www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

COURSE OUTCOMES: At the end of the course, students will be able to	
CO1	State the historical background of the constitution making and its importance for building a democratic India.
CO2	Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
CO3	Demonstrate the value of the fundamental rights and duties for becoming good citizen of India.
CO4	Analyze the decentralization of power between central, state and local self-government
CO5	Appraise the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
CO6	Develop themselves as responsible citizens and pave way to build a democratic country.

PROFESSIONAL ELECTIVE – III

Course Code	**DIGITAL IMAGE PROCESSING**	**L**	**T**	**P**	**C**
20A70401a		3	0	0	3
Pre-requisite	**Semester**	**VII**			
Digital Signal Processing					

Course Objectives:

- To learn the fundamentals of Image Processing and the image transforms used in image processing.
- To study the different types of filtering techniques used for image enhancement.
- To gain an understanding of image restoration techniques.
- To understand the techniques used for image segmentation and image restoration.
- To analyze various types of image compression methods.

Course Outcomes (CO): At the end of this course, the students will be able to

- Relate the fundamentals of Image Processing and the image transforms.
- Correlate different types of filtering techniques used for image enhancement.
- Gain an understanding of image restoration techniques.
- Understand the techniques used for image segmentation and image restoration.
- Analyze various types of image compression methods.

UNIT - I

Digital Image Fundamentals: Elements of digital image processing systems, An image model, Basic relationships between pixels and basic transformation, Image acquisition, sampling and quantization, Image file formats Two-dimensional convolution, Two-dimensional correlation, Two-dimensional frequency responses.
Image Transforms: Study analysis with examples of 2D transforms, Transforms: DFT, DCT, Discrete Sine, Walsh, Hadamard, Slant, Haar, KLT, Radon, Hough, and Wavelet

UNIT - II

Image Enhancement: Image enhancement through – point processing, Histogram processing, spatial filtering, Enhancement in frequency domain, image smoothing, image sharpening

UNIT - III

Image Restoration: Noise distributions, Degradation model, Unconstrained and constrained restoration, Inverse filtering, minimum mean square error (Wiener) filtering, Constrained least square restoration

UNIT – IV

Image Segmentation and Recognition: Edge detection, Image segmentation: Region growing, Region splitting and merging, Edge linking, Morphological operations: Dilation, Erosion, Opening, Closing, Image recognition: Patterns and pattern classes, matching by minimum distance classifier, Statistical classifier, Matching by correlation.

UNIT – V

Image Compression: Need for image compression, Image coding, Huffman coding, Run length encoding, Arithmetic encoding, Vector Quantization, Block truncation coding, Transform coding: DCT, Wavelet, Image compression standards

Textbooks:

1. R. C. Gonzalez and R.E. Woods, "Digital Image Processing", 3rd Edition, Addison Wesley/Pearson education, 2010.
2. A. K. Jain, "Fundamentals of Digital Image processing", PHI, 1994.

Reference Books:

1. Rafael C. Gonzalez, Richard E woods and Steven L. Eddins, "Digital Image processing using MATLAB", 2nd Edition, Tata McGraw Hill, 2010.
2. William K. Pratt, "Digital Image Processing", 3rd Edition, John Wilely, 2004.

Online Learning Resources:

PROFESSIONAL ELECTIVE – III

Course Code	INTRODUCTION TO INTERNET OF THINGS	L	T	P	C
20A70401b		3	0	0	3
Pre-requisite	Semester	VII			

Microcontrollers and Interfacing

Course Objectives:

- To understand the concepts of Internet of Things
- To identify hardware and software components of Internet of Things
- To analyze basic communication protocols
- To design IoT applications in different domain and be able to analyze their performance

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the concepts of Internet of Things
- Identify hardware and software components of Internet of Things
- Analyze basic communication protocols
- Design IoT applications in different domain and be able to analyze their performance

UNIT - I

Introduction to IoT: Architectural overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals-Devices and gateways, Data management, Business processes in IoT, Role of cloud in IoT

UNIT - II

Elements of IoT: Hardware components – computing (Arduino, Raspberry Pi), communication, Sensing, Actuation, I/O interfaces Software Components- Programming APIs (Using python/Arduino) for communication protocols-MQTT, Zigbee, Bluetooth, CoAP, UDP, TCP

UNIT - III

Sensing and Actuation: Definition of Sensor, Sensor features, Resolution, Classes, Different types of sensors, Actuator, Different types of Actuators, purpose of Sensors and Actuators in IoT

UNIT - IV

IoT Application Development: Solution framework for IoT Applications-Implementation of Device integration, Data acquisition and Integration, Device data storage on cloud/local server, Authentication, authorization of Devices

UNIT - V

IoT Case Studies: IoT Case studies and mini projects based on industrial Automation, Transportation, Agriculture, Healthcare, Home Automation.

Textbooks:

1. Vijay Madisetti, ArshdeepBahga, "Internet of Things a Hands-On- Approach",2014.
2. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013.

Reference Books:

1. Dr SRN Reddy, RachitThukral and Manasi Mishra," Introduction to Internet of Things": A practical Approach" ETI Labs
2. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill

Online Learning Resources:

PROFESSIONAL ELECTIVE – III

Course Code	RADAR SYSTEMS		L	T	P	C
20A70401c			3	0	0	3
Pre-requisite		Semester	VII			

Antennas and Wave Propagation
Microwave Engineering and Optical Communications

Course Objectives:

- To understand the basic working principle of Radar and target detection procedure.
- To learn about the working and applications of CW and Frequency modulated Radar.
- To comprehend the working and applications of MTI and Pulse Doppler Radar
- To understand different methods of tracking a target and their limitations.
- To analyze the effect of noise at the receiver and uses of phased array antennas.

Course Outcomes (CO): At the end of this course, the students will be able to

- Learn the basic working principle of Radar and target detection procedure.
- Know the working and applications of CW and Frequency modulated Radar.
- Gain the knowledge of about MTI and Pulse Doppler Radar.
- Understand different methods of tracking a target and their limitations.
- Analyze the effect of noise at the receiver and uses of phased array antennas.

UNIT - I

Basics of Radar: Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems. Radar Equation**:** SNR, Envelope Detector, False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT - II

CW and Frequency Modulated Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Illustrative Problems.FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar.

UNIT - III

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, And Staggered PRFs. Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler radar.

UNIT - IV

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two-coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT - V

Detection of Radar Signals in Noise: Introduction, Noise Figure and Noise Temperature, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection, Detection criteria, Detector Characteristics, Automatic Detection, Constant False Alarm Rate Receiver.

Radar Receivers: Displays – types. Duplexer – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas- Basic Concepts, Electronically Steered Phased Array Antennas, Phase Shifters, Frequency – scan Arrays, Radiation for Phased Array, Architecture for Phased Arrays. Radiation Pattern. Beam Steering and Beam Width changes.

Textbooks:

1. Merrill I. Skolnik, "Introduction to Radar Systems", 2nd Edition, TMH Special Indian Edition, 2007.
2. Byron Edde, "Radar Principals, Technology, Applications", Pearson Education, 1992.

Reference Books:

1. Peebles, "Radar Principles", Wiley, New York, 1998.
2. G.S.N. Raju, "Radar Engineering and Fundamentals of Navigational Aids", I. K. International Pvt. Ltd.
3. G. SasiBhushanRao, "Microwave and Radar Engineering", Pearson Education, 2014

Online Learning Resources:

PROFESSIONAL ELECTIVE – IV

Course Code	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	C
20A70402a		3	0	0	3
Pre-requisite	Semester	VII			

Linear Algebra and Calculus
Differential Equations & Vector Calculus

Course Objectives:

- To understand problem solving methods and learning design of intelligent systems.
- To understand the concepts of machine learning
- To appreciate supervised and unsupervised learning and their applications
- To build systems those learns and adapt using real-world applications.
- To implement software/project of learning algorithms applied to real-world

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand problem solving methods and learning design of intelligent systems.
- Understand the concepts of machine learning
- Appreciate supervised and unsupervised learning and their applications
- Build systems those learns and adapt using real-world applications.
- Implement software/project of learning algorithms applied to real-world

UNIT - I

Introduction to AI: Computerized reasoning - Artificial Intelligence (AI) - characteristics of an AI problem – Problem representation in AI - State space representation - problem reduction-Concept of small talk programming.

UNIT - II

Search Process: AI and search process - Brute force search techniques, Depth first, Breadth first search techniques, Hill climbing, Best first search, AND/OR graphs, A* algorithm - Constraint satisfaction.

Knowledge Representation: Logic, Propositional logic - Tautology - Contradiction - Normal forms - Predicate logic - Rules of inference - Resolution - Unification algorithm - Production rules - Semantic networks - Frames – Scripts - Conceptual dependency.

UNIT - III

Introduction to Machine Learning: Introduction to Machine Learning - Types of Machine learning - Basic Concepts in Machine Learning

Supervised Learning: Linear Models for Classification: Discriminant Functions - Probabilistic Generative Models - Probabilistic Discriminative Models - Bayesian Logistic Regression. Neural Networks: Feed forward Network Functions - Error Backpropagation – Regularization in Neural Networks - Mixture Density Networks - Bayesian Neural Networks - Kernel Methods - Dual Representations - Radial Basis Function Networks - Ensemble learning: Boosting - Bagging.

UNIT - IV

Unsupervised Learning: Clustering - K-means - Mixtures of Gaussians - The EM Algorithm in General – Model Selection for Latent Variable Models - High-Dimensional Spaces. Dimensionality Reduction: Factor analysis - Principal Component Analysis - Probabilistic PCA - Independent components analysis.

UNIT - V

Application: Examples of Machine Learning Applications - Linear Models for Regression -

Linear Basis Function Models - The Bias-Variance Decomposition - Bayesian Linear Regression – Bayesian Model Comparison. Radar for target detection, Deep Learning Automated ECG Noise Detection and Classification, ML in Network for routing, traffic prediction and classification, Application of ML in Cognitive Radio Network (CRN)

Textbooks:

1. Stuart Russel and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Prentice Hall, 2009.
2. 2. Elaine Rich, Kevin Knight and Shivashankar B Nair, “Artificial Intelligence”, Tata McGraw Hill, 2010.

Reference Books:

1. Patrick Henry Winston, “Artificial Intelligence”, Addison Wesley, 2000.
2. Luger George F and Stubblefield William A, “Artificial Intelligence: Structures and Strategies for Complex Problem Solving”, Pearson Education, 2002.
3. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.
4. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
5. EthemAlpaydin, “Introduction to Machine Learning”, MIT Press, 3 rd Edition, 2014
6. Sayed, A.H., 2014. Adaptation, learning, and optimization over networks. Foundations and Trends® in Machine Learning, 7(4-5), pp.311-801

Online Learning Resources:

PROFESSIONAL ELECTIVE – IV

Course Code	EMBEDDED SYSTEM DESIGN		L	T	P	C
20A70402b			3	0	0	3
Pre-requisite		Semester	VII			

Microcontrollers and Interfacing

Course Objectives:

- To teach the basics of an embedded system and RTOS.
- To introduce the typical components of an embedded system & different communication interfaces.
- To provide knowledge on the design process of embedded system applications

Course Outcomes (CO): At the end of this course, the students will be able to

- Identify hardware and software components of an embedded system
- Learn the basics of OS and RTOS
- Illustrate different Inter Process Communication (IPC) mechanisms used by tasks/process/tasks to communicate in multitasking environment
- Design simple embedded system-based applications

UNIT - I

Introduction To Embedded Systems: History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, The embedded system design process-requirements, specification, architecture design, designing hardware and software, components, system integration, Applications of embedded systems, and characteristics of embedded systems.

UNIT - II

Typical Embedded System: Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, Sensors, actuators, I/O components: seven segment LED, relay, piezo buzzer, push button switch, other sub-systems: reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer.

UNIT - III

Communication Interface: Onboard communication interfaces-I2C, SPI, CAN, parallel interface; External communication interfaces-RS232 and RS485, USB, infrared, Bluetooth, Wi-Fi, ZigBee, GPRS, GSM.

UNIT - IV

Embedded Firmware Design and Development:

Embedded firmware design approaches-super loop-based approach, operating system-based approach; embedded firmware development languages-assembly language-based development, high level language-based development.

UNIT - V

RTOS Based Embedded System Design: Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-pre-emptive and pre-emptive scheduling; task communication-shared memory, message passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Task Synchronization Techniques

Textbooks:

1. Introduction to Embedded Systems - Shibu KV, McGraw Hill Education.
2. Computers as Components –Wayne Wolf, Morgan Kaufmann (second edition).

Reference Books:

1. Embedded System Design -frank vahid, tony grivargis, john Wiley.
2. Embedded Systems- An integrated approach - Lyla b das, Pearson education 2012.
3. Embedded Systems – Raj Kamal, TMH

Online Learning Resources:

PROFESSIONAL ELECTIVE – IV

Course Code	RF CIRCUIT DESIGN	L	T	P	C
20A70402c		3	0	0	3
Pre-requisite	Semester	VII			

Analog Circuits
Antennas and Wave Propagation
Microwave Engineering and Optical Communications

Course Objectives:

- To analyze RF components, circuits and networks.
- To understand the concept of Impedance matching and biasing networks.
- To analyze different types of RF Active components and Filters.
- To design and analyze the characteristics of RF Amplifiers.
- To analyze the characteristics of oscillators and mixers.

Course Outcomes (CO): At the end of this course, the students will be able to

- Analyze different types of RF components, circuits and networks.
- Learn the concept of Impedance matching and biasing networks.
- Analyze different types of RF Active components and Filters.
- Design and analyze the characteristics of RF Amplifiers.
- Analyze the characteristics of oscillators and mixers.

UNIT - I

RF Electronic Components, Circuits & Networks: The Electromagnetic frequency bands and their applications, units and Physical Constants, Microwave bands, RF behavior of Passive components: Tuned resonant circuits, Varactors, Inductors and Capacitors, Voltage and Current in capacitor circuits. MicrostripTransmissionLines- types, Special Termination Conditions- sourced and Loaded Transmission Lines. The Smith Chart, inter connectivity networks, Network properties and Applications, Scattering Parameters.

UNIT - II

Matching Network and Biasing: Impedance matching using discrete components- Two component, T and π matching networks, Microstrip line matching networks- Single stub and Double stub matching networks, Amplifier classes of Operation and biasing networks- BJT and FET biasing networks.

UNIT - III

Active RF Components: Filter basics–Lumped filter design– Distributed Filter Design–Diplexer Filters-Crystal and Saw Filters-Active Filters - Tunable filters. RF Diodes – BJTs- FETs and Models.

UNIT - IV

RF Amplifier Design : Characteristics of Amplifiers- Amplifier power relations and Circuit Configurations, Stability Considerations, Small Signal amplifier design, Power amplifier design, Broadband, High Power, multistage amplifiers, Low noise amplifiers, VGA Amplifiers.

UNIT - V

Oscillators and Mixers: Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Gunn Element Oscillator, PLLSynthesizer. Basic characteristics of mixer- Active mixers, Image Reject and Harmonic mixers, Frequency domain considerations.

Textbooks:

1. Reinhold Ludwing and PavelBretchko, “RF Circuit design: Theory and applications”, Pearson Education Asia Publication, New Delhi 2001.
2. Devendra K. Misra, “Radio Frequency and Microwave Communication Circuits– Analysis and Design”, Wiley Student Edition, John Wiley &Sons.

Reference Books:

1. Mathew M. Radmangh, “Radio frequency and Microwave Electronics”, PE Asia Publ,2001.
2. Christopher Bowick, Cheryl AljuniandJohnBiyler, “RF Circuit Design–Elsevier Science”, 2008.

Online Learning Resources:

PROFESSIONAL ELECTIVE – V

Course Code	CELLULAR AND MOBILE	L	T	P	C
20A70403a	COMMUNICATIONS	3	0	0	3
Pre-requisite	Semester	VII			

Microwave Engineering and Optical Communications

Course Objectives:

- To comprehend the basic elements of cellular and mobile communications.
- To introduce about Co-channel interference and cell splitting in cellular communication.
- To gain an understanding of signal coverage and propagation losses.
- To learn about frequency management, channel assignment and the antennas used at cell site and mobile.
- To introduce types of digital cellular networks and hands off mechanism.

Course Outcomes (CO): At the end of this course, the students will be able to

- Learn the basic elements of cellular and mobile communications.
- Understand Co-channel interference and cell splitting concepts in cellular communication.
- Gain an understanding of signal coverage and propagation losses.
- Explain about frequency management, channel assignment and antennas used at cell site and mobile.
- Know about types of digital cellular networks and hands off mechanism.

UNIT - I

Cellular Mobile Radio Systems: Introduction to Cellular Mobile system, basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems.

UNIT - II

Elements of Cellular Radio System Design: General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in an Omni directional Antenna system, Cell splitting, consideration of the components of cellular system.

Interference: Introduction to Co-channel interference, real time co-channel interference, Co-channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.

UNIT - III

Cell Coverage for Signal and Traffic: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation antenna height gain, form of a point-to-point model.

UNIT - IV

Cell Site and Mobile Antennas: Sum and difference patterns and their synthesis, Omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

Frequency Management and Channel Assignment: Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non-fixed channel assignment.

UNIT - V

Handoff: Handoff, dropped calls and cell splitting, types of handoffs, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

System Evaluations: Performance evaluation, Signal evaluation, Measurement of average received level and level crossings, Spectrum efficiency evaluation.

Textbooks:

1. W .C. Y. Lee, "Mobile cellular telecommunications", Tata Mc-Graw Hill, 2nd Edition, 2006.
2. Theodore. S. Rapport, "Wireless communications", Pearson Education, 2ndEdn., 2002.

Reference Books:

1. Gordon L. Stuber, "Principles of Mobile communications", Springer International 2nd Edition, 2007.
2. Lee , "Wireless and Mobile Communications", McGraw Hills, 3rd Edition, 2006.
3. Jon W.Mark and WeihuaZhqung , "Wireless communications and Networking", PHI, 2005.
4. R.Blake, "Wireless communication Technology", Thompson Asia Pvt. Ltd., 2004.

Online Learning Resources:

PROFESSIONAL ELECTIVE – V

Course Code	REAL TIME OPERATING SYSTEMS	L	T	P	C
2070403b		3	0	0	3
Pre-requisite	**Semester**	**VII**			

Data Communications and Networks

Course Objectives:

- To introduce general idea, structure and functions of general-purpose operating systems.
- To describe process & memory management techniques
- To teach concepts of how process is created and controlled with RTOs.
- To provide knowledge about the common problems in developing an RTOS.
- To discuss application development using RTOS

Course Outcomes (CO): At the end of this course, the students will be able to

- Describe real-time operating system requirements and design issues
- Illustrate role of operating systems in memory and I/O devices management
- Apply concepts of inter-task communication and synchronization via shared memory, message queues, signals, semaphores
- Examine challenges arising in design problems when developing embedded applications in multitasking systems
- Develop programs using system proved timers, signals, mutual exclusion, semaphores, message queues and exception handlers

UNIT - I

Introduction: Operating Systems Objectives and functions, Computer System Architecture, OS Structure, OS Operations, Evolution of Operating Systems - Simple Batch, Multi programmed, time shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, Special - Purpose Systems, Operating System services, user OS Interface, System Calls, Types of System Calls, System Programs, Opening System Design and Implementation, OS Structure, Virtual machines

UNIT - II

Process: Process Concept, Process Scheduling, Operations on Processes, Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Threads- Overview, Multithreading models, Threading issues.

Process Synchronization: The critical-section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors, Memory Management and Virtual Memory and File System Interface.

UNIT - III

RTOS: Differences between General Purpose OS & RTOS, Real-time concepts, Hard Real time and Soft Real-time systems, Basic architecture of an RTOS, components in RTOS, kernel, objects, scheduler, Multitasking, context switch, Scheduling types, Task states, Task management. Kernel Objects, Semaphores, Synchronization between two tasks and multiple tasks, Single shared-resource-access synchronization, Recursive shared- resource- access synchronization, message queue, Common pipe, pipe operation, select operation on multiple pipes, Pipes for inter-task Synchronization, Event register, control block, Signals, Catch operation, Execution sequence of wait and signal operations.

UNIT - IV

RTOS Services Overview: TCP/IP protocol- Stack- File system- Remote procedure calls- RTOS command shell Exceptions and Interrupts- Programmable interrupt controller-Priority scheme- Task and stack Interrupt nesting- Interrupt processing in two contexts. Timer and Timer Services - Real-time clock Soft-timer- Servicing the timer interrupt in the task context- Timeout event handlers. I/O Subsystem and Memory Management Port-mapped I/O- Memory-mapped I/O- Write operation for a block-mode device- I/O function mapping- Associating devices with drivers-Memory allocation map, fragmentation, free operation, Management unit.

UNIT - V

Typical RTOS: Introduction to RT Linux, Real-Time Linux Applications in Embedded system, Common Design Problems - Deadlock, priority inversion problem, Embedded RTOS for fault-Tolerant applications

Textbooks:

1. Operating System Principles, Abraham Silberchatz, Peter B. Galvin, Greg Gagne 8th Edition, Wiley Student Edition.
2. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011

Reference Books:

1. Operating systems - Internals and Design Principles, W. Stallings, 6th Edition, Pearson.
2. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.

Online Learning Resources:

PROFESSIONAL ELECTIVE – V

Course Code	FPGA ARCHITECTURES AND	L	T	P	C
20A70403c	APPLICATIONS	3	0	0	3
Pre-requisite	Semester	VII			

VLSI Design

Course Objectives:

- To acquire knowledge about various architectures and device technologies of PLD's.
- To comprehend FPGA Architectures.
- To analyze System level Design and their application for Combinational and Sequential Circuits.
- To familiarize with Anti-Fuse Programmed FPGAs.
- To apply knowledge of this subject for various design applications.

Course Outcomes (CO): At the end of this course, the students will be able to

- Acquire knowledge about various architectures and device technologies of PLD's.
- Comprehend FPGA Architectures.
- Analyze System level Design and their application for Combinational and Sequential Circuits.
- Familiarize with Anti-Fuse Programmed FPGAs.
- Apply knowledge of this subject for various design applications.

UNIT - I

Introduction to Programmable Logic Devices: Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/Generic Array Logic; Complex Programmable Logic Devices–Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

UNIT - II

Field Programmable Gate Arrays: Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, and Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, and Applications of FPGAs.

UNIT - III

SRAM Programmable FPGAs: Introduction, Programming Technology, Device Architecture, the Xilinx XC2000, XC3000 and XC4000 Architectures.

UNIT - IV

Anti-Fuse Programmed FPGAs: Introduction, Programming Technology, Device Architecture, The Actel ACT1, ACT2 and ACT3 Architectures.

UNIT - V

Design Applications: General Design Issues, Counter Examples, A Fast Video Controller, A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture

Textbooks:

1. Field Programmable Gate Array Technology - Stephen M. Trimberger, Springer International Edition.
2. Digital Systems Design - Charles H. Roth Jr, LizyKurian John, Cengage Learning.

Reference Books:

1. Field Programmable Gate Arrays-John V.Oldfield, Richard C.Dorf, Wiley India.
2. Digital Design Using Field Programmable Gate Arrays - Pak K. Chan/SamihaMourad, Pearson Low Price Edition.
3. Digital Systems Design with FPGAs and CPLDs-Ian Grout, Elsevier, Newnes.
4. FPGA based System Design-Wayne Wolf, Prentice Hall Modern Semiconductor Design Series.

Online Learning Resources:

JNTUA College Of Engineering (Autonomous),Ananthapuramu

Department of Computer Science & Engineering

MANAGEMENT SCIENCE

Common to All Branches

Course Code:20A75401a **Semester VII(R20)** **L T P C : 3 0 0 3**

COURSE OBJECTIVES:

- To provide fundamental knowledge on management, administration, organization & its concepts.
- To make the students understand the role of management in Production process and marketing management
- To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, job evaluation and Merit rating concepts
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
- To make the students aware of the contemporary issues in management

Course Outcomes (CO): At the end of the course, students will be able to

- Define the Management, and its Functions
- Understand the concepts & principles of management and designs of organization in a practical world
- Apply the knowledge of Work-study principles & Quality Control techniques in industry
- Analyse the concepts of HRM in Recruitment, Selection and Training & Development.
- Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyse the business through SWOT.
- Create Modern technology in management science.

UNIT - I **INTRODUCTION TO MANAGEMENT**

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor’s Scientific Theory-Henry Fayol’s principles - Elton Mayo’s Human relations - Systems Theory - **Organizational Designs** - Line organization - Line & Staff Organization - Functional Organization - Committee form of Organization - Social responsibilities of Management.

LEARNING OUTCOMES: At the end if the Unit, the learners will be able to

- Understand the concept of management and organization
- Analyze the organization chart & structure for an enterprise.
- Apply the concepts & principles of management in real life industry.
- Evaluate and interpret the theories and the modern organization theory.

UNIT - II **OPERATIONS & MARKETING MANAGEMENT**

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), - Statistical Quality Control- **Materials Management -** Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Purchase Procedure - **Marketing Management -** Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

- Understand the core concepts of Management Science and Operations Management
- Apply the knowledge of Method of Production principles in real life industry.
- Analyze Marketing Mix Strategies for an enterprise
- Evaluate Materials departments & Determine EOQ
- Create and design advertising and sales promotion

UNIT - III **HUMAN RESOURCES MANAGEMENT (HRM)**

HRM - Evolution of HRM - Definition and Meaning – Nature - Managerial and Operative functions - - Job Analysis - Human Resource Planning (HRP) – Process of Recruitment & Selection - Training and Development - Performance Appraisal - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration.

LEARNING OUTCOMES: At the end if the Unit, the learners will

- Understand the concepts of HRM in Recruitment, Selection, Training & Development
- Apply Managerial and operative Functions of HRM
- Analyze the need of training
- Evaluate performance appraisal Techniques
- Design the basic structure of salaries and wages Administration.

UNIT - IV **STRATEGIC & PROJECT MANAGEMENT**

Strategy Definition & Meaning - Vision - Mission - Goals - Steps in Strategy Formulation and Implementation - SWOT Analysis **Project Management -** Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Project Crashing (Simple problems).

LEARNING OUTCOMES: At the end of the Unit, the learners will be able to

- Understand Mission, Objectives, Goals & strategies for an enterprise
- Apply SWOT Analysis to strengthen the project
- Analyze Strategy formulation and implementation
- Evaluate PERT and CPM Techniques
- Creative in completing the projects within given time

UNIT - V **Contemporary Issues In Management**

The concept of Management Information System (MIS) - Materials Requirement Planning (MRP) - Customer Relations Management (CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management (SCM) - Enterprise Resource Planning (ERP) - Business Process Outsourcing (BPO) - Business Process Re-engineering - knowledge Management.

LEARNING OUTCOMES At the end if the Unit, the learners will be able to

- Understand modern management techniques
- Apply Knowledge in Understanding in modern management techniques
- Analyze Concept of CRM, MRP, TQM
- Evaluate Six Sigma concept and SCM

Textbooks:

1. A.R Aryasri, Management Science, TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 2012.

Reference Books:

1. Koontz & Weihrich, Essentials of Management, 6/e, TMH, 2005.
2. Thomas N.Duening & John M.Ivancevich, Management Principles and Guidelines, Biztantra.
3. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
4. Samuel C.Certo, Modern Management, 9/e, PHI, 2005

Online Learning Resources:

www.slideshare.net/jhayabesamis/chapter-1-the-nature-and-concept-of-management-122625641?
www.slideshare.net/vivekpratapsingh14/school-of-management-thoughts?
https://www.slideshare.net/89ajpaul/organizational-design-anf-structure
https://www.slideshare.net/sujeet2685/plant-layout-46555840#
https://www.slideshare.net/drmadhurverma/materials-38395397
https://www.slideshare.net/ShaliniShetty3/introduction-to-marketing-management-72210724?
https://www.slideshare.net/srinidhiraman/human-resource-management-ppt-43320777
https://www.slideshare.net/wicaksana/training-and-development-33535063
https://www.slideshare.net/ayushijain107/strategic-management-ppt-58012275

JNTUA College Of Engineering (Autonomous),Ananthapuramu

Department of Computer Science & Engineering

BUSINESS ENVIRONMENT

(Human Elective)

Course Code:20A75401b **Semester VII(R20)** **L T P C : 3 0 0 3**

Course Objectives:

1. To make the student understand about the business environment
2. To enable them in knowing the importance of fiscal and monitory policy

3 To facilitate them in understanding the export policy of the country

4. To Impart knowledge about the functioning and role of WTO
5. To Encourage the student in knowing the structure of stock markets

Course Outcomes (CO): At the end of the course, students will be able to

- Define Business Environment and its Importance.
- Understand various types of business environment.
- Apply the knowledge of Money markets in future investment
- Analyse India's Trade Policy
- Evaluate fiscal and monitory policy
- Develop a personal synthesis and approach for identifying business opportunities

UNIT - I **Overview of Business Environment**

Introduction – meaning Nature, Scope, significance, functions and advantages. Types - Internal & External, Micro and Macro. Competitive structure of industries - Environmental analysis - advantages & limitations of environmental analysis & Characteristics of business.

Learning Outcomes: - After completion of this unit student will

- Understand the concept of Business environment
- Classify various types of business environment
- Evaluate the environmental analysis in business
- Discuss the Characteristics of Business.

UNIT - II **Fiscal Policy**

Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Public debt - Development activities financed by public expenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget - Monetary Policy - Demand and Supply of Money – RBI - Objectives of monetary and credit policy - Recent trends - Role of Finance Commission.

Learning Outcomes: - After completion of this unit student will

- Understand the concept of public revenue and public Expenditure
- Identify the functions of RBI and its role
- Analyze the Monitory policy in India
- Know the recent trends and the role of Finance Commission in the development of our country
- Differentiate between Fiscal and Monitory Policy

UNIT - III **India's Trade Policy**

Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank - Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

Learning Outcomes: - After completion of this unit student will

- Understand the role of Indian international trade
- Understand and explain the need for Export and EXIM Policies
- Analyze causes for Disequilibrium and correction measure
- Differentiate between Bilateral and Multilateral Trade Agreements

UNIT - IV **World Trade Organization**

Introduction – Nature, meaning, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - Agreements in the Uruguay Round – TRIPS, TRIMS, and GATT - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

Learning Outcomes: - After completion of this unit student will

- Understand the role of WTO in trade
- Analyze Agreements on trade by WTO
- Understand the Dispute Settlement Mechanism
- Compare and contrast the Dumping and Anti-dumping Measures.

UNIT - V **Money Markets and Capital Markets**

Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI - Stock Exchanges - Investor protection and role of SEBI.

Learning Outcomes: - After completion of this unit student will

- Understand the components of Indian financial system
- Know the structure of Money markets and Capital markets
- Analyze the Stock Markets
- Apply the knowledge in future investments

- Understand the role of SEBI in investor protection.

Textbooks:

1. Business Environment Text & Cases: JUNE 2017
2. Francis Cherunilam (2009), International Business: Text and Cases, Prentice Hall of India.
3. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH2016

Reference Books:

1. K. V. Sivayya, V. B. M Das (2009), Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black (2009), International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.
3. Chari. S. N (2009), International Business, Wiley India.
4. E. Bhattacharya (2009), International Business, Excel Publications, New Delhi.

Online Learning Resources:

https://www.slideshare.net/ShompaDhali/business-environment-53111245
https://www.slideshare.net/jitenparmar313/fiscal-policy-65521889
https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt
https://www.slideshare.net/prateeknepal3/ppt-mo

JNTUA College Of Engineering (Autonomous),Ananthapuramu

Department of Computer Science & Engineering

ORGANIZATIONAL BEHAVIOUR

(Human Elective)

Course Code:20A75401c **Semester VII(R20)** **L T P C : 3 0 0 3**

Course Objectives:

- **To make them aware of concepts & analysis in organizational behaviour**
- **To offer knowledge to students on self-motivation, leadership and management**
- **To facilitate them to become powerful leaders**
- **To Impart knowledge about group dynamics**
- **To make them understand the importance of change and development**

COURSE OUTCOMES: At the end of the course, students will be able to

- Define the Organizational Behaviour, its nature and scope
- Understand the nature and concept of Organizational behaviour
- Apply theories of motivation to analyse the performance problems
- Analyse the different theories of leadership
- Evaluate group dynamics
- Develop as powerful leader

UNIT - I **Introduction Of Organizational Behavior and Various Concepts**

Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective - Understanding Individual Behavior – Attitude - Perception - Learning – Personality.

LEARNING OUTCOMES: - After completion of this unit student will

- Understand the concept of Organizational Behavior
- Contrast and compare Individual & Group Behavior and attitude
- Evaluate personality types

UNIT - II **Motivation and Organization Outcome**

Theories of Motivation - Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theory of expectancy - McClelland's theory of needs – Mc Gregor's theory X and theory Y – Adam's equity theory – Locke's goal setting theory –

LEARNING OUTCOMES: - After completion of this unit student will

- Understand the concept of Motivation
- Analyze the Theories of motivation
- Explain how employees are motivated according to Maslow's Needs Hierarchy

UNIT - III **Leadership**

Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Alderfer's ERG theory – traits - Leaders Vs Managers.

Conflict Management - Evaluating Leader - Women and Corporate leadership.

LEARNING OUTCOMES: - After completion of this unit student will

- Understand the concept of Leadership
- Contrast and compare Trait theory and Managerial Grid
- Distinguish the difference between Transactional and Transformational Leadership
- Evaluate the qualities of good leaders

UNIT - IV **Organizational Culture**

Introduction – Nature, Meaning, scope, definition and functions - Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development

LEARNING OUTCOMES: - After completion of this unit student will

- Understand the importance of organizational change and development
- Apply change management in the organization
- Analyze work stress management
- Evaluate Managerial implications of organization

UNIT - V **Organizational Change and Development**

Introduction – Nature, Meaning, scope, definition and functions - Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development

LEARNING OUTCOMES: - After completion of this unit student will

- Understand the importance of organizational change and development
- Apply change management in the organization
- Analyze work stress management
- Evaluate Managerial implications of organization

Textbooks:

1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12 Th edition 2011
2. P Subba Rao, Organisational Behaviour, Himalya Publishing House 2017

Reference Books:

- McShane, Organizational Behaviour, TMH 2009
- Nelson, Organisational Behaviour, Thomson, 2009.
- Robbins, P.Stephen, Timothy A. Judge, Organisational Behaviour, Pearson 2009.
- Aswathappa, Organisational Behaviour, Himalaya, 2009

https://www.slideshare.net/payalrchhabra/organisational-behavior-15668552
https://www.slideshare.net/nilendrakumar7/motivation-and-team-building
https://www.slideshare.net/Knight1040/organizational-culture-9608857
https://www.slideshare.net/harshrastogi1/group-dynamics-159412405
https://www.slideshare.net/kohlisudeep18/organisational-developmet

OPEN ELECTIVE – III

Course Code	**DIGITAL ELECTRONICS**	**L**	**T**	**P**	**C**
20A70404		3	0	0	3
Pre-requisite	**Semester**	**VII**			

Basics of Electronics and Communication Engineering

Course Objectives:

- To learn simplification methods for minimizing Boolean functions and their realization using logic gates.
- To understand and design various combinational logic circuits like adders and code converters.
- To know the design of various combinational circuits useful to implement logic functions.
- To study the design of sequential logic circuits in synchronous and asynchronous modes.
- To introduce programmable logic devices.

Course Outcomes (CO): At the end of this course, the students will be able to

- Learn simplification methods for minimizing Boolean functions and their realization using logic gates.
- Understand and design various combinational logic circuits like adders and code converters.
- Know the design of various combinational circuits useful to implement logic functions.
- Gain knowledge on the design of sequential logic circuits in synchronous and

asynchronous modes.

- Understand the operation and uses of programmable logic devices.

UNIT - I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Quine –McCluskey Tabular Minimization Method. Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT - II

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT - III

Combinational Logic Design 2: Decoders (3 to 8, octal to decimal), Encoders, Priority Encoders, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT - IV

Sequential Logic Design: Latches, Flipflops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, flipflop conversions, set up and hold times, Ripple and Synchronous counters, Shift registers.

UNIT - V

Programmable Logic Devices:ROM, Programmable Logic Devices (PLDs), Introduction to logic families and their comparisons.

Textbooks:

1. Digital Design, M. Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
2. Switching theory and Finite Automata Theory, ZviKohavi and Nirah K. Jha, 2nd Edition, Tata McGraw Hill, 2005.

Reference Books:

1. Fundamentals of Logic Design, Charles H Roth, Jr., 5th Edition, Brooks/coleCengage Learning, 2004.
2. Digital & State Machine Design, Comer, 3rd Edition, OXFORD.

Online Learning Resources:

OPEN ELECTIVE – IV

Course Code	PRINCIPLES OF DIGITAL SIGNAL	L	T	P	C
20A70405	PROCESSING	3	0	0	3
Pre-requisite	Semester	VII			

Basics of Electronics and Communication Engineering

Course Objectives:

- To understand the frequency domain analysis of discrete time signals.
- To learn the properties of discrete Fourier series and Fourier transforms.
- To design & analyze IIR digital filters from analog filters.
- To know various structures used in implementation of FIR digital filters.
- To grasp the importance and applications of Multirate Digital signal processing.

Course Outcomes (CO): At the end of this course, the students will be able to

- Articulate the frequency domain analysis of discrete time signals.
- Understand the properties of discrete Fourier series and Fourier transforms.
- Design & analyze IIR digital filters from analog filters.
- Design various structures used in implementation of FIR digital filters.
- Summarize the importance and applications of Multirate Digital signal processing.

UNIT - I

Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, LTI system Properties. Solution of Linear constant coefficient difference equations, frequency domain representation of discrete time signals and systems. Review of Z-transforms.

UNIT - II

Discrete Fourier Series and Fourier Transforms: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT - III

Design of IIR Digital Filters and Realizations: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT - IV

Design of FIR Digital Filters and Realizations: Characteristics of FIR Digital Filters, frequency response. Design of FIR digital filters using window techniques and frequency sampling techniques, comparison of IIR & FIR filters, basic structures of FIR systems.

UNIT - V

DSP Applications: Introduction to programmable DSPs, Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor; Adaptive filters: Introduction, Basic principles of Forward Linear Predictive filter and applications such as system identification, echo cancellation, equalization of channels, and beam forming using block diagram representation study only.

Textbooks:

1. John G. Proakis and Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithmsand Applications", Pearson Education, 2007.
2. A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", PHI.

Reference Books:

1. Andreas Antoniou, "Digital Signal Processing", TATA McGraw Hill, 2006
2. MH Hayes, "Digital Signal Processing", Schaum's Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling and Sandra L. Harris, "Fundamentals of Digital Signal Processing using MATLAB", Thomson, 2007.
4. B. Venkataramani and M. Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications", TATA McGraw Hill, 2002.

Online Learning Resources:

SKILL ORIENTED COURSE – V

Course Code **INDUSTRIAL IOT AND AUTOMATION** **L T P C**
20A70408
Pre-requisite **Semester VII**
Microcontrollers and Interfacing

Course Objectives:

- To discover key IIoT concepts including identification, sensors, localization, wireless protocols, data storage and security
- To explore IoT technologies, architectures, standards, and regulation
- To realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices
- To examine technological developments that will likely shape the industrial landscape in the future
- To understand how to develop and implement own IoT technologies, solutions, and applications

Course Outcomes (CO): At the end of this course, the students will be able to

- Discover key IIoT concepts including identification, sensors, localization, wireless protocols, data storage and security
- Explore IoT technologies, architectures, standards, and regulation
- Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices
- Examine technological developments that will likely shape the industrial landscape in the future
- Understand how to develop and implement own IoT technologies, solutions, and applications

UNIT - I

MODULE 1: Introduction & Architecture

What is IIoT and connected world? the difference between IoT and IIoT, Architecture of IIoT, IOT node, Challenges of IIOT.

Practice

1. Introduction to Arduino, Introduction to raspberry Pi.

https://www.youtube.com/watch?v=AQdLQV6vhbk

UNIT - II

MODULE 2: IIOT Components

Fundamentals of Control System, introductions, components, closed loop & open loop system.

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11). Digital switch, Electromechanical switches.

Practice

1. Measurement of temperature & pressure values of the process using raspberry pi/node

MCU.
2. Modules and Sensors Interfacing (IR sensor, Ultrasonic sensors, Soil moisture sensor) using Raspberry pi/node MCU.
3. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using Raspberry pi/node MCU.

UNIT - III

MODULE 3: Communication Technologies of IIoT

Communication Protocols: IEEE 802.15.4, ZigBee, Bluetooth, BLE, NFC, RFID Industry standards communication technology (MQTT), wireless network communication.

Practice

1. Demonstration of MQTT communication.

UNIT - IV

MODULE 4: Visualization and Data Types of IIoT

Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT.

Practice

1. Visualization of diverse sensor data using dashboard (part of IoT's 'control panel')
2. Sending alert message to the user. ways to control and interact with your environment)

UNIT - V

MODULE 5: Retrieving Data

Extraction from Web: Grabbing the content from a web page, sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction (M2M).

Practice

1. Device control using mobile Apps or through Web pages.
2. Machine to Machine communication.

UNIT - VI

MODULE 6: Control & Supervisory Level of Automation

Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA).

Practice

1. Digital logic gates programming using ladder diagram.
2. Implementation of Boolean expression using ladder diagram.
3. Simulation of PLC to understand the process control concept.

Projects

IIoT based smart energy meter
Smart Agriculture system
Automation using controller via Bluetooth
Temperature controlled Fan/cooler using controller
Automatic streetlight
Smart Baggage Tracker

Textbooks:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail

Butun (editor)

Reference Books:

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I Civil

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	**Experimental Stress Analysis**	**L**	**T**	**P**	**C**
20A50105		**3**	**0**	**0**	**3**
	Semester		**V**		

Course Objectives:

1. To understand different methods of experimental stress analysis
2. To understand the use of strain gauges for measurement of strain
3. To be exposed to different Non destructive methods of concrete
4. To understand the theory of photo elasticity and its applications in analysis of structures
5. To understand different methods of photo elasticity

Course Outcomes (CO):

1. Understand different methods of experimental stress analysis
2. Understand the use of strain gauges for measurement of strain
3. Expose to different Non destructive methods of concrete
4. Understand the theory of photo elasticity and its applications in analysis of structures
5. Understand different methods of photo elasticity

UNIT - I

PRINCIPLES OF EXPERIMENTAL APPROACH:Merits of Experimental Analysis Introduction, uses of experimental stress analysisAdvantages of experimental stress analysis, Different methods –Simplification of problems.

UNIT - II

STRAIN MEASUREMENT USING STRAIN GAUGES :Definition of strain and its relation of experimental Determinations Properties of Strain-

Gauge Systems-Types of Strain Gauges –Mechanical, Acoustic and Optical Strain Gauges. Introduction to Electrical strain gauges - Inductance strain gauges – LVDT – Resistance strain gauges – Various types –Gauge factor – Materials of adhesion base.

UNIT - III

STRAIN ROSSETTES AND NON – DESTRUCTIVE TESTING OF CONCRETE: Introduction – The three elements Rectangular Rosette – The Delta Rosette Corrections for Transverse Strain Gauge.

Ultrasonic Pulse Velocity method –Application to Concrete. Hammer Test – Application to Concrete.

UNIT - IV

THEORY OF PHOTOELASTICITY: Introduction –Temporary Double refraction – The stress Optic Law –Effects of stressed model in a polar scope for various arrangements – Fringe

Sharpening. Brewster's Stress Optic law.

UNIT - V

TWO DIMENSIONAL PHOTOELASTICITY:Introduction – Isochramic Fringe patterns-Isoclinic Fringe patterns passage of light through plane Polariscope and Circular polariscope Isoclinic Fringe patterns – Compensation techniques – Calibration methods – Separation methods – Scaling Model to prototype Stresses – Materials for photo – Elasticity Properties of Photoelastic Materials.

Textbooks:

1. Experimental stress analysis by J.W.Dally and W.F.Riley, College House Enterprises2005
2. Experimental stress analysis by Dr.SadhuSingh.khanna Publishers 4th edition

Reference Books:

1. Experimental Stress analysis by U.C.Jindal, Pearson Pubilications 2012 edition
2. Experimental Stress Analysis by L.S.Srinath, MC.Graw Hill Company Publishers.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I EEE

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	ELECTRIC VEHICLE ENGINEERING (OE-I) EEE		L	T	P	C
20A50205			3	0	0	3
Pre-requisite	AC & DC Machines	Semester	V			

Course Objectives: The student will be able to:

- Understand latest trends in Electric Vehicles; parameters used in EV and types of EVs.
- Analyze various energy sources available to run EV like batteries, fuels cells etc.
- Analyze the dynamics and the propulsion system used in EVs, working of fuel cells, battery charging concept.
- Design a electromechanical system using various control techniques.

Course Outcomes (CO): At the end of the course, the student will be able to:

CO1: Understand the difference between conventional and latest trends in Electric Vehicles; understand the various parameters used in EV, types of HEVs.

CO2: Analyze various energy sources available to run EV like batteries, fuels cells etc.

CO3: Analyze the propulsion system of EV, its dynamics and the concept of battery charging.

CO4: Design EV system with battery charger using various fundamental concepts.

UNIT - I	INTRODUCTION TO EV SYSTEMS AND PARAMETERS	Lecture Hrs: 10

Past, Present and Future EV, EV Concept, EV Technology, State-of-the Art EVs, EV configuration, EV system, Fixed and Variable gearing, single and multiple motor drive, in-wheel drives, EV parameters: Weight, size, force and energy, performance parameters.

UNIT - II	EV AND ENERGY SOURCES	Lecture Hrs: 08

Electro mobility and the environment, history of Electric power trains, carbon emissions from fuels, green houses and pollutants, comparison of conventional, battery, hybrid and fuel cell electric systems

UNIT - III	EV PROPULSION AND DYNAMICS	Lecture Hrs: 10
Choice of electric propulsion system, block diagram, concept of EV Motors, single and multi motor configurations, fixed and variable geared transmission, In-wheel motor configuration, classification, Electric motors used in current vehicle applications, Recent EV Motors, Vehicle load factors, vehicle acceleration.		
UNIT - IV	**FUEL CELLS**	**Lecture Hrs: 10**
Introduction of fuel cells, basic operation, model, voltage, power and efficiency, power plant system – characteristics, sizing, Example of fuel cell electric vehicle. Introduction to HEV, brake specific fuel consumption, comparison of series, series-parallel hybrid systems, examples		
UNIT - V	**BATTERY CHARGING AND VEHICLE CONTROL**	**Lecture Hrs: 10**
Battery charging: Battery Chemistry, Basic requirements, charger architecture, charger functions, wireless charging, power factor correction. **Battery Management System:** Introduction and BMS functionality, Battery pack topology, Voltage, Temperature and Current Sensing. **Control:** Introduction, modelling of electro mechanical system, feedback controller design approach, PI controllers designing, torque-loop, speed control loop compensation, acceleration of battery electric vehicle		

Textbooks: C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001.

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

Reference Books:

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2005.
2. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2015.
3. Tom Denton, "Electric and Hybrid Vehicles", TAYLOR & FRANCIS; 2nd edition, CBS PUBLISHERS, 2nd Edition, 2020.
4. MehrdadEhsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
5. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems -Design by Modelling" Philips Research Book Series 2002.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ee53/preview

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I Mechanical

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Subject Code	Title of the Subject	L	T	P	C
2050305	**OPTIMIZATION TECHNIQUES**	3	0	0	3

Course Objectives:

To introduce various optimization techniques i.e classical, linear programming,

Transportation problem, simplex algorithm, dynamic programming Constrained and unconstrained optimization techniques for solving and optimizing.

Electrical and electronic engineering circuits design problems in real world situations.

To explain the concept of Dynamic programming and its applications to project

Learn the knowledge to formulate optimization problems

UNIT - I

Classical optimization techniques: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints– method of Lagrange multipliers, Kuhn-Tucker conditions.

UNIT - II

Numerical methods for optimization: Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method, types of penalty methods for handling constraints.

UNIT - III

Genetic algorithm (GA) : Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA,

Multi-Objective GA: Pareto's analysis, Non-dominated front, multi – objective GA, Non-dominated sorted GA, convergence criterion, applications of multi-objective problems

UNIT – IV

Genetic Programming (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.

UNIT V

Applications of Optimization in Design and Manufacturing systems: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam and general optimization model of a machining process.

Course Outcomes:

After completion of this course, the student will be able to explain the need of optimization of engineering systems

understand optimization of electrical and electronics engineering problems

apply classical optimization techniques, linear programming, simplex algorithm,

• transportation problem apply unconstrained optimization and constrained non-linear programming anddynamic programming Formulate optimization problems.

TEXT BOOKS:

Optimal design – Jasbir Arora, Mc Graw Hill (International) Publishers

Optimization for Engineering Design – Kalyanmoy Deb, PHI Publishers

Engineering Optimization – S.S.Rao, New Age Publishers

REFERENCES:

1.Genetic algorithms in Search, Optimization, and Machine learning – D.E.Goldberg, Addison-Wesley Publishers

Genetic Programming- Koza

Multi objective Genetic algorithms - Kalyanmoy Deb, PHI Publishers

Open Elective Course – I ECE

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	BASICS OF ELECTRONICS AND	L	T	P	C
20A50405	COMMUNICATION ENGINEERING	3	0	0	3
	Semester	V			

Pre-requisite

Applied Physics

Course Objectives:

- To study the basic principle, construction and operation of semiconductor devices.
- To learn the real time applications of semiconductor devices.
- To introduce binary number systems, logic gates and digital logic circuits.
- To get an idea about the basic principles of communication systems and their applications.
- To learn the measurement of physical parameters using Sensors and Transducers.

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the basic principle, construction and operation of semiconductor devices.
- Learn the real time applications of semiconductor devices.
- Comprehend the binary number systems, logic gates and digital logic circuits.
- Understand the basic principles of communication systems and their applications.
- Measure the physical parameters using Sensors and Transducers.

UNIT - I

Introduction to Electronics Engineering: Overview, scope and objective of studying Electronics Engineering. Introduction to semiconductor devices: Bond structure of semiconductors, intrinsic and extrinsic semiconductors; Basic principle and operation of semiconductor devices – diode, bipolar junction transistor, field effect transistors; Introduction to VLSI.

UNIT - II

Applications of semiconductor devices: Basic concepts of rectifiers, voltage regulators, amplifiers and oscillators; Basic concepts of operational amplifier and their applications.

UNIT - III

Introduction to digital systems: Binary number system, Boolean algebra, Logic gates, adders, one-bit memory, flip-flops (SR, JK), shift registers, Asynchronous counter.

UNIT - IV

Introduction to Communication Systems: Elements of a communication system – transmitter and receiver; Signal types in communication; FDM and TDM; Processing of signals for transmission – basic concepts of amplitude and frequency modulation; Examples of telecommunication systems – telephone, radio, television, mobile communication and satellite communication.

UNIT - V

Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

Textbooks:

5. Millman J, Halkias C.C and Jit S, “Electronic Devices and Circuits”, Tata McGraw-Hill, 2nd 2007 Edition.
6. Mano M.M., “Digital Design”, Prentice-Hall, 3rd Edition. 2002
7. A.K. Sawhney, “A course in Electrical and Electronics Measurements and Instrumentation”, DhanpatRai& Co. 3rd edition Delhi, 2010.
8. Kennedy G. and Davis B., “Electronic Communication Systems”, Tata McGraw-Hill, 4th 2008 Edition.

Reference Books:

3. Tomasi W., “Advanced Electronic Communication Systems”, Pearson/Prentice-Hall, 6th 2004 Edition.
4. Boylstead R.L. and Nashelsky L., “Electronic Devices and Circuit Theory”, Pearson, 10th 2009 Edition.

Online Learning Resources:

Open Elective Course – I CSE

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

INTRODUCTION TO JAVA PROGRAMMING

Course Code:20A50505 Semester V(R20) L T P C : 3 0 0 3

Course Objectives:

- To understand object-oriented concepts and problem-solving techniques
- To obtain knowledge about the principles of inheritance and polymorphism
- To implement the concept of packages, interfaces, exception handling and concurrency mechanism.
- To design the GUIs using applets and swing controls.
- To understand the Java Database Connectivity Architecture

Course Outcomes:

CO1: Solve real-world problems using OOP techniques.
CO2: Apply code reusability through inheritance, packages and interfaces
CO3: Solve problems using java collection framework and I/O classes.
CO4: Develop applications by using parallel streams for better performance and develop applets for web applications.
CO5: Build GUIs and handle events generated by user interactions and Use the JDBC API to access the database.

UNIT – I: **Introduction**

Introduction to Object Oriented Programming, The History and Evolution of Java, Introduction to Classes, Objects, Methods, Constructors, this keyword, Garbage Collection, Data Types, Variables, Type Conversion and Casting, Arrays, Operators, Control Statements, Method Overloading, Constructor Overloading, Parameter Passing, Recursion, String Class and String handling methods.

UNIT – II: **Inheritance, Packages, Interfaces**

Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, Using final with inheritance, Object class,
Packages: Basics, Finding packages and CLASSPATH, Access Protection, Importing packages.
Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

UNIT – III: **Exception handling, Stream based I/O**

Exception handling - Fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built-in exceptions, creating own exception subclasses.

Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and Writing Files, Random access file operations, The Console class, Serialization, Enumerations, Autoboxing, Generics.

UNIT – IV: **Multithreading, The Collections Framework**

Multithreading: The Java thread model, Creating threads, Thread priorities, Synchronizing threads, Interthread communication.

The Collections Framework (java.util): Collections overview, Collection Interfaces, The Collectionclasses- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Hashtable, Properties, Stack, Vector, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner.

UNIT – V: **Applet, GUI Programming with Swings, Accessing Databases with JDBC**

Applet: Basics, Architecture, Applet Skeleton, requesting repainting, using the status window, passing parameters to applets

GUI Programming with Swings – The origin and design philosophy of swing, components and containers, layout managers, event handling, using a push button, jtextfield, jlabel and image icon, the swing buttons, jtext field, jscrollpane, jlist, jcombobox, trees, jtable, An overview of jmenubar, jmenu and jmenuitem, creating a main menu, show message dialog, show confirmdialog, show input dialog, show option dialog, jdialog, create a modeless dialog.

Accessing Databases with JDBC:

Types of Drivers, JDBC Architecture, JDBC classes and Interfaces, Basic steps in developing JDBC applications, Creating a new database and table with JDBC.

Textbooks:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.

2. Java How to Program, 10th Edition, Paul Dietel, Harvey Dietel, Pearson Education.

Reference Books:

1. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.
2. Core Java Volume – 1 Fundamentals, Cay S. Horstmann, Pearson Education.
3. Java Programming for core and advanced learners, Sagayaraj, Dennis, KarthikandGajalakshmi, University Press
4. Introduction to Java programming, Y. Daniel Liang, Pearson Education

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I Chemical

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code		L	T	P	C
20A50805	**ENERGY CONVERSION AND STORAGE DEVICES**	**3**	**0**	**0**	**3**

Pre-requisite

Course Objectives:

1. Understand the fundamentals of fossil energy sources, solar, biomass and electrochemical energy etc
2. Understand the basics of photosynthetic, photocatalytic and photoelectrochemical systems and devices for the efficient energy and fuels production.
3. Learn the principles and operations of electrochemical energy storage devices,

Course Outcomes (CO):

At the end of the course, the student will be able to:

CO1	Understand the need of energyconversion and the various methods of energy storage
CO2	Identify Winds energy as alternateform of energy and to know how itcan be tapped
CO3	Understand the nuclear and bio energy, its mechanism of production and its applications
CO4	Analyse chemical, electrochemical energy storage devices and interpret the conversion efficiencies
CO5	Explain bio gas generation and itsimpact on environment

Course Articulation Matrix

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												

CO2

CO3

CO4

CO5

CO6

UNIT - I

Outline of the course. Introduction and scope of energy conversion. World Energy Production and Balance. Motivations for studying future energy systems (e.g. pollution, climate change, energy security).

UNIT - II

Fossil Energy: Overview of fossil fuel resources and energy contents. Cycle analysis (Rankine, Brayton, combined cycles, cogeneration)

Nuclear Energy: nuclear reaction and energy conversion physics (fission and fusion), nuclear power systems

UNIT - III

Solar-thermal energy: solar thermal radiation physics, Active and passive solar-thermal energy collection and conversion systems

Photoelectric energy: Photoelectric physics. Solar photovoltaic cell materials and technology

Wind Energy: Wind interaction with objects fluid dynamics. Wind harvesting devices and systems

UNIT - IV

Biomass and Waste to Energy: Potential and resources of biomass and waste energy. Thermal-chemical and bio-chemical conversion methods

Overview of Climate Control, CO_2 Sequestration and Energy Sustainability

UNIT - V

Basic of Electrochemical energy conversion and storage, Fundamentals of Fuel Cells, Basics of Fusion power, Energy Storage Technologies, Mechanical storage, Chemical storage, Electrical storage

Textbooks:

Energy Systems Engineering, F.M. Vanek, L.D Albright, and LargusAngenent, Second Edition, McGraw-Hill, Inc., 2012,

Reference Books:

- AngèleReinders, Pierre Verlinden, Wilfried van Sark, Alexandre Freundlich, Photovoltaic Solar Energy:From Fundamentals to Applications, JOHN WILEY.
- Alexander P. Kirk, Solar Photovoltaic Cells: Photons to Electricity, ELSEVIER
- Francesco Dalena, Angelo Basile, Claudio Rossi, Bioenergy Systems For The Future: Prospects ForBiofuels And Biohydrogen, 1st Edition, ELSEVIER
- Jean-Marie Tarascon, Patrice Simon, ELECTROCHEMICAL ENERGY STORAGE,
- Electrochemistry by Carl H. Hamann, Andrew Hamnett and Wolf Vielstich, Wiley VCH, 1998.
- Modern Electrochemistry 1. Volume 1 and 2, by J. O'M. Bockris and A. K. N. Reddy, Kluwer Academic,2000.
- Electrochemical Methods, by A. J. Bard and L. R. Faulkner, John Willey, 1980
- John Love and John A. Bryant, Biofuels and Bioenergy, John Wiley
- Anju Dahiya, Bioenergy: Biomass to Biofuels, Elsevier

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I Mathematics

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

<table>
<tr><td>Course Code</td><td colspan="2" rowspan="2">Optimization Methods
B.Tech III Year
(Common for all)
Open elective course -1</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>20A55101</td><td>0</td><td>3</td><td>0</td><td>3</td></tr>
<tr><td>Pre-requisite</td><td>--</td><td>Semester</td><td colspan="4">I</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="7">Course Objectives:</td></tr>
<tr><td colspan="7">This course enables the students to classify and formulate real-life problem for modeling as optimization problem, solving and applying for decision making.</td></tr>
<tr><td colspan="7">Course Outcomes (CO): Student will be able to</td></tr>
<tr><td colspan="7">formulate a linear programming problem and solve it by various methods.
give an optimal solution in assignment jobs, give transportation of items from sources to destinations.
identify strategies in a game for optimal profit.
implement project planning.</td></tr>
<tr><td>UNIT - I</td><td colspan="2"></td><td colspan="4">8 Hrs</td></tr>
<tr><td colspan="7">Introduction to operational research-Linear programming problems (LPP)-Graphical method-Simplex method-Big M Method-Dual simplex method.</td></tr>
<tr><td>UNIT - II</td><td colspan="2"></td><td colspan="4">8 Hrs</td></tr>
<tr><td colspan="7">Transportation problems- assignment problems-Game theory.</td></tr>
<tr><td>UNIT - III</td><td colspan="2"></td><td colspan="4">9 Hrs</td></tr>
<tr><td colspan="7">CPM and PERT –Network diagram-Events and activities-Project Planning-Reducing critical events and activities-Critical path calculations.</td></tr>
<tr><td>UNIT - IV</td><td colspan="2"></td><td colspan="4">8 Hrs</td></tr>
<tr><td colspan="7">Sequencing Problems-Replacement problems-Capital equipment- Discounting costs-Group replacement .</td></tr>
<tr><td>UNIT - V</td><td colspan="2"></td><td colspan="4">9 Hrs</td></tr>
<tr><td colspan="7">Inventory models-various costs- Deterministic inventory models-Economic lot size-Stochastic inventory models- Single period inventory models with shortage cost.</td></tr>
<tr><td colspan="7">Textbooks:</td></tr>
<tr><td colspan="7">Operations Research , S.D. Sharma.
Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.
Operations Research, Nita H Shah, Ravi M Gor, HardikSoni, PHI publishers</td></tr>
<tr><td colspan="7">Reference Books:</td></tr>
</table>

1. Problems on Operations Research, Er. Premkumargupta, Dr.D.S. Hira, Chand publishers 2. Operations Research, CB Gupta, PK Dwivedi, Sunil kumaryadav
Online Learning Resources:
https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module_1/M1L2slides.pdf https://slideplayer.com/slide/7790901/ https://www.ime.unicamp.br/~andreani/MS515/capitulo12.pdf

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I Physics

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Subject Code	Title of the Subject	L	T	P	C
20A55201	**MATERIALS CHARACTERIZATION TECHNIQUES**	3		-	3

COURSE OBJECTIVES	
1	To provide an exposure to different characterization techniques.
2	To explain the basic principles and analysis of different spectroscopic techniques.
3	To elucidate the basic principle of Scanning electron microscope along with its limitations and applications.
4	To identify the Resolving power and Magnification of Transmission electron microscope and its applications.
5	To educate the uses of advanced electric and magnetic instruments for characterization.
COURSE OUTCOMES	
At the end of the course the student will be able	
CO1	To explain the structural analysis by X-ray diffraction.
CO2	To understand the morphology of different materials using SEM and TEM.
CO3	To recognize basic principles of various spectroscopic techniques.
CO4	To apprehend the electric and magnetic properties of the materials.
CO5	To make out which technique has to be used to analyse a material

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Credit: 3 **Hours of teaching: - 45 H**

UNIT-I **9H**

Structure analysis by Powder X-Ray Diffraction: Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure,Crystallite size by Scherrer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

UNIT-II **9H**

Microscopy technique -1 –Scanning Electron Microscopy (SEM)

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (SecondaryElectron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT-III **9H**

Microscopy Technique -2 - Transmission Electron Microscopy (TEM): Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy,Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy.

UNIT-IV **9H**

Spectroscopy techniques – Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy(ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

UNIT-V **9H**

Electrical & Magnetic Characterization techniques: Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method,Vibrating sample Magnetometer (VSM) and SQUID.

TEXT BOOKS:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods –Yang

Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2008

2. Hand book of Materials Characterization -by **Sharma** S. K. - S**pringer**

REFERENCES:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville BanwellandElaine M.

McCash, Tata McGraw-Hill, 2008.

2. Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks, PrenticeHall, 2001 – Science

3. Materials Characterization: Introduction to Microscopic and Spectroscopic Methods-Yang Leng- John Wiley & Sons

4. Characterization of Materials 2nd Edition, 3 Volumes-Kaufmann E N -John Wiley(Bp)

5. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan,John Wiley & Sons Ltd., 2008.

NPTEL courses

https://nptel.ac.in/courses/115/103/115103030/

https://nptel.ac.in/content/syllabus_pdf/113106034.pdf

https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I H & SS

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES

Course Code	**E-Business**	**L**	**T**	**P**	**C**
20A55401		**3**	**0**	**0**	**3**
Pre-requisite					

Course Objectives:

1.	To provide knowledge on emerging concept on E-Business related aspect.
2.	To understand various electronic markets models which are trending in India
3.	To give detailed information about electronic payment systems net banking.
4.	To exact awareness on internet advertising, market research strategies and supply chain management.
5.	To understand about various internet protocols-security related concept.

Course Outcomes (CO):

1	They will be able to identify the priority of E-Commerce in the present globalised world.
2	Will be able to understand E-market-Models which are practicing by the organization
3.	Will be able to recognize various E-payment systems & importance of net banking.
4.	By knowing E-advertisement, market research strategies, they can identify the importance of customer role.
5.	By understanding about E-security, they can ensure better access control to secure the information
6	Develop a personal synthesis and approach towards E-Business

UNIT – I **Electronic Business**

Definition of Electronic Business - Functions of Electronic Commerce (EC) - Advantages of E-Commerce – E-Commerce and E-Business Internet Services Online Shopping-Commerce Opportunities for Industries.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the concept of E-Business
- Contrast and compare E-Commerce E-Business
- Analyze Advantages of E-Commerce
- Evaluate opportunities of E-commerce for industry

UNIT - II **Electronic Markets and Business Models**

E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals - Business Models-Business to Business(B2B)-Business to Customers(B2C)-Business to Government(B2G)-Auctions-B2B Portals in India

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the concept of business models
- Contrast and compare Vertical portal and Horizontal portals
- Analyze Advantages of portals
- Explain the B2B,B2C and B2G model

UNIT - III **III Electronic Payment Systems**

Digital Payment Requirements-Designing E-payment System- Electronic Fund Transfer (EFT)-Electronic Data Interchange (EDT)-Credit Cards-Debit Cards-E-Cash-Electronic Cheques -Smart Cards-Net Banking-Digital Signature.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the Electronic payment system
- Contrast and compare EFT and EDT
- Analyze debit card and credit card
- Explain the on Digital signature

UNIT - IV **E-Security**

Internet Protocols - Security on the Internet –Network and Website Security – Firewalls – Encryption – Access Control – Secure Electronic transactions.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand E-Security
- Contrast and compare security and network
- Analyze Encryption
- Evaluate electronic transitions

UNIT - V **E-Marketing**

Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Online Market Research– Data mining and Marketing Research Marketing Strategy On the Web – E-Customer Relationship Management(e-CRM) –E- Supply Chain Management.(e-SCM) –New Trends in Supply Chain Management.

LEARNING OUTCOMES:- After completion of this unit student will

- Understand the concept of online marketing
- Analyze advantages of online marketing
- Compare the e-CRM and e-SCM
- Explain the New trends in supply chain management

Textbooks:

1. **E-Commerce by C.S.V Murthy** Himalaya publication house, 2002.
2. **E-Commerce by** P.T.S Joseph, Fourth Edition, Prentice Hall of India 2011

Reference Books:

1. **E-Commerce: by** KamaleshKBajaj,DebjaniNa, Second Edition TataMcGrwHills 2005
2. **E-Commerce E-Management: by Dave Chaffey** – Second Edition, Pearson, 2012.
3. **E-Commerce Fundamentals and Application; by** Henry Chan, Raymond Lee,Tharm Wiley India 2007
4. **E-Commerce: by** S. Jaiswall Galgotia Publication Pvt Ltd 2003.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – I

III B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF CHEMISTRY

Subject Code	Title of the Subject	L	T	P	C
20A55301	**CHEMISTRY OF ENERGY**	2	1	-	3

	MATERIALS				

COURSE OBJECTIVES	
1	To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
2	To understand the basic concepts of processing and limitations of fossil fuels and Fuel cells & their applications.
3	To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method
4	Necessasity of harnessing alternate energy resources such as solar energy and its basic concepts.
5	To understand and apply the basics of calculations related to material and energy flow in the processes.

COURSE OUTCOMES	
CO1	Solve the problems based on electrode potential,Describe the Galvanic Cell Differentiate between Lead acid and Lithium ion batteries, Illustrate the electrical double layer
CO2	Describe the working Principle of Fuel cell,Explain the efficiency of the fuel cell Discuss about the Basic design of fuel cells,Classify the fuel cell
CO3	Differentiate Chemical and Physical methods of hydrogen storage,Discuss the metal organic frame work, Illustrate the carbon and metal oxide porous structures Describe the liquification methods
CO4	Apply the photo voltaic technology,Demonstrate about solar energy and prospects Illustrate the Solar cells,Discuss about concentrated solar power
CO5	Differentiate between Photo and Photo electrochemical Conversions,Illustrate the photochemical cells, Identify the applications of photochemical reactions, Interpret advantages of photoelectron catalytic conversion

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

UNIT-1: Electrochemical Systems: Galvanic cell, standard electrode potential, application of EMF, electrical double layer, dipole moments, polarization, Batteries-Lead-acid and Lithium ion batterie**s.-**
UNIT-2: Fuel Cells: Fuel cell working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency, Basic design of fuel cell,
UNIT-3: Photo and Photo electrochemical Conversions: Photochemical cells and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions.
UNIT-4: Solar Energy: Solar energy introduction and prospects, photo voltaic (PV) technology, concentrated solar power (CSP), Solar Fuels, Solar cells .
UNIT-5: Hydrogen Storage: Hydrogen Storage, Chemical and Physical methods of hydrogen storage, Hydrogen Storage in metal hydrides, metal organic frame works (MOF), Carbon structures, metal oxide porous structures, hydrogel storage by high pressure methods. Liquifaction method.

References :

1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins
4. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services and corporation)
5. Hand book of solar energy and applications by Arvind Tiwari and Shyam.
6. Solar energy fundamental, technology and systems by Klaus Jagar et.al.
7. Hydrogen storage by Levine Klebonoff

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – II Civil
III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	Disaster Management	L	T	P	C
20A60105		**3**	**0**	**0**	**3**

Course Objectives:

1. To give knowledge types of disasters and stages in disaster rehabilitation process.
2. To make awareness on change in climates and their impacts on occurrence of environmental disasters.
3. To impart knowledge on Consideration of wind and water effects as per codal provisions to withstand disasters.
4. To familiarize the student with the Causes of earthquake and their effects and remedial methods to be adopted for buildings.
5. To illustrate the methodology in Planning and design considerations of various structures constructing in disaster prone areas.

Course Outcomes (CO):

1. About various types of disasters and stages in disaster rehabilitation process.
2. Impact of change in climates and their impacts on occurrence of environmental disasters.
3. Adopting suitable codal provisions to study the effect of wind and water effects on various structures constructed at disaster prone areas.
4. Causes of earthquake and their effects and remedial methods to be adopted for buildings.
5. Adopt suitable Planning and design considerations of various structures constructing in disaster prone areas.

UNIT - I

Brief introduction to different types of natural disaster, Occurrence of disaster in different climatic and geographical regions, hazard (earthquake and cyclone) map of the world and India, Regulations for disaster risk reduction, Post disaster recovery and rehabilitation (socioeconomic consequences)

UNIT - II

Climate change and its impact on tropical cyclone, Nature of cyclonic wind, velocities and pressure, Cyclone effects, Storm surge, Floods, Landslides. Behavior of structures in past cyclones and wind storms, case studies. Cyclonic retrofitting, strengthening of structures and adaptive sustainable reconstruction. Life–line structures such as temporary cyclone shelter.

UNIT - III

Basic wind engineering, aerodynamics of bluff bodies, vortex shedding and associated unsteadiness along and across wind forces. Lab: Wind tunnel testing, its salient features. Introduction to Computational fluid dynamics. General planning/design considerations under wind storms & cyclones; Wind effects on buildings, towers, glass panels etc, & wind resistant features in design. Codal Provisions, design wind speed, pressure coefficients; Coastal zoning regulation for construction & reconstruction phase in the coastal areas, innovative construction material & techniques, traditional construction techniques in coastal areas.

UNIT - IV

Causes of earthquake, plate tectonics, faults, seismic waves; magnitude, intensity, epicenter, energy release and ground motions. Earthquake effects – On ground, soil rupture, liquefaction, landslides. Performance of ground and building in past earthquakes: Behavior of various types of buildings, structures, and collapse patterns; Behavior of Non-structural elements like services, fixtures, mountings- case studies. Seismic retrofitting- Weakness in existing buildings, aging, concepts in repair, restoration and seismic strengthening.

UNIT - V

General Planning and design consideration; Building forms, horizontal and vertical eccentricities, mass and stiffness distribution, soft storey etc.; Seismic effects related to building configuration. Plan and vertical irregularities, redundancy and setbacks. Various Types and Construction details of: Foundations, soil stabilization, retaining walls, plinth fill, flooring, walls, openings, roofs, terraces, parapets, boundary walls, under-ground – overhead tanks, staircases and isolation of structures; innovative construction material and techniques; Local practices: traditional regional responses; Computational investigation techniques.

Textbooks:

1. Disaster Management by Rajib Shah, Universities Press, India, 2003
2. Disaster Management by R.B. Singh (Ed) Rawat Publication, New Delhi, 2000

Reference Books:

1. Natural disasters. By Abbott, L. P. (2013) 9th Ed. McGraw-Hill.
2. Earthquake Resistant Design of Structures. By Agarwal, P. and Shrikhande, M. (2009). New Delhi : PHI Learning.
3. Mapping Vulnerability: Disasters, Development and People. byBankoff, G., Frerks, G. and Hilhorst, D. (2004). London :Earthscan.
4. Improving Earthquakes and Cyclone Resistance of Structures:Guidelines for the Indian Subcontinent. TERI
5. Disaster Mitigation, preparedness, recovery and Response. By Sinha, P. C. (2006). New Delhi : SBS Publishers.
6. World Bank. (2009). Handbook for Reconstructingafter Natural Disasters.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II EEE

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	RENEWABLE ENERGY SYSTEMS	L	T	P	C

20A60205	(OE-II)		3	0	0	3
Pre-requisite		**Semester**	**VI**			

Course Objectives: To make the students learn about:

- Various sources of Energy and the need of Renewable Energy Systems.
- The concepts of Solar Radiation, Wind energy and its applications.
- Operation of Solar thermal and solar PV systems
- The concept of geo thermal energy and its applications, biomass energy, the concept of Ocean energy and fuel cells.

Course Outcomes (CO): At the end of the course the student will be able to:

CO 1 Understand various alternate sources of energy for different suitable application requirements.
CO 2 Analyze the concepts of solar energy generation strategies and wind energy system
CO 3 Design Solar and Wind energy systems.
CO 4 Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power.

UNIT - I	**SOLAR ENERGY**	Lecture Hrs: 10

Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

UNIT - II	**PV ENERGY SYSTEMS**	Lecture Hrs: 10

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Electrical characteristics of silicon PV cells and modules, PV systems for remote power, Grid connected PV systems.

UNIT - III	**WIND ENERGY**	Lecture Hrs: 10

Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations.

UNIT - IV	**GEOTHERMAL ENERGY**	Lecture Hrs: 8

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

UNIT - V	**MISCELLANEOUS ENERGY TECHNOLOGIES**	Lecture Hrs: 10

Ocean Energy: Tidal Energy-Principle of working, performance and limitations. Wave Energy-Principle of working, performance and limitations.
Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration
Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Text books:

1. Stephen Peake, "Renewable Energy Power for a Sustainable Future", Oxford International Edition, 2018.
2. G. D. Rai, "Non-Conventional Energy Sources", 4th Edition, Khanna Publishers, 2000.

Reference Books:

1. S. P. Sukhatme, "Solar Energy",3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
2. B H Khan , " Non-Conventional Energy Resources", 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
3. S. Hasan Saeed and D.K.Sharma,"Non-Conventional Energy Resources",3rd Edition, S.K.Kataria& Sons, 2012.
4. G. N. Tiwari and M.K.Ghosal, "Renewable Energy Resource: Basic Principles and Applications", Narosa Publishing House, 2004.

Online Learning Resources:

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771
https://www.slideshare.net/VikramNani/e-commerce-business-models
https://www.slideshare.net/RiteshGoyal/electronic-payment-system
https://www.slideshare.net/WelingkarDLP/electronic-security
https://www.slideshare.net/Ankitha2404/emarketing-ppt

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II Mechanical

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Subject Code	Title of the Subject	L	T	P	C
	SOLAR ENERGY	3	0	0	3

20A60305	SYSTEMS				

Course objectives

Learning the fundamental principles of solar radiation and geographic distribution of solar radiation.

Study of various solar energy technologies with different types of concentrating collectors.

Comparative study of different solar cells with respect to properties and applications of solar cells in nano technology.

Understanding the basics of economics involves in the solar system.

Learning the concepts and designing aspects in thermal power. 6. Study of solar pond and solar stills and their applications.

UNIT – I

SOLAR RADIATION:

Sources of radiation –sun earth relationship, Solar Time and angles, day length, angle of incidence on tilted surface; Sun path diagram, Solar Radiation: Extraterrestrial Radiation; Effect of earth atmosphere; Estimation of solar radiation on horizontal and tilted surfaces. Geographic Distribution of solar radiation, Phyrellio, pyranometer, equation of time-estimation of average radiation falling on tilled.

UNIT-II

SOLAR ENERGY TECHNOLOGIES:

Performance analysis of a liquid Flat-plate collector, Total loss coefficient and heat losses: Top loss coefficient, Bottom loss coefficient, Side loss coefficient. Solar concentrating collectors, types of concentrating collectors, Parabolic Dish System, The central power tower system, The Parabolic Trough System, Tracking CPC and Solar Swing, Performance analysis of cylindrical parabolic collector, Compound parabolic concentrator (CPC).

UNIT-III

SOLAR CELLS:

Solar cell fundamentals, solar cell classification, solar cell, module, panel array construction, maximum power pint trackers(MPPT), solar PV applications, The Recent developments in Solar cells, Role of Nano-Technology in Solar cells.

UNIT – IV

ECONOMICS:

Discounted Cash Flow-light cycle, coasting of solar system, production function and optimization

UNIT – V

THERMAL POWER:

The power concepts- design aspects, thermo-chemical reactor.

SOLAR POND AND SOLAR STILLS:

Working Principle-Construction-operating difficulties and remedies, Agriculture and Domestic applications: Still, timber drying, crop drying, cooker.

Course Outcomes :

Illustrate the fundamental principles of solar radiation and geographic distribution of solar radiation.

Obtaining the performance analysis of liquid flat plate collector and cylindrical parabolic collector.

Developing solar cells in the field of nano technology.

Calculating the cash flow and costs involves in the solar energy systems.

Designing and developing of thermo chemical reactor with respect to thermal power.

<u>Reference Books:</u>

Solar Energy Thermal Process Diffice and Beckman

Solar Heating and Cooling by Kreith and Kreider

Solar Energy Utilization by G.D.Rai

Solar Energy Utilization by G.D.Rai , Khanna Publishers.

Renewable Energy Sources and Emerging Technologies- By D.P. Kothari, PHI Pub.,

Applied Solar Energy by Meinel and Meinel

Non-Conventional Energy Resources by B.H . Khan, Tata McGraw Hill

Energy Resources Utilization and Technologies ByAnjaneyulu, BS Pub.

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II ECE

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	BASICS OF INTEGRATED CIRCUITS	L	T	P	C
20A60405	**APPLICATIONS**	3	0	0	3

\Pre-requisite

Basics of Electronics and Communication Engineering

Course Objectives:

- To introduce the basic building blocks of linear & digital integrated circuits.
- To learn the linear and non - linear applications of operational amplifiers.
- To introduce the theory and applications of 555 and PLL.
- To learn the theory of ADC and DAC
- To understand different families of digital integrated circuits and their characteristics.

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the basic concepts of Op -AMPs, characteristics and specifications.
- Design circuits using operational amplifiers for various applications.
- Develop, apply and analyze circuits for advanced applications using Op-Amps, PLL, VCO and Analog multipliers.
- Understand different families of digital integrated circuits and their characteristics
- Design various and sequential circuits using digital ICs.

UNIT - I

Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT - II

Op-Amp, IC-555 & IC 565 Applications: Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

UNIT - III

Data Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT - IV

Digital Integrated Circuits: Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing- TTL Driving CMOS & CMOS Driving TTL

Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT - V

Sequential Logic ICs and Memories: Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers. Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

Textbooks:

3. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", PHI, 2003.
4. Floyd and Jain, "Digital Fundamentals", Pearson Education, 8th Edition, 2005.

Reference Books:

5. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (p) Ltd, Second Edition, 2003.
6. James M. Fiore, "Op Amps and Linear Integrated Circuits-Concepts and Applications", Cengage Learning/ Jaico, 2009.
7. K.Lal Kishore, "Operational Amplifiers with Linear Integrated Circuits", Pearson, 2009.
8. John. F. Wakerly, "Digital Design Principles and Practices", Pearson, Third Edition, 2005.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II CSE

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Introduction to Linux Programming

Course Code:20A60505 **L T P C : 3 0 0 3**

Course Objectives:

- To study the commands according to user requirements.
- To utilize Shell scripts to perform the given task.
- To enable writing own programs in UNIX.
- To know AWK programs.

Course Outcomes:

CO1: Develop text data processing applications using Unix commands and filters.

CO2: Design and develop text based user interface components

CO3: Understand user management, network management and backup utilities

CO4: Use the system calls for file management

CO5: Understands the Concept of Process Threads and File Structure.

UNIT-I: Introduction,Unix File System,Unix Commands

Operating System, History of UNIX, Overview and Features of Unix System,Structure of Unix System, Unix Environment. **Unix File System**: Introduction of Files, Organization of File Systems, Accessing File Systems, Structure of File Systems. **Unix Commands**: Basic Commands, Advanced Unix Commands: File Access Permissions, Pipe Operator, cut, paste, wc, sort, head, tail, diff, cmp, uniq, comm, time, Conversions between DOS and Unix, man.

UNIT-II: File management and Compression Techniques,Manipulating Processes and Signals
Managing and Compressing Files, Computer Devices, Disk related Commands, Compression and Uncompressing Files, Important Unix System Files, Shell Variables, Export of Local and Global Shell Variables.
Manipulating Processes and Signals: Process Basics, Processes States and Transitions, Zombie Process, Context switching, Threads, ps-status of Process.
UNIT-III: System calls
Introduction, File-related System calls (open, create, read, write, lseek), File-related System calls (close, mknod, link and unlink, access, and chown, chmod), Directory Handling System calls (mkdir, rmdir, chdir, opendir, readdir, telldir, closedir), Process related System calls (exec, fork, wait,exit).
Editors in Unix: introduction, Stream editor, Emacs Editor.

UNIT-IV: AWK Script,Burne Shell

AWK Command, print, printf, Displaying Content of Specified Patterns, Comparison Operators, Compound Expressions, Arithmetic Operators, Begin and end Sections, User-defined Variables, if else Statement, Built-in Variables, Changing Input Filed Separator, Functions, Loops, Getting Input from User, Search and Substitute Functions, Copying results into Another file.

Bourne Shell: Introduction, beginning Bourne Shell Scripting, Writing Shell Scripts, Command Line Parameters, read, for Loop, While Loop, if Statement, Bourne Shell Commands.

UNIT-V: InterprocessCommunicaation, Unix System Administration and Networking

Interprocess Communication, Synchronization, Filters.

Unix System Administration and Networking: Unix Booting Procedure,Mounting Unix File System, Unmounting Unix File System, Managing User Accounts, Networking Tools, mail Command, Distributed File System, Firewalls, Backup and Restore.

TEXT BOOKS

1. "UNIX and SHELL Programming", B.M. HARWANI, OXFORD UNIVERSITY PRESS.

REFERENCES

1. "UNIX and Linux System Administration Handbook", Evi Nemeth, Garth Snyder, Trent R. Hein and Ben Whaley, PHI

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II Chemical

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	OE2. GREEN TECHNOLOGY	L	T	P	C
20A60805		3	0	0	3

Pre-requisite

Course Objectives:

Course Outcomes (CO):

At the end of the course, the student will be able to:

CO1	Understand the basic knowledge of environmental issues and estimate the risk
CO2	Evaluate the exposures
CO3	To discuss the type of wastes and emissions that drive the environmental impacts
CO4	Estimation of the environmental properties, persistence, ecosystem risk,
CO5	To present approaches and methodologies for evaluating and improving the environmental performance of chemical processes and chemical products.

Course Articulation Matrix

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

UNIT - I

An introduction to environmental issues: Role of chemical processes and chemical products, Global environmental issues, Air and water quality issues, Ecology.

Risk concept: Description of risk, Risk assessment concept, Dose-response, Exposure assessment.

UNIT - II

Evaluating exposures: Occupational exposures: recognition, evaluation, control, Exposure assessment for chemicals in the ambient environment, Designing safer chemicals.

Green chemistry:Green chemistry methodologies, Optimization based frameworks for the design of green chemical synthesis pathway.

UNIT - III

Evaluating environmental fate: Chemical and physical property estimation, estimating environmental persistence, estimating ecosystem risk, classifying environmental risk based on chemical structure.

UNIT - IV

Life-cycle concepts: Life-cycle assessment, Life-cycle impact assessment

UNIT - V

Material flows in chemical manufacturing, Assessing opportunities for waste exchanges and by-product synergies.

Textbooks:

SHONNARD, DALLEN, D. Green Engineering: Environmentally Conscious Design of Chemical Processes.

Reference Books:

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF MATHEMATICS

Course Code	Mathematical Modelling & Simulation	L	T	P	C

<table>
<tr><td>20A65101</td><td colspan="2">(Common for CIVIL,MECH&CHEM)</td><td>0</td><td>3</td><td>0</td><td>3</td></tr>
<tr><td>Pre-requisite</td><td></td><td>Semester</td><td colspan="4">II</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="7">Course Objectives:</td></tr>
<tr><td colspan="7">This course focuses on what is needed to build simulation software environments, and not just building simulations using preexisting packages.</td></tr>
<tr><td colspan="7">Course Outcomes (CO): Student will be able to</td></tr>
<tr><td colspan="7">• understand basic Model Forms.
• understand basic Simulation Approaches.
• evaluate handling Stepped and Event-based Time in Simulations.
• distinguish Discrete versus Continuous Modeling.
• apply Numerical Techniques.
• calculate Sources and Propagation of Error.</td></tr>
<tr><td>UNIT - I</td><td colspan="2"></td><td colspan="4">8 Hrs</td></tr>
<tr><td colspan="7">Simulation Basics-Handling Stepped and Event-based Time in Simulations-Discrete versus Continuous Modelling-Numerical Techniques-Sources and Propagation of Error</td></tr>
<tr><td>UNIT - II</td><td colspan="2"></td><td colspan="4">9 Hrs</td></tr>
<tr><td colspan="7">Dynamical, Finite State, and Complex Model Simulations-Graph or Network Transitions Based Simulations-Actor Based Simulations-Mesh Based Simulations-Hybrid Simulations</td></tr>
<tr><td>UNIT - III</td><td colspan="2"></td><td colspan="4">8 Hrs</td></tr>
<tr><td colspan="7">Converting to Parallel and Distributed Simulations-Partitioning the Data-Partitioning the Algorithms-Handling Inter-partition Dependencies</td></tr>
<tr><td>UNIT - IV</td><td colspan="2"></td><td colspan="4">8 Hrs</td></tr>
<tr><td colspan="7">Probability and Statistics for Simulations and Analysis-Introduction to Queues and Random Noise-Random Variates Generation-Sensitivity Analysis</td></tr>
<tr><td>UNIT - V</td><td colspan="2"></td><td colspan="4">9 Hrs</td></tr>
<tr><td colspan="7">Simulations Results Analysis and Viewing Tools-Display Forms: Tables, Graphs, and Multidimensional Visualization-Terminals, X and MS Windows, and Web Interfaces-Validation of Model Results.</td></tr>
<tr><td colspan="7">Textbooks:</td></tr>
<tr><td colspan="7">1. Mathematical modeling, JN Kapur, Newage publishers
2. Mathematical Modeling and Simulation: Introduction for Scientists and Engineers</td></tr>
</table>

by Kai Velten, Wiley Publishers
Reference Books:
1. Introduction to Mathematical Modeling and Computer Simulations By Vladimir Mityushev,WojciechNawalaniecNataliaRylko Published by Chapman and Hall/CRC.
Online Learning Resources:
http://www.cse.chalmers.se/~dag/docs/matmodReport6.pdf https://www.slideshare.net/arupparia/introduction-to-mathematical-modelling-42588379 https://www.slideshare.net/mailrenuka/simulation-for-queuing-problems-using-random-numbers

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF MATHEMATICS

Course Code	Wavelet transforms and its Applications	L	T	P	C

20A65102	(Common for EEE&ECE)		0	3	0	3
Pre-requisite	Fourier Series	**Semester**	**II**			

Course Objectives:

This course provides the students to understand Wavelet transforms and its applications.

Course Outcomes (CO): Student will be able to

- understand wavelets and wavelet expansion systems.
- illustrate the multi resolution analysis ad scaling functions.
- form fine scale to coarse scale analysis.
- find the lattices and lifting.
- perform numerical complexity of discrete wavelet transforms.
- find the frames and tight frames using Fourier series.

UNIT - I	Wavelets	9 Hrs

Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems - Haar Scaling Functions and Wavelets -effectiveness of Wavelet Analysis -The Discrete Wavelet Transform The Discrete-Time and Continuous Wavelet Transforms.

UNIT - II	A Multiresolution Formulation of Wavelet Systems	8 Hrs

Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT - III	Filter Banks and the Discrete Wavelet Transform	9 Hrs

Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating -Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View.

UNIT - IV	Time-Frequency and Complexity	9 Hrs

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

UNIT - V	Bases and Matrix Examples	8 Hrs

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight Frame Example.

Textbooks:
1. C. Sidney Burrus, Ramesh A. Gopinath, “Introduction to Wavelets and Wavelets Transforms”,Prentice Hall, (1997). 2. James S. Walker, “A Primer on Wavelets and their Scientific Applications”, CRC Press, (1999).
Reference Books:
1. Raghuveer Rao, “Wavelet Transforms”, Pearson Education, Asia.
Online Learning Resources:
https://www.slideshare.net/RajEndiran1/introduction-to-wavelet-transform-51504915

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF MATHEMATICS

Course Code	**Statistical Methods for Data Science**	**L**	**T**	**P**	**C**
20A65103	**CSE (Data Science)**		**3**		**3**

Pre-requisite		Semester	II
Course Objectives:			
This course aims at providing knowledge on basic concepts of Statistics, Estimation and testing of hypotheses for large and small samples.			
Course Outcomes (CO): Student will be able to			
• Understand the basic concepts of Statistics • Analyze data and draw conclusion about collection of data under study using Point estimation • Analyze data and draw conclusion about collection of data under study using Interval estimation • Analyzing the tests and types of errors for large samples • Apply testing of hypothesis for small samples.			
UNIT - I	**Basic Concepts**		**9 Hrs**
Population, sample, parameter and statistic; characteristics of a good estimator; Consistency – Invariance property of Consistent estimator, Sufficient condition for consistency; Unbiasedness; Sufficiency – Factorization Theorem – Minimal sufficiency; Efficiency – Most efficient estimator, likelihood equivalence, Uniformly minimum variance unbiased estimator,applications of Lehmann-Scheffe’s Theorem, Rao - Blackwell Theorem and applications			
UNIT - II	**Point Estimation**		**8 Hrs**
Point Estimation- Estimator, Estimate, Methods of point estimation – Maximum likelihood method (the asymptotic properties of ML estimators are not included), Large sample properties of ML estimator(without proof)- applications , Method of moments, method of least squares, method of minimum chi-square and modified minimum chi-square-Asymptotic Maximum Likelihood Estimation and applications.			
UNIT - III	**Interval Estimation**		**8 Hrs**
Confidence limits and confidence coefficient; Duality between acceptance region of a test and a confidence interval; Construction of confidence intervals for population proportion (small and large samples) and between two population proportions(large samples); Confidence intervals for mean and variance of a normal population; Difference between the mean and ratio of two normal populations.			
UNIT - IV	**Testing of hypotheses**		**9 Hrs**
Types of errors, power of a test, most powerful tests; Neyman-Pearson Fundamental Lemma and its applications; Notion of Uniformly most powerful tests; Likelihood Ratio tests: Description and property of LR tests - Application to standard distributions.			
UNIT - V	**Small sample tests**		**9 Hrs**
Student’s t-test, test for a population mean, equality of two population means, paired t-test, F-test for equality of two population variances,CRD,RBD,LSD; Chi-square test for goodness of fit and test for independence of attributes, $\chi 2$ test for testing variance			

of a normal distribution Sign test, Signed rank test, Median test, Mann-Whitney test, Run test and One sample Kolmogorov –Smirnov test ,Kruskal – Wallis H test(Description, properties and applications only).
Textbooks:
1. Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of Hypotheses, Prentice Hall of India, 2014. 2. Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman, Probability and Statistical Inference,9th edition,Pearson publishers,2013.
Reference Books:
1. S.P.Gupta, Statistical Methods, 33rd Edition, Sultan Chand & Sons. 2. Miller and John E Freund, Probability and Statistics for Engineers, 5th Edition.
Online Learning Resources:
1. https://www.statstutor.ac.uk/resources/uploaded/1introduction3.pdf 2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2996198/

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

PHYSICS OF ELECTRONIC MATERIALS AND DEVICES

COURSE OBJECTIVES

1 To impart the fundamental knowledge on various materials, their properties and

Applications.

2 To provide insight into various semiconducting materials and their properties.

3 To elucidate the characteristic behavior of various semiconductor devices.

4 To provide the basics of dielectric and piezoelectric materials and their properties.

5 To explain different categories of magnetic materials, mechanism and their

advanced applications.

COURSE OUTCOMES

At the end of the course the student will be able

CO1 To understand the fundamentals of various materials.

CO2 To exploit the physics of semiconducting materials

CO3 To familiarize with the working principles of semiconductor-based devices.

CO4 To understand the behavior of dielectric and piezoelectric materials.

CO5 To make use of the magnetic materials for advanced applications.

Mapping between Course Outcomes and Programme Outcomes

PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12

CO1

CO2

CO3

CO4

CO5

SYLLABUS **Credit: 3 Hours of teaching: - 45 H**

UNIT-1 Fundamentals of Materials Science: 9H

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. Basic idea of point, line and planar defects.Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge).

UNIT-2: Semiconductors: 9H

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

UNIT-3: Physics of Semiconductor Devices: 9H

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium.and under bias, Construction and working principles of: Light emitting diodes, Heterojunctions, Transistors, FET and MOSFETs.

UNIT-4: Dielectric Materials and their Applications: 9H

Introduction, Dielectric properties, Electronic polarizability and susceptibility, Dielectric constant and frequency dependence of polarization, Dielectric strength and dielectric loss, Piezoelectric properties- Ferroelectricity-Applications.

UNIT-5: Magnetic Materials and their Applications: 9H

Introduction, Magnetism & various contributions to para and dia magnetism, Ferro and Ferri magnetism and ferrites, Concepts of Spin waves and Magnons, Anti-ferromagnetism, Domains and domain walls, Coercive force, Hysteresis, Nano-magnetism, Super-paramagnetism – Properties and applications.

Text Books

1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd.,3rd edition, 2007.

2. Electronic Components and Materials- Grover and Jamwal, DhanpatRai and Co.

Reference Books:

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning,6th edition

2. Electronic Materials Science- Eugene A. Irene, , Wiley, 2005

3. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd., , 2nd Edition,2011

4. A First Course In Material Science- by Raghvan, McGraw Hill Pub.

5. The Science and Engineering of materials- Donald R.Askeland,Chapman& Hall Pub.

6. Electrical Engineering Materials-by A.J. Dekker, PHI Pub

NPTEL courses links

https://nptel.ac.in/courses/113/106/113106062/

https://onlinecourses.nptel.ac.in/noc20_mm02/preview

https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-mm07

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II H& SS

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	**Academic Writing and Public Speaking**		**L**	**T**	**P**	**C**
20A65501			**3**	**0**	**0**	**3**
Pre-requisite						
Course Objectives:						

➢ To encourage all round development of the students by focusing on writing skills ➢ To make the students aware of non-verbal skills ➢ To develop analytical skills ➢ To deliver effective public speeches		
Course Outcomes (CO):		
By the end of the program students will be able to • Define various elements of Academic Writing • Understand how to paraphrase sources and avoid plagiarism • Demonstrate the knowledge in writing a Research paper • Analyse different types of essays • Assess the speeches of others and know the positive strengths of speakers • Build confidence in giving an impactful presentation to the audience		
UNIT - I	Introduction to Academic Writing	Lecture Hrs
Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing		
UNIT - II	**Academic Journal Article**	Lecture Hrs
Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing - Editing, Proof Reading - Plagiarism		
UNIT - III	**Essay & Writing Reviews**	Lecture Hrs
Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review-		
UNIT - IV	Public Speaking	Lecture Hrs
Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation – Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events		
UNIT - V	Public Speaking and Non-Verbal Delivery	Lecture Hrs
Body Language – Kinesics – Oculesics – Proxemics – Haptics – Paralanguage		
Textbooks:		
1. **Critical Thinking, Academic Writing and Presentation Skills: Mg University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010)** 2. **A Course In Academic Writing Paperback – 1 January 2017Publisher : The Orient Blackswan; Second edition (1 January 2017)**		

Reference Books:
1. **A Handbook For Academic Writing and Composition Paperback – 1 January 2014** by Nzanmongi Jasmine PattonPublisher : Pinnacle Learning; 1st edition (1 January 2014) 2. Critical Thinking, Academic Writing and Presentation Skills: Mg University Edition Paperback – 1 January 2010Publisher : Pearson Education; First edition (1 January 2010) by Marilyn Anderson (Author) 3. Effective Academic Writing Second Edition: 1: Student Book: The Paragraph Paperback – Student Edition, 9 June 2014 by Alice Savage (Author), MasoudShafiei (Author)Publisher : Oxford University Press; Student, Workbook edition (9 June 2014) 4. A Course In Academic Writing Paperback – 1 January 2017 by Renu Gupta (Author) Publisher : The Orient Blackswan; Second edition (1 January 2017)
Online Learning Resources:
1. https://youtu.be/NNhTIT81nH8 2. phttps://www.youtube.com/watch?v=478ccrWKY-A 3. https://www.youtube.com/watch?v=nzGo5ZC1gMw 4. https://www.youtube.com/watch?v=Qve0ZBmJMh4

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – II

III B.TECH – II SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF CHEMISTRY

Subject Code	Title of the Subject	L	T	P	C
	CHEMISTRY OF POLYMERS AND ITS APPLICATIONS	2	1	-	3

COURSE OBJECTIVES	
1	To understand the basic principles of polymers
2	To synthesize the different polymeric materials and their characterization by various instrumental methods.
3	To impart knowledge to the students about fundamental concepts of Hydro gels of polymer networks, surface phenomenon by micelles
4	To enumerate the applications of polymers in engineering

COURSE OUTCOMES	
CO1	Classify the polymers, Explain polymerization mechanism, Differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer
CO2	Differentiate Bulk, solution, Suspension and emulsion polymerization, Describe fibers and elastomers, Identify the thermosetting and thermo polymers, Characterize the properties of polymers by IR, NMR, XRD etc.
CO3	Describe the properties and applications of polymers, Interpret the properties of cellulose, lignin, starch, rosin, latex etc., Discuss the special plastics of PES, PAES, PEEK etc., Explain modified cellulosics
CO4	Identify types of polymer networks, Describe methods involve in hydrogel preparation, Explain applications of hydrogels in drug delivery, Demonstrate the advanced drug delivery systems and controlled release
CO5	Demonstrate electrical phenomena at interfaces including electrokinetics, miselles, reverse micelles etc., Explain photoelectron spectroscopy, Discuss ESCA and Auger spectroscopy to the study of surfaces, Differentiate micelles and reverse micelles

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Unit – I: Polymers-Basics and Characterization :-

Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, co polymerization and coordination. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: end group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

Unit – II: Synthetic Polymers

Addition and condensation polymerization processes – Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties, Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers, Diene polymers, nylons, Urea - formaldehyde, phenol – formaldehyde. Melamine Epoxy and Ion exchange resins. Characterization of polymers by IR, NMR, XRD

Unit – III : Natural Polymers & Modified cellulosics

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins. Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

Unit-IV: Hydrogels of Polymer networks and Drug delivery

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

Introduction to drug systems including, drug development, regulation, absorption and disposition, routes of administration and dosage forms. Advanced drug delivery systems and controlled release.

Unit – V: Surface phenomena

Surface tension, adsorption on solids, electrical phenomena at interfaces including electrokinetics, micelles, reverse micelles, solubilization. Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces.

References :

1. A Text book of Polymer science, Billmayer
2. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
3. Advanced Organic Chemistry, B.Miller, Prentice Hall
4. Polymer Chemistry – G.S.Mishra
5. Polymer Chemistry – Gowarikar
6. Physical Chemistry –Galston
7. Drug Delivery- Ashim K. Misra

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – III CIVIL

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

Course Code	Building Technology for Engineers	L	T	P	C
20A70104		3	0	0	3

Course Objectives :

1. To make the student familiar with varioustypes of Buildings and its components
2. To teach the students about general requirements of building regarding safety and transportation

3. To impart knowledge on various special requirements of buildings regarding ventilation, insulation acoustics, etc,.
4. To make the student familiar with the concepts of various Prefabrication systems.
5. To Teach the students about various construction equipments used in building.

Course Outcomes:

By the end of this course the student will be able to

1. Classify various types of buildings and its components.
2. Understand the general requirements of building regarding safety and transportation.
3. Understand the Special requirements of buildings regarding ventilation, insulation acoustics, etc,.
4. Familiarize with the concepts of various Prefabrication systems.
5. Understand various construction equipments used in building.

UNIT-1

Building planning: Types of Buildings — components, definitions, economy and design, Principles and aspects of building planning, Definitions and importance of Grouping and circulation; Lighting and ventilation; Sustainability and Green Buildings.

UNIT-II

General requirements: Requirements for safety against fire, termite, damping, earthquakes, Vertical transportation in building — planning of vertical transportation, Stairs, different forms of stairs, Other modes of vertical transportation.

UNIT-III

Special Requirements: Air conditioning — process and classification of air conditioning, Dehumidification. Systems of air-conditioning, ventilation, functional requirements of ventilation. Thermal insulation. Acoustics, effect of noise, properties of noise and its measurements, Principles of acoustics of building. Sound insulation.

UNIT-IV

Prefabrication systems: Prefabricated walls, openings, cupboards, shelves etc., planning and modules and sizes of components in prefabrication. Plumbing services — water supply system, maintenance of building pipe line, Sanitary fittings, Design of building drainage.

UNIT-V

Construction Equipment: Introduction and Planning for construction Equipment, Earthmoving and Excavating equipment, Pile driving equipment, Lifting and Concreting Equipment.

<u>Learning Resources:</u>

Text Books:

1. Building Construction, Punmia B. C., Jain A.J., and Jain A.J., Laxmi Publication, 2016, Eleventh Edition.
2. The Text book for Building Construction, Arora S. P., and Bindra S. P., Dhanpat Rai Pubications, 2010.

Reference Books:

1. Building Construction, Varghese P.C., PHI Learning Pvt. Ltd., 2017, 2^{nd} Edition.
2. Construction Planning, Equipment and Methods, Robert P., Clifford J. S., and Aviad S., McGrawHiII Education, 2010

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – III EEE

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

<table>
<tr><td>Course Code</td><td colspan="2" rowspan="2" align="center">BATTERY MANAGEMENT SYSTEMS
(OE-III)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>20A70204</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Pre-requisite</td><td>Basic Electrical Engineering</td><td align="right">Semester</td><td colspan="4">VI</td></tr>
<tr><td colspan="7">Course Objectives: To make the students learn about:</td></tr>
<tr><td colspan="7">• Understand the role of battery management system and the requirements of BMS.
• Interpret the concept associated with battery charging / discharging process</td></tr>
</table>

- Analyze various parameters of battery and battery pack
- Design the model of battery pack

Course Outcomes (CO): After completion of this course, student will be able to

CO1: Understand and remember the basic concepts and terminologies of Cells and Batteries, charging, discharging methods, concept of cell balancing.

CO2: Analyze BMS functionality, various sensors used, control techniques, Sate of Charge estimation, cell total energy and cell total power.

CO3: Apply the equivalent circuits, physical models, empirical modelling of BMS.

CO4: Design of Battery management system considering various parameters and through simulation.

UNIT - I	**INTRODUCTION**	Lecture Hrs: 14

Introduction to Battery Management System, Cells & Batteries, Nominal voltage and capacity, C rate, Energy and power, Cells connected in series, Cells connected in parallel, Electrochemical and lithium-ion cells, Rechargeable cell, Charging and Discharging Process, Overcharge and Undercharge, Modes of Charging

UNIT - II	**BATTERY MANAGEMENT SYSTEM**	Lecture Hrs: 14

Introduction and BMS functionality, Battery pack topology, BMS Functionality, Voltage Sensing, Temperature Sensing, Current Sensing, BMS Functionality, High-voltage contactor control, Isolation sensing, Thermal control, Protection, Communication Interface, Range estimation, State-of charge estimation, Cell total energy and cell total power

UNIT - III	**BATTERY STATE OF CHARGE AND STATE OF HEALTH ESTIMATION**	Lecture Hrs: 12

Battery state of charge estimation (SOC), voltage-based methods to estimate SOC, Model-based state estimation, Battery Health Estimation, Lithium-ion aging: Negative electrode, Lithium ion aging: Positive electrode, Cell Balancing, Causes of imbalance, Circuits for balancing

UNIT - IV	**MODELLING AND SIMULATION**	Lecture Hrs: 12

Equivalent-circuit models (ECMs), Physics-based models (PBMs), Empirical modelling approach, Physics-based modelling approach, Simulating an electric vehicle, Vehicle range calculations, Simulating constant power and voltage, Simulating battery packs

UNIT - V	**DESIGN OF BATTERY MANAGEMENT SYSTEMS**	Lecture Hrs: 12

Design principles of battery BMS, Effect of distance, load, and force on battery life and BMS, energy balancing with multi-battery system

Textbooks:
1. Plett, Gregory L. Battery management systems, Volume I: Battery modelling. Artech House, 2015. 2. Plett, Gregory L. Battery management systems, Volume II: Equivalent-circuit methods. Artech House, 2015.
Reference Books:
1. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems -Design by Modelling" Philips Research Book Series 2002. 2. Davide Andrea," Battery Management Systems for Large Lithium-ion Battery Packs" Artech House, 2010 3. Pop, Valer, et al. Battery management systems: Accurate state-of-charge indication for battery-powered applications. Vol. 9. Springer Science & Business Media, 2008. 4. RuiXiong, "Battery management Algorithm for Electric Vehicles", China Machine Press, Springer,2020. 5. Bergveid, Krujit, Notten, " Battery Management Systems: Design by Modelling", Philips Research Book Series, Kluwer Academic Publishers.
Online Learning Resources:
1. https://www.coursera.org/learn/battery-management-systems

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – III

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF MECHANICAL ENGINEERING

Subject Code	Title of the Subject	L	T	P	C
20A70304	**MODERN MANUFACTURING METHODS**	3	0	0	3

Course Objectives:

To learn the importance and basics of unconventional machining.
To understand the rapid prototyping processes.

To have the knowledge of different micro machining methods
To understand the working principles of various Non-traditional machining methods.
To learn about Non-traditional forming processes.

UNIT-I

Need for Modern Manufacturing Methods: Non-traditional machining methods and rapid prototyping methods - their relevance for precision and lean manufacturing. Classification of non-traditional processes - their selection for processing of different materials and the range of applications.

Introduction to rapid prototyping - Classification of rapid prototyping methods - sterolithography, fused deposition methods - materials, principle of prototyping and various applications.

UNIT-II

Ultrasonic machining – Elements of the process, mechanics of material removal, process parameters, applications and limitations, Abrasive jet, Water jet and abrasive water jet machining: Basic mechanics of material removal, descriptive of equipment, process variables, applications and limitations.

UNIT-III

Electro –Chemical Processes: Fundamentals of electro chemical machining, electrochemical grinding, metal removal rate in ECM, Tooling, process variables, applications, economic aspects of ECM.

Chemical Machining: Fundamentals of chemical machining- Principle of material removal- maskants – etchants- process variables, advantages and applications.

UNIT-IV

Thermal Metal Removal Processes: Basic principle of spark erosion (EDM), Wire cut EDM, and Electric Discharge Grinding processes - Mechanics of machining, process parameters, selection of tool electrode and dielectric fluids, choice of parameters for improved surface finish and machining accuracy - Applications of different processes and their limitations.

Plasma Machining: Principle of material removal, description of process and equipment, process variables, scope of applications and the process limitations.

UNIT-V

Electron Beam Machining: Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes - process mechanics, parameters, applications and limitations.

Laser Beam Machining: Process description, Mechanism of material removal, process parameters, capabilities and limitations, features of machining, applications and limitations.

Course Outcomes:

At the end of this course the student should be able to understand

- Technical aspects of precision machining.
- Applications of rapid prototyping technologies.
- Tool selection for non traditional processes.
- Knowledge of economic aspects of Non traditional processes.
- Fabrication of microelectronic devices.

TEXT BOOKS:

- Manufacturing processes for engineering materials by SeropeKalpakjian and Steven R Schmid, 5edn, Pearson Pub.
- Advanced machining processes, VK Jain, Allied publishers.

REFERENCE:

- New Technology , Bhattacharya A, The Institution of Engineers, India 1984
- Manufacturing Technology, Kalpakzian, Pearson
- Modern Machining Process, Pandey P.C. and Shah H.S., TMH.

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – III

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Electronic & Communication Engineering

Course Code	**DIGITAL ELECTRONICS**		**L**	**T**	**P**	**C**
20A70404			3	0	0	3
Pre-requisite		**Semester**	**VII**			

Basics of Electronics and Communication Engineering

Course Objectives:

- To learn simplification methods for minimizing Boolean functions and their realization using logic gates.
- To understand and design various combinational logic circuits like adders and code

converters.

- To know the design of various combinational circuits useful to implement logic functions.
- To study the design of sequential logic circuits in synchronous and asynchronous modes.
- To introduce programmable logic devices.

Course Outcomes (CO): At the end of this course, the students will be able to

- Learn simplification methods for minimizing Boolean functions and their realization using logic gates.
- Understand and design various combinational logic circuits like adders and code converters.
- Know the design of various combinational circuits useful to implement logic functions.
- Gain knowledge on the design of sequential logic circuits in synchronous and asynchronous modes.
- Understand the operation and uses of programmable logic devices.

UNIT - I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Quine –McCluskey Tabular Minimization Method. Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT - II

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT - III

Combinational Logic Design 2: Decoders (3 to 8, octal to decimal), Encoders, Priority Encoders, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT - IV

Sequential Logic Design: Latches, Flipflops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, flipflop conversions, set up and hold times, Ripple and Synchronous counters, Shift registers.

UNIT - V

Programmable Logic Devices:ROM, Programmable Logic Devices (PLDs), Introduction to logic families and their comparisons.

Textbooks:

3. Digital Design, M. Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
4. Switching theory and Finite Automata Theory, ZviKohavi and Nirah K. Jha, 2nd Edition, Tata McGraw Hill, 2005.

Reference Books:

3. Fundamentals of Logic Design, Charles H Roth, Jr., 5th Edition, Brooks/coleCengage Learning, 2004.
4. Digital & State Machine Design, Comer, 3rd Edition, OXFORD.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Compute Science & Engineering

Cyber Security

Course Code:20A70504 **L T P C : 3 0 0 3**

Course Objectives:

- To introduce the concepts of Java.
- To Practice object-oriented programs and build java applications.
- To implement java programs for establishing interfaces.

- To implement sample programs for developing reusable software components.
- To establish database connectivity in java and implement GUI applications.

Course Outcomes:

CO1: Recognize the Java programming environment.
CO2: Select appropriate programming constructs to solve a problem.
CO3: Develop efficient programs using multithreading.
CO4: Design reliable programs using Java exception handling features.
CO5: Extend the programming functionality supported by Java.

UNIT-I: Cybercrime

Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, Need for Cyberlaws in Indian context, Legal perspectives of cybercrime, Indian perspective of cybercrimes, Cybercrime and the Indian ITA 2000, Positive aspects and weak areas of ITA 2000, Amendments made in Indian ITA 2000 for admissibility of e- records, Amendments to the Indian IT Act, Global perspective on cybercrimes, Intellectual property in cyberspace, Ethical dimension of cybercrimes.

UNIT-II: Cyber Offenses

Cybercrime and information security, Cybercriminals, Classifications of cybercrimes, Need for Cyberlaws in Indian context, Legal perspectives of cybercrime, Indian perspective of cybercrimes, Cybercrime and the Indian ITA 2000, Positive aspects and weak areas of ITA 2000, Amendments made in Indian ITA 2000 for admissibility of e- records, Amendments to the Indian IT Act, Global perspective on cybercrimes, Intellectual property in cyberspace, Ethical dimension of cybercrimes.

UNIT-III: Cybercrime in Mobile and Wireless Devices

Proliferation of mobile and wireless devices, Trends in mobility, Credit card frauds in mobile and wireless computing era, Security challenges posed by mobile devices, Registry settings for mobile devices, Authentication service security, Attacks on mobile/cell phones, Security implications of mobile devices for organizations, Organizational measures for handling mobile devices related security issues.

UNIT-VI: Tools and Methods Used in Cybercrime

Proxy servers and anonymizers, Password cracking, Keyloggers and spywares, Virus and worms, Trojan horses and backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow, Attacks on wireless networks

UNIT-V: Cyber Forensics, Cybercrime in Real-World

Forensics of Computer and Handheld Devices: Cyber forensics, Cyber forensics and digital evidence, Forensics analysis of e-mail, Forensics and social networking sites, Forensics of handheld devices – Smartphone forensics, EnCase, Device Seizure, MOBIL edit.

Cybercrime examples, mini-cases, online scams: Real-life examples - Official website of Maharashtra Government hacked, Indian banks lose millions of rupees, Game source code stolen; Mini-cases - Indian Case of online gambling, Indian case of intellectual property crime; Online scams - Cheque cashing scam, Charity scams.

References:

1. K. A. Navas, “Electronics Lab Manual”, Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424
2. Cyril Prasanna Raj P., “CMOS digital circuit design manual”, Volume 1, MSEC E-publication, Edition 2016

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – III

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Chemical Engineering

Course Code	INDUSTRIAL POLLUTION CONTROL ENGINEERING	L	T	P	C
20A70804		3	0	0	3

Pre-requisite

Course Objectives:

Course Outcomes (CO):

At the end of the course, the student will be able to:

CO1 Understand the different types of wastes generated in an industry, their effects on living and non-living things & environmental regulatory legislations and standards and climate changes.

CO2 Quantify, analyse and treat wastewater

CO3 Apply the different unit operations and unit processes involved in conversion of highly polluted water to potable standards

CO4 Apply the operating principles, design calculations of particulate control devices.

CO5 Estimate the different waste generated from the industries

Course Articulation Matrix

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

UNIT - I

Types of emissions from chemical industries and effects of environment, environment legislation, Type of pollution, sources of wastewater, Effluent guidelines and standards. Characterization of effluent streams, oxygen demands and their determination (BOD, COD, and TOC), Oxygen sag curve, BOD curve mathematical, controlling of BOD curve, self purification of running streams, sources and characteristics of pollutants in fertilizer, paper and pulp industry, petroleum and petroleum industry.

UNIT - II

General methods of control and removal of sulfur dioxide, oxides of nitrogen and organic vapors from gaseous effluent, treatment of liquid and gaseous effluent in fertilizer industry. Air pollution sampling and measurement: Types of pollutant and sampling and measurement,ambient air sampling: collection of gaseous air pollutants, collection of particulate air pollutants. Stack sampling: sampling system, particulate sampling, and gaseous sampling. Analysis of air pollutants: Sulphur dioxide, nitrogen oxides, carbon monoxide, oxidants and ozones, hydrocarbons, particulate matter

UNIT - III

Air pollution control methods and equipments: Source collection methods: raw material changes, process changes, and equipment modification. Cleaning of gaseous equipments particulate emission control: collection efficiency, control equipment like gravitational settling chambers, Cyclone separators, fabric filters, ESP and their constructional details and design aspects. Scrubbers: wet scrubbers, spray towers, centrifugal scrubbers, packed beds and plate columns, venturi scrubbers, their design aspects. Control of gaseous emissions: absorption by liquids, absorption equipments, adsorption by solids, equipment and the design aspects

UNIT - IV

Introduction to waste water treatment, biological treatment of wastewater, bacterial and bacterial growth curve, aerobic processes, suspended growth processes, activated aerated lagoons and stabilization ponds, attached growth processes, trickling filters, rotary drum filters, anaerobic processes.

UNIT - V

Methods of primary treatments: screening, sedimentation, flotation, neutralization, and methods of tertiary treatment. A brief study of carbon absorption, ion exchange, reverse osmosis, ultra-filtration, chlorination, ozonation, treatment and disposal. Hazardous waste management: nuclear wastes: health and environment effects, sources and disposal methods. Chemical wastes: health and environmental effects, treatment and disposal: treatment and disposal by industry, off site treatment and disposal, treatment practices in various countries. Biomedical wastes: types of wastes and their control.

Textbooks:

1. Environmental Pollution and Control Engineering, C. S. Rao – Wiley Eastern Limited, India, New Delhi, 1993.

2. Pollution Control in Process Industries, S.P. Mahajan, Tata McGraw-Hill, New Delhi, 1985.

Reference Books:

1. Wastewater Treatment, M. Narayana Rao and A.K.Datta, Oxford and IHB publ. New Delhi.

Online Learning Resources:

Open Elective Course – III

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF MATHEMATICS

<table>
<tr><td>Course Code</td><td rowspan="2" colspan="2">Numerical Methods for Engineers
(Common for all Branches)</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>20A75101</td><td>0</td><td>3</td><td>0</td><td>3</td></tr>
<tr><td>Pre-requisite</td><td>---</td><td></td><td colspan="4"></td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="7">Course Objectives:</td></tr>
<tr><td colspan="7">This course aims at providing the student with the knowledge on various numerical methods for solving equations, interpolating the polynomials, evaluation of integral equations and solution of differential equations.</td></tr>
<tr><td colspan="7">Course Outcomes (CO): Student will be able to</td></tr>
<tr><td colspan="7">• apply numerical methods to solve algebraic and transcendental equations.
• understand fitting of several kinds of curves.
• derive interpolating polynomials using interpolation formulae.
• Solve differential and integral equations numerically.</td></tr>
<tr><td>UNIT - I</td><td colspan="2">Solution of Algebraic & Transcendental Equations:</td><td colspan="4">8 Hrs</td></tr>
<tr><td colspan="7">Introduction-Bisection method-Iterative method-Regula falsi method-Newton Raphson method. System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.</td></tr>
<tr><td>UNIT - II</td><td colspan="2">Curve Fitting</td><td colspan="4">8 Hrs</td></tr>
<tr><td colspan="7">Principle of Least squares- Fitting of curves- Fitting of linear, quadratic and exponential curves.</td></tr>
<tr><td>UNIT - III</td><td colspan="2">Interpolation</td><td colspan="4">9 Hrs</td></tr>
<tr><td colspan="7">Finite differences-Newton’s forward and backward interpolation formulae – Lagrange’s formulae. Gauss forward and backward formula, Stirling’s formula, Bessel’s formula</td></tr>
<tr><td>UNIT - IV</td><td colspan="2">Numerical Integration</td><td colspan="4">8 Hrs</td></tr>
<tr><td colspan="7">Numerical Integration: Trapezoidal rule – Simpson’s 1/3 Rule – Simpson’s 3/8 Rule</td></tr>
<tr><td>UNIT - V</td><td colspan="2">Solution of Initial value problems to Ordinary differential equations</td><td colspan="4">9 Hrs</td></tr>
</table>

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.
Textbooks:
1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers. 2. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole,PNIE. 3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India
Reference Books:
1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers. 2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.
Online Learning Resources:
https://slideplayer.com/slide/8588078/

Open Elective Course – III

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Physics

Subject Code	Title of the Subject	L	T	P	C
20A75201	**SMART MATERIALS AND DEVICES**	3		-	3

COURSE OBJECTIVES	
1	To provide exposure to smart materials and their engineering applications.
2	To impart knowledge on the basics and phenomenon behind the working of smart materials
3	To explain theproperties exhibited by smart materials
4	To educate various techniques used to synthesize and characterize smart materials
5	To identify the required smart material for distinct applications/devices
COURSE OUTCOMES	
At the end of the course the student will be able	
CO1	To recognize the need of smart materials
CO2	To understand the working principles of smart materials
CO3	To know different techniques used to synthesize and characterize smart materials
CO4	To exploit the properties of smart materials
CO5	To make use of smart materials for different applications

<u>Mapping between Course Outcomes and Programme Outcomes</u>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Credit: 3 **Hours of teaching: - 45 H**

UNITI : Introduction to Smart Materials: 9H

Historical account of the discovery and development of smart materials, Two phases: Austenite and Martensite, Temperature induced phase changes, Shape memory effect, Pseudoelasticity, One-way shape memory effect, Two-way shape memory effect.

UNIT II: Properties of Smart Materials: 9H

Physical principles of optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

UNIT III: Synthesis of Smart materials: 9H

Solid state reaction technique, Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method,Co-precipitaiton.Green synthesis, Mechanical alloying and Thin film deposition techniques: Chemical etching, Spray pyrolysis.

UNIT IV: Characterization Techniques: 9H

X-ray diffraction, Raman spectroscopy (RS), Fourier-transform infrared reflection (FTIR), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy, Atomic force microscopy (AFM) and Differential Scanning Calorimetry (DSC).

UNIT V:Smart Materials and Devices: 9H

Characteristics of shape memory alloys, Magnetostrictive, Optoelectronic, Piezoelectric, Metamaterials, Electro-rheological and Magneto-rheological materials and Composite materials.

Devices based on smart materials: Sensors & Actuators, MEMS and intelligent devices, Future scope of the smart materials.

Text Books:

1.Encyclopaediaof Smart Materials- Mel Schwartz, John Wiley & Sons, Inc.2002

2. Smart Materials and Structures - M. V. Gandhi and B.S. Thompson, Champman and Hall, 1992

Texts/References:

1. Smart Materials and Technologies- M. Addington and D. L. Schodek, , Elsevier, 2005.

2. Characterization and Application of smart Materials -R. Rai, Synthesis, , Nova Science, 2011.

3. Electroceramics: Materials, Properties, Applications -A.J. Moulson and J.M. Herbert, , 2nd Edn., John Wiley & Sons, 2003.

4. Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic 1. Emission Sensors, Materials and Amplifiers,G.Gautschi, Springer, 2002.

5. Optical Metamaterials: Fundamentals and Applications-W. Cai and V. Shalaev, ,springer,2010.

6. Smart Materials and Structures - P. L Reece, New Research, Nova Science, 2007

NPTEL courses links

https://nptel.ac.in/courses/112/104/112104173/
https://nptel.ac.in/courses/112/104/112104251/
https://nptel.ac.in/content/storage2/courses/112104173/Mod_1_smart_mat_lec_1.pdf

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – III

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF H &SS

Course Code	Employability Skills	L	T	P	C
20A75501		3	0	0	3

Pre-requisite		Semester-VII	
Course Objectives:			
➢ To encourage all round development of the students by focusing on productive skills ➢ To make the students aware of Goal setting and writing skills ➢ To enable them to know the importance of presentation skills in achieving desired goals. ➢ To help them develop organizational skills through group activities To function effectively with heterogeneous teams			
Course Outcomes (CO):			
CO1: Define goals and try to achieve them CO2: Understand the significance of self-management CO3: Apply the knowledge of writing skills in preparing eye-catchy resumes CO4: Analyse various forms of Presentation skills CO5: Judge the group behaviour CO6: Develop skills required for employability.			
UNIT - I	Goal Setting and Self-Management		Lecture Hrs
Definition, importance, types of Goal Setting – SMART Goal Setting – Motivation – Intrinsic and Extrinsic Motivation – Self-Management - Knowing about self – SWOT Analysis			
UNIT - II	Writing Skills		Lecture Hrs
Definition, significance, types of writing skills – Resume writing, E-Mail writing, Cover Letters, - E-Mail Etiquettes			
UNIT - III	Technical Presentation Skills		Lecture Hrs
Nature, meaning & significance of Presentation Skills – Planning, Preparation, Presentation, Stage Dynamics – PPT & Poster Presentation			
UNIT - IV	Group Presentation Skills		Lecture Hrs
Body Language – Group Behaviour - Team Dynamics – Leadership Skills – Personality Manifestation- Group Discussion			
UNIT - V	Job Cracking Skills		Lecture Hrs
Nature, characteristics, importance & types of Interviews – Job Interviews – Skills for success - Answering Strategies – Mock Interviews			
Textbooks:			
• 1. Soft Skills & Employability Skills (English, Paperback, SABINA PILLAI, AGNA FERNANDEZ)Publisher: Cambridge 2.Personality Development and Soft Skills (English, Paperback, MitraBarun K.)			
Reference Books:			
1. Learning How To Fly - Life Lessons for the Youth (English, Paperback, Kalam Abdul A. P. J.), Rupa& Co 2. Personality Development and Soft Skills - Preparing for Tomorrow 1 Edition (English, Paperback, Shikha Kapoor)Publisher: Dreamtech Press 3. Skills for Employability - Skills for Employability with 0 Disc (English, Paperback, Dr. M. Sen Gupta)Publisher: Innovative Publication			

Online Learning Resources:
1. https://youtu.be/gkLsn4ddmTs 2. https://youtu.be/2bf9K2rRWwo 3. https://youtu.be/FchfE3c2jzc 4. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – III

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Chemistry

Subject Code	Title of the Subject	L	T	P	C

20A75301	**GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT**	2	1	-	3

COURSE OBJECTIVES	
1	Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry and the redesign of chemicals, industrial processes and products.
2	Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

COURSE OUTCOMES	
CO1	Apply the Green chemistry Principles for day to day life as well as synthesis, Describe the sustainable development and green chemistry, Explain economic and un-economic reactions, Demonstrate Polymer recycling.
CO2	Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries, Differentiate Homogeneous and Heterogeneous catalysis, Identify the importance of Bio and Photo Catalysis, Discuss Transition metal and Phase transfer Catalysis
CO3	Demonstrate Organic solvents and importance of solvent free systems, Discuss Super critical carbondioxide, Explain Super critical water and water as a reaction solvent, Interpret Ionic Liquids as Catalyst and Solvent
CO4	Describe importance of Biomass and Solar Power, Illustrate Sonochemistry and Green Chemistry, Apply Green Chemistry for Sustainable Development , Discuss the importance of Renewable resources
CO5	Discuss green Chemistry Principles for practicing Green nano synthesis, Illustrate Microwave Assisted Synthesis, Differentiate Hydrothermal and Reflux synthesis, Demonstrate Green Chemistry applications of Inorganic nanomaterials

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												

CO5												

SYLLABUS

UNIT 1: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement and addition reactions and un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling.

UNIT 2: CATALYSIS AND GREEN CHEMISTRY

Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, Asymmetric Catalysis, Heterogeneous and Homogenous catalysts, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide, Bio-catalysis and photo-catalysis with examples,

UNIT 3: ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbondioxide, super critical water and water as a reaction solvent: water based coatings, Ionic liquids as catalyst and solvent.

UNIT 4: EMERGING GREENER TECHNOLOGIES

Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Other Forms of Renewable Energy, Fuel Cells, Chemicals from Renewable Feedstocks, Chemicals from Fatty Acids, Polymers from Renewable Resources, Some Other Chemicals from Natural Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Industrial applications of alternative environmentally benign catalytic systems for carrying out the important reactions such as selective oxidation, reduction and C-C bond formations (specific reactions)

UNIT 5: ALTERNATIVE ENERGY SOURCES

Photo redox catalysis, single electron transfer reactions (SET), Advantages and Challenges Faced by Photochemical Processes, Examples of Photochemical Reactions, Chemistry Using Microwaves: Microwave Heating, Microwave-assisted Reactions, Sonochemistry: Sonochemistry and Green Chemistry, Electrochemical Synthesis: Examples of Electrochemical Synthesis.

Text Books :

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA

References :

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and Ackmez Mudhoo, CRC Press, 2010.
2. Edited by Alvise Perosa and Maurizio Selva , Hand Book of Green chemistry Volume 8:

Green Nanoscience, wiley-VCH, 2013.

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – IV

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Civil Engineering

		L	T	P	C
20A70105	**Environmental Impact Assessment**	**3**	**0**	**0**	**3**

Course Objectives:

1. To impart knowledge on different concepts of Environmental Impact Assessment.
2. To teach procedures of risk assessment.

3. To teach the EIA methodologies and the criterion for selection of EIA methods.
4. To teach the procedures for environmental clearances and audit.
5. To know the impact quantification of various projects on the environment.

Course Outcomes (CO):

1. To prepare EMP, EIS, and EIA report.
2. To identify the risks and impacts of a project.
3. To choose an appropriate EIA methodology.
4. To evaluation the EIA report.
5. To Estimate the cost benefit ratio of a project.

UNIT - I

Concepts and methodologies of EIA :Initial environmental Examination, Elements of EIA, -Factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters- Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis.

UNIT - II

Impact of Developmental Activities and Land Use :Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives. Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact.

UNIT - III

Assessment of Impact on Vegetation, Wildlife and Risk Assessment :Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation - Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-Advantages of Environmental Risk Assessment

UNIT - IV Environmental audit

Introduction - Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

UNIT - V Environmental Acts and Notifications

The Environmental protection Act, The water preservation Act, The Air (Prevention &Control of pollution Act), Wild life Act - Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report-Evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000.

Textbooks:

1. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication,

Hyderabad 2nd edition 2011

Reference Books:

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers
3. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi.

Online Learning Resources:

https://nptel.ac.in/courses/124107160

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – IV

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Electrical & Electronic & Engineering

Course Code	**IoT APPLICATIONS IN ELECTRICAL ENGINEERING (OE-IV)**		**L**	**T**	**P**	**C**
20A70205			**3**	**0**	**0**	**3**
Pre-requisite						

Course Objectives: To make the students learn about:		
• Basics of Internet of Things and Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process. • The concept of motion less and motion detectors in IoT applications. • Applications of IoT in smart grid. • The concept of Internet of Energy for various applications.		
Course Outcomes (CO): After completing the course, the student should be able to do the following:		
CO 1 Understand the concept of IoT in Electrical Engineering. **CO 2**Analyze various types of motionless sensors and various types of motion detectors **CO 3** Apply various applications of IoT in smart grid. **CO 4** Design future working environment with Energy internet.		
UNIT - I	**SENSORS**	Lecture Hrs: 10
Definitions, Terminology, Classification, Temperature sensors, Thermoresistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric		
UNIT - II	**OCCUPANCY AND MOTION DETECTORS**	Lecture Hrs: 10
Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, Capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors - Resistive microphones, Piezoelectric, Photo resistors		
UNIT - III	**MEMS**	Lecture Hrs: 10
Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RF MEMS switches, Electric and Magnetic field sensors		
UNIT - IV	**IoT FOR SMART GRID**	Lecture Hrs: 8
Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home		
UNIT - V	**INTERNET of ENERGY (IoE)**	Lecture Hrs: 10
Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IoE, Architecture, Energy routines, information sensing and processing issues, Energy internet as smart grid .		

Textbooks:

1. Jon S. Wilson, Sensor Technology Hand book, Newnes Publisher, 2004
2. Tai Ran Hsu, MEMS and Microsystems: Design and manufacture, 1st Edition, Mc Grawhill Education, 2017
3. ErsanKabalci and YasinKabalci, From Smart grid to Internet of Energy, 1st Edition, Academic Press, 2019

Reference Books:

1. Raj Kumar Buyya and Amir VahidDastjerdi, Internet of Things: Principles and Paradigms, Kindle Edition, Morgan Kaufmann Publisher, 2016
2. Yen Kheng Tan and Mark Wong, Energy Harvesting Systems for IoT Applications: Generation, Storage and Power Management, 1st Edition, CRC Press, 2019
3. RMD SundaramShriram, K. Vasudevan and Abhishek S. Nagarajan, Internet of Things, Wiley, 2019

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc22_cs96/preview
2. https://nptel.ac.in/courses/108108123
3. https://nptel.ac.in/courses/108108179

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF Mechanical Engineering

Subject Code	Title of the Subject	L	T	P	C
20A70305	**MATERIAL HANDLING EQUIPMENTS**	3	0	0	3

Course Objectives:

To understand how the knowledge of materials management can be an advantage to logistics and supply chain operations.
To sensitize the students on the materials management functions – Planning, Purchase, Controlling, Storing, Handling, Packaging, Shipping and Distributing, and Standardizing.

To realize the importance of materials both in product and service.

planning/ production and plant layouts, studying about strategies of material handling and equipments, and selection of site locations.

It also aims to explore the layout planning by computer applications following different algorithms.

UNIT-I

Overview of Material Handling: Principles of Material Handling, Principal groups of Material Handling equipment – General Characteristics and application of Material Handling Equipment, Modern trends in material handling.

UNIT-II

Lifting Equipments: Hoist- Components of Hoist – Load Handling attachments hooks, grabs and clamps – Grabbing attachments for bulk material – Wire ropes and chains.

UNIT-II

Lifting tackle pulleys for gain of force and speed: Tension in drop parts – Drums, Shears and sprockets – Arresting gear and brakes – Block brakes, Band brakes, thrust brakes – Safety and hand cranks. Principle operation of EOT, Gantry and jib cranes Hoisting Mechanisms, Travelling mechanisms, lifting mechanisms – Slewing Mechanisms – Elevators and lifts.

UNIT-IV

CONVEYORS: Types - description -applications of Belt conveyors, apron conveyors and escalators Pneumatic conveyors, Screw conveyors and vibratory conveyors

UNIT-V

ELEVATORS: Bucket elevators: Loading and bucket arrangements - Cage elevators - shaft way, guides, counter weights, hoisting machine, safety devices - Design of fork lift trucks.

Course Outcomes :

The students will be able to select appropriate location for establishing industrial plants by applying the concepts of location selection.

The students will be able to plan and design plant and production layouts through basic strategies and with computer applications.

The students will be able to identify and analyse the problems in the existing layout/ material handling system and shall be able to the optimize the layout/ material handling system

The students will be able to develop algorithms for new planning layouts for typical applications in the industries and Suggesting appropriate material handling strategies in the industries.

The students will be able to design of fork lift trucks.

REFERENCES

Rudenko, N., Materials handling equipment, ELnvee Publishers, 1970.

Spivakovsy, A.O. and Dyachkov, V.K., Conveying Machines, Volumes I and II, MIR Publishers, 1985.

Alexandrov, M., Materials Handling Equipments, MIR Publishers, 1981.

Boltzharol, A., Materials Handling Handbook, The Ronald Press Company, 1958.

P.S.G. Tech., "Design Data Book", KalaikathirAchchagam, Coimbatore, 2003.

Lingaiah. K. and Narayana Iyengar, "Machine Design Data Hand Book", Vol. 1 & 2, Suma Publishers,

Bangalore, 1983

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – IV

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Electronics & Communication Engineering

Course Code	PRINCIPLES OF DIGITAL SIGNAL	L	T	P	C
20A70405	PROCESSING	3	0	0	3

Pre-requisite
Basics of Electronics and Communication Engineering

Course Objectives:
- To understand the frequency domain analysis of discrete time signals.
- To learn the properties of discrete Fourier series and Fourier transforms.
- To design &analyzeIIR digital filters from analog filters.
- To know various structures used in implementation of FIR digital filters.
- To grasp the importance and applications of Multirate Digital signal processing.

Course Outcomes (CO): At the end of this course, the students will be able to
- Articulate the frequency domain analysis of discrete time signals.
- Understand the properties of discrete Fourier series and Fourier transforms.
- Design &analyzeIIR digital filters from analog filters.
- Design various structures used in implementation of FIR digital filters.
- Summarize the importance and applications of Multirate Digital signal processing.

UNIT - I
Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, LTI system Properties. Solution of Linear constant coefficient difference equations, frequency domain representation of discrete time signals and systems. Review of Z-transforms.

UNIT - II
Discrete Fourier Series and Fourier Transforms: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT - III
Design of IIR Digital Filters and Realizations: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT - IV
Design of FIR Digital Filters and Realizations: Characteristics of FIR Digital Filters, frequency response. Design of FIR digital filters using window techniques and frequency sampling techniques, comparison of IIR & FIR filters, basic structures of FIR systems.
UNIT - V
DSP Applications: Introduction to programmable DSPs, Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor; Adaptive filters: Introduction, Basic principles of Forward Linear Predictive filter and applications such as system identification, echo cancellation, equalization of channels, and beam forming using

block diagram representation study only.

Textbooks:

3. John G. Proakis and Dimitris G. Manolakis, “Digital Signal Processing, Principles, Algorithmsand Applications”, Pearson Education, 2007.
4. A.V. Oppenheim and R.W. Schaffer, “Discrete Time Signal Processing”, PHI.

Reference Books:

5. Andreas Antoniou, “Digital Signal Processing”, TATA McGraw Hill, 2006
6. MH Hayes, “Digital Signal Processing”, Schaum’s Outline series, TATA Mc-Graw Hill, 2007.
7. Robert J. Schilling and Sandra L. Harris, “Fundamentals of Digital Signal Processing using MATLAB”, Thomson, 2007.
8. B. Venkataramani and M. Bhaskar, “Digital Signal Processors – Architecture, Programming and Applications”, TATA McGraw Hill, 2002.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Computer Science & Engineering

Introduction to Database Management Systems

Course Code:20A70505 **L T P C : 3 0 0 3**

Course Objectives:

- To introduce the concept of Internet of Things.
- To Practice programs and build real time applications.

- Students will be explored to the interconnection and integration of the physical world.
- Students will gain practical experience in the development of Cloud-based IoT systems.
- To get knowledge on cloud platforms

Course Outcomes (CO):

CO1: Design reliable real time applications using microcontrollers and microprocessors .
CO2: Extend the programming functionality and design new modules.
CO3: Able to design & develop IOT Devices.

UNIT-I: Introduction

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database

system, approaches to building a database, data models, database management system, Data Independence, DBMS

system architecture, challenges in building a DBMS, various components of a DBMS

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database

system, approaches to building a database, data models, database management system, Data Independence, DBMS

system architecture, challenges in building a DBMS, various components of a DBMS

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database

system, approaches to building a database, data models, database management system, Data Independence, DBMSsystem architecture, challenges in building a DBMS, various components of a DBMS

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database

system, approaches to building a database, data models, database management system, Data Independence, DBMS

system architecture, challenges in building a DBMS, various components of a DBMS.

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database system, approaches to building a database, data models, database management system, Data Independence,DBMS system architecture, challenges in building a DBMS, various components of a DBMS.

Introduction to database systems; Characteristics of databases, File system V/s Database system, Users of Database system, approaches to building a database, data models, database management system, Data Independence, DBMSsystem architecture, challenges in building a DBMS, various components of a DBMS.

Introduction to database systems, Characteristics of databases, File system V/s Database system, Users of Database system, approaches to building a database, data models, database management system, Data Independence, DBMS system architecture, challenges in building a DBMS, various components of a DBMS.

UNIT-II: E/R Model

Conceptual Data Modeling – motivation, entities, entity types, various types of attributes, relationships, relationship

types, Entity set types, Participation constraints, E/R diagram notation, Extended E/R Model, Examples

Conceptual Data Modeling – motivation, entities, entity types, various types of attributes, relationships, relationship

types, Entity set types, Participation constraints, E/R diagram notation, Extended E/R Model, Examples

Conceptual Data Modeling - motivation, entities, entity types, various types of attributes, relationships, relationship types, Entity set types, Participation constraints, E/R diagram notation, Extended E/R Model, Examples.

UNIT-III: Relational Data Model

Concepts of relations, schema-instance distinction, keys, referential integrity & foreign keys, converting the database specification in ER notation to the relational schema, Relational algebra operators: selection, projection, cross product, various types of joins, division, set operations, example queries, tuple relational calculus, domain relational calculus, Fundamentals of SQL.

UNIT-VI: Relational Database Design

Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, Normalization, Normal Forms - INF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, multi valued dependencies and 4NF, join dependencies and 5NF, Concept of Denormalization.

UNIT-V: Transaction Processing,Data Storage & Indexing

Transaction processing and Error recovery-Concepts of transaction processing, ACID properties, concurrency control, Serializability, locking based protocols, Timestamp based protocols, recovery and logging methods.

Data Storage and Indexes - File organizations, primary, secondary index structures, various index structures - hasb based, dynamic hashing techniques, multi-level indexes, B and B-trees.

References:

3. K. A. Navas, “Electronics Lab Manual”, Volume I, PHI, 5th Edition, 2015, ISBN:9788120351424
4. Cyril Prasanna Raj P., “CMOS digital circuit design manual”, Volume 1, MSEC E-publication, Edition 2016

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Chemical Engineering

Course Code	SOLID WASTE MANAGEMENT	L	T	P	C
20A70805		3	0	0	3

Pre-requisite

Course Objectives:

- Material flow in society and generation of solid waste source
- Clarification of solid waste on characterization of the same
- Understand the sense of onsite handling storage and collection systems including transportation
- Understand processing technologies with mechanical volume reduction and thermal volume reduction corporate land filling, deep well injections.
- Learn to estimate material recovery energy recovery from a given waste data using case standing

Course Outcomes (CO):

At the end of the course, the student will be able to:

CO1	Identify sources and relationship between various functional elements of solid waste management and methods of storage and collection and transport of solid wastes.
CO2	Know the importance of transfer station and suggest suitable methods of solid waste disposal based on the composition of solid waste.
CO3	Suggest suitable methods for the management of plastic and E-wastes
CO4	Identify hazardous wastes and suggest suitable management techniques for radioactive wastes and Bio-medical wastes.
CO5	Adopt the suitable management method for a given industry

Course Articulation Matrix

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1												
CO2												
CO3												
CO4												
CO5												

UNIT - I

Introduction: Definition, characteristics and perspectives of solid waste. Types of solid waste. Physical and chemical characteristics. Variation of composition and characteristics. Municipal, industrial, special and hazardous wastes.

General aspects Overview of material flow in society. Reduction in raw material usage. Reduction in solid waste generation. Reuse and material recovery. General effects on health and environment. Legislations

UNIT - II

Engineered systems: Typical generation rates. Estimation and factors effecting generation rates. On site handling. Storage and processing. Collection systems and devices. Transfer and transport.

UNIT - III

Processing Techniques: Mechanical volume reduction. Thermal volume reduction. Component separation. Land filling and land forming. Deep well injection.

UNIT - IV

Material recovery: Mechanical size alteration. Electromagnetic separation. Drying and dewatering. Other material recovery systems. Recovery of biological conversion products. Recovery of thermal conversion products.
Energy recovery: Energy recovery systems and efficiency factors. Determination of output and efficiency. Details of energy recovery systems. Combustion incineration and heat recovery. Gasification and pyrolysis. Refuse derived fuels (RDF).

UNIT - V

Case studies: Major industries and management methods used in typical industries – Coal fired power stations, textile industry, oil refinery, distillery, sugar industry, and radioactive waste generation units.

Textbooks:

1. Howard S. Peavy, Environmental Engineering, McGraw Hill International Edition, 1986.
2. Dutta, Industrial Solid Water Management and Land Filling Practice, Narose Publishing House, 1999.

Reference Books:

1. Sastry C.A., Waste Treatment Plants, Narose Publishing House, 1995.
2. Lagrega, Hazardous Waste Management, McGraw Hill, 1994.

Online Learning Resources:

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV
IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch
DEPARTMENT OF MATHEMATICS

<table>
<tr><td>Course Code</td><td colspan="2" rowspan="2">Number theory and its Applications</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>20A75102</td><td>0</td><td>3</td><td>0</td><td>3</td></tr>
<tr><td>Pre-requisite</td><td>-----</td><td>Semester</td><td colspan="4">I</td></tr>
<tr><td colspan="7"></td></tr>
<tr><td colspan="7">Course Objectives:</td></tr>
<tr><td colspan="7">This course enables the students to learn the concepts of number theory and its applications to information security.</td></tr>
<tr><td colspan="7">Course Outcomes (CO): Student will be able to</td></tr>
<tr><td colspan="7">understand number theory and its properties.
understand principles on congruences
develop the knowledge to apply various applications
develop various encryption methods and its applications.</td></tr>
<tr><td>UNIT - I</td><td colspan="2">Integers, Greatest common divisors and prime Factorization</td><td colspan="4">8 Hrs</td></tr>
<tr><td colspan="7">The well-ordering property-Divisibility-Representation of integers-Computer operations with integers-Prime numbers-Greatest common divisors-The Euclidean algorithm -The fundamental theorem of arithmetic-Factorization of integers and the Fermat numbers-Linear Diophantine equations</td></tr>
<tr><td>UNIT - II</td><td colspan="2">Congruences</td><td colspan="4">8 Hrs</td></tr>
<tr><td colspan="7">Introduction to congruences -Linear congruences-The Chinese remainder</td></tr>
</table>

theorem-Systems of linear congruences		
UNIT - III	**Applications of Congruences**	9 Hrs
Divisibility tests-The perpetual calendar-Round-robin tournaments-Computer file storage and hashing functions. Wilson's theorem and Fermat's little theorem-Pseudo primes- Euler's theorem- Euler's p hi-function- The sum and number of divisors- Perfect numbers and Mersenne primes.		
UNIT - IV	**Finite fields & Primality, factoring**	8 Hrs
Finite fields- quadratic residues and reciprocity-Pseudo primes-rho method-fermat factorization and factor bases.		
UNIT - V	**Cryptology**	9 Hrs
Basic terminology-complexity theorem-Character ciphers-Block ciphers-Exponentiation ciphers- Public-key cryptography-Discrete logarithm-Knapsack ciphers- RSA algorithm-Some applications to computer science.		
Textbooks:		
1. Elementary number theory and its applications, Kenneth H Rosen, AT & T Information systems & Bell laboratories. 2. A course in Number theory & Cryptography, Neal Koblitz, Springer.		
Reference Books:		
1. An Introduction To The Theory Of Numbers, Herbert S. Zuckerman, Hugh L. Montgomery, Ivan Niven, wiley publishers 2. Introduction to Analytic number theory-Tom M Apostol, springer **3.** Elementary number theory, VK Krishnan, Universities press		
Online Learning Resources:		
https://www.slideshare.net/ItishreeDash3/a-study-on-number-theory-and-its-applications		

JNTUA College of Engineering (Autonomous), Ananthapuramu

Open Elective Course – IV

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Physics

Subject Code	Title of the Subject	L	T	P	C
20A75202	**SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS**	3		-	3

COURSE OBJECTIVES	
1	To provide exposure to various kinds of sensors and actuators and their engineering applications.
2	To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
3	To explain the operating principles of various sensors and actuators
4	To educate the fabrication of sensors
5	To explain the required sensor and actuator for interdisciplinary application
COURSE OUTCOMES	
At the end of the course the student will be able	
CO1	To recognize the need of sensors and actuators
CO2	To understand working principles of various sensors and actuators
CO3	To identify different type of sensors and actuators used in real life applications
CO4	To exploit basics in common methods for converting a physical parameter into an electrical quantity
CO5	To make use of sensors and actuators for different applications

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												

CO3												
CO4												
CO5												

SYLLABUS

Credits: 3 **Hours of teaching:- 45 H**

UNIT – I: Introduction to Sensors and Actuators 9H

Sensors: Types of sensors:temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Materials used and their fabrication process: Deposition:ChemicalVapor Deposition, Pattern: photolithography and Etching: Dry and WetEtching.

Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Hydraulic, Pneumatic, Mechanical, Electrical, Magnetic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

UNIT –II: Temperature and Mechanical Sensors 9H

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Resistance temperature sensors, Silicon resistive sensors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Semiconductor, Piezoresistive, capacitive, Variable Reluctance Sensor (VRP).

UNIT –III: Optical and Acoustic Sensors 9H

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo-resistors based sensors, Photomultipliers, Infrared sensors:thermal, Passive Infra Red, Fiber based sensors and Thermopiles

Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones.

UNIT –IV: Magnetic, Electromagnetic Sensors and Actuators 9H

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magneto-strictive sensors and actuators, Voice coil actuators (speakers and speaker-like actuators).

UNIT –V: Chemical and Radiation Sensors 9H

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Geiger-Muller counters, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Text Books:

1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2^{nd} Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

Reference Books:

1.Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.
5. Principles of Industrial Instrumentation By D. Patranabhis

NPTEL courses links

https://onlinecourses.nptel.ac.in/noc21_ee32/preview

Open Elective Course – IV

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF H & SS

Subject Code	Title of the Subject	L	T	P	C
20A79102	English Literary Spectrum	3		0	3

COURSE OBJECTIVES	
1	To develop aesthetic sense to appreciate the beauty of life
2	To introduce to Elizabethan drama and be able to appreciate the nuances of humour
3	To familiarize with Victorian novel and industrialization
4	To expose to the historical significance of ideas of different periods
5	To give exposure to the vicissitudes of life through short stories

COURSE OUTCOMES	
CO1	Awareness to lead a life of quality than quantity
CO2	Able to understand humour and Elizabethan culture
CO3	Enable to appreciate human relations in this mechanized world
CO4	Tolerant and receptive to different ideas
CO5	Be imaginative and understanding of human aspirations

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

UNIT I: Poetry

1. Ode to a Grecian Urn- John Keats
2. To a Skylark- P.B.Shelley
3. Satan's Speech from Paradise Lost Book I- 140-170 lines- John Milton
4. My Last Duchess- Robert Browning

UNIT II: Drama

1. Twelfth Night- William Shakespeare
   a) Elizabethan theatre

b) Shakespearean tragedy
c) Shakespearean Comedy
d) Themes of Shakespearean Dramas

UNIT III: Novel

1. Hard Times- Charles Dickens

a) Rise of the English Novel
b) Victorian Novel
c) Utilitarianism
d) Humanism

UNIT IV: Prose

1. Of Studies – Francis Bacon
2. On Seeing People Off- A.G.Gardiner
3. Sweetness and Light- Mathew Arnold
4. I too have a Dream- Martin Luther King Junior

UNIT V: Short Stories

1. The Last Leaf- O.Henry
2. Useless Beauty- Guy de Maupassant
3. After the Dance – Leo Tolstoy
4. The Selfish Giant- Oscar Wilde

Text Books:

The Oxford Book of English Verse by Christopher Ricks (Editor)

Twelfth Night (2010 edition): Oxford School Shakespeare (Oxford School Shakespeare Series)

Dickens Charles, Hard Times (Penguin Classics)

The Art of the Personal Essay: An Anthology from the Classical Era to the Present, Anchor Books Publication

References:

Legois and Cazamian, *A History of English Literature*

JNTUA College of Engineering (Autonomous), Ananthapuramu
Open Elective Course – IV

IV B.TECH – I SEMESTER (R20) (common to all branches) - 2020 Admitted Batch

DEPARTMENT OF Chemistry

Subject Code	Title of the Subject	L	T	P	C

20A75302	**CHEMISTRY OF NANOMATERIALS AND APPLICATIONS**	2	1	-	3

COURSE OBJECTIVES	
1	To understand synthetic principles of Nanomaterials by various methods
2	And also characterisae the synthetic nanomaterials by various instrumental methods
3	To enumerate the applications of nanomaterials in engineering

COURSE OUTCOMES	
CO1	Classify the nanostructure materials, Describe scope of nano science and technology, Explain different synthetic methods of nano materials, Identify the synthetic methods of nanomaterial which is suitable for preparation of particular material
CO2	Describe the top down approach, Explain aerosol synthesis and plasma arc technique, Differentiate chemical vapour deposition method and electrodeposition method, Discuss about high energy ball milling.
CO3	Discuss different technique for characterization of nanomaterial, Explain electron microscopy techniques for characterization of nanomaterial, Describe BET method for surface area analysis, Apply different spectroscopic techniques for characterization
CO4	Explain synthesis and properties and applications of nanaomaterials, Discuss about fullerenes and carbon nanotubes, Differentiate nanomagnetic materials and thermoelectric materials, Describe liquid crystals
CO5	Illustrate applications of nanaomaterials, Discuss the magnetic applications of nanomaterials, list the applications of non-linear optical materials, Describe the applications fullerenes, carbon nanotubes

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Unit – I

Basics and Characterization of Nanomaterials : Introduction**,** Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nano materials.

Unit – II

Synthesis of nanomaterials : Top-Down approach**,** Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, high energy ball milling method.

Synthetic Methods**:** Bottom-Up approach**:-** Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

UNIT-III

Techniques for characterization: Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterilas, BET method for surface area analysis, dynamic light scattering for particle size determination-

UNIT-IV

Studies of Nano-structured Materials: Synthesis, properties and applications of the following nanomaterials, fullerenes, carbon nanotubes, core-shell nanoparticles, nanoshells, self- assembled monolayers, and monolayer protected metal nanoparticles, nanocrystalline materials, magnetic nanoparticles and important properties in relation to nanomagnetic materials, thermoelectric materials, non-linear optical materials and liquid crystals.

UNIT-V

Engineering Applications of Nanomaterials : Applications of Nano Particle, nano rods of nano wires, Fullerenes, carbon nano tubes, Graphines nanoparticles and other applications of nonmaterials and uses.

TEXT BOOKS:

1. **NANO: The Essentials:** T Pradeep, MaGraw-Hill, 2007.
2. **Textbook of Nanoscience and nanotechnology:** B S Murty, P Shankar, Baldev Rai, BB Rath and James Murday, Univ. Press, 2012.

REFERENCE BOOKS:

1. Concepts of Nanochemistry; Ludovico Cademrtiri and Geoffrey A. Ozin & Geoffrey A. Ozin, Wiley-VCH, 2011.
2. **Nanostructures & Nanomaterials; Synthesis, Properties & Applications:** Guozhong Cao, Imperial College Press, 2007.
3. **Nanomaterials Chemistry**, C. N. R. Rao, Achim Muller, K.Cheetham, Wiley-VCH, 2007.

HONOURS DEGREE IN ECE

HONOURS DEGREE IN ECE

Course Code	ADAPTIVE SIGNAL PROCESSING	L	T	P	C
20A04H11		**3**	**1**	**0**	**4**
Pre-requisite	**Semester**				

Digital Signal Processing

Course Objectives:

- To design and apply optimal minimum mean square estimators and in particular line are estimators.
- To design, implement and apply Wiener Filters (FIR, non-casual, causal) and evaluate their performance.
- To develop systems on recursive, model-based estimation methods taking the advantage of the statistical properties of the received signals.
- To analyze the performance of adaptive filters and application to practical problems such as beam forming and echo cancellation signal.

Course Outcomes (CO): At the end of this course, the students will be able to

- Design and apply optimal minimum mean square estimators and in particular line are estimators.
- Design, implement and apply Wiener Filters (FIR, non-casual, causal) and evaluate their performance.
- Develop systems on recursive, model-based estimation methods taking the advantage of the statistical properties of the received signals.
- Analyze the performance of adaptive filters and application to practical problems such as beam forming and echo cancellation signal.

UNIT - I

Introduction to Adaptive Systems: Definitions, Characteristics, Applications, Example of an Adaptive System. The Adaptive Linear Combiner - Description, Weight Vectors, Desired Response Performance function - Gradient & Mean Square Error.

UNIT - II

Development of Adaptive Filter Theory & Searching the Performance surface: Introduction to Filtering - Smoothing and Prediction – Linear Optimum Filtering, Problem statement, Principle of Orthogonally - Minimum Mean Square Error, Wiener- Hopf equations, Error Performance - Minimum Mean Square Error, Estimation of phase shift between two narrow band signals using Orthogonal Decomposer.

UNIT - III

Steepest Descent Algorithms: Searching the performance surface – Methods & Ideas of Gradient Search methods - Gradient Searching Algorithm & its Solution - Stability & Rate of convergence - Learning Curves Gradient Search by Newton's Method, Method of Steepest Descent, Comparison of Learning Curves.

UNIT - IV

LMS Algorithm & Applications: Overview - LMS Adaptation algorithms, Stability &Performance analysis of LMS Algorithms - LMS Gradient & Stochastic algorithms - Convergence of LMS algorithm. Applications: Adaptive BFSK, BPSK, ASK demodulators and delay estimation. Adaptive Beam forming, concept of IQ channels, Adaptive filter implementation of Hilbert Transform.

UNIT - V

State Estimators: Introduction to RLS Algorithm, Statement of Kalman filtering problem, The Innovation Process, Estimation of State using the Innovation Process- Expression of Kalman Gain, Filtering Example estimation of state from observations of noisy observed narrow band signals. Target tracking using only DOA.

Textbooks:

1. Adaptive Signal Processing - Bernard Widrow, Samuel D. Strearns, 2005, PE.
2. Adaptive Filter Theory - Simon Haykin-, 4 ed., 2002, PE Asia.

Reference Books:

1. Digital Signal Processing: A Practitioner's Approach, Kaluri V. Rangarao, Ranjan K. Mallik ISBN: 978-0-470-01769-2, 210 pages, November 2006, John Weley (UK)
2. Optimum signal processing: An introduction - Sophocles.J. Orfamadis, 2 ed., 1988, McGraw-Hill, Newyork
3. Adaptive signal processing-Theory and Applications, S. Thomas Alexander, 1986, Springer – Verlag.

Online Learning Resources:

HONOURS DEGREE IN ECE

Course Code 20A04H12	**5G COMMUNICATIONS**	**L** 3	**T** 1	**P** 0	**C** 4
Pre-requisite		**Semester**			

Antennas and Wave Propagation
Microwave Engineering and Optical Communications

Course Objectives:

- To know about the evolution and advancements of mobile technologies.
- To learn about the channel models and their requirements.
- To understand the requirements of transmission over 5G and modulation techniques.
- To acquire knowledge on D2D and M2M communications.
- To gain the knowledge about millimeter wave communications.

Course Outcomes (CO): At the end of this course, the students will be able to

- Know about the evolution and advancements of mobile technologies.
- Learn about the channel models and their requirements.
- Understand the requirements of transmission over 5G and modulation techniques.
- Acquire knowledge on D2D and M2M communications.
- Gain the knowledge about millimeter wave communications.

UNIT - I

Overview of 5G Broadband Wireless Communications: Evolution of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro), An overview of 5G requirements, Regulations for 5G, Spectrum analysis and sharing for 5G.

UNIT - II

The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mm Wave MIMO Systems.

UNIT - III

Transmission and Design Techniques for 5G: Basic requirements of transmission over 5G, Modulation techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple accesses techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), non-orthogonal multiple accesses (NOMA).

UNIT - IV

Device-to-Device (D2D) and Machine-to-Machine (M2M) type Communications: Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multihop and multi-operator D2D communications.

UNIT - V

Millimeter-wave Communications: Spectrum regulations, deployment scenarios, beamforming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with imperfect CSI, Multi-cell Massive MIMO, Pilot contamination, Spatial modulation (SM).

Textbooks:

1. Martin Sauter “From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband”, Wiley-Blackwell.
2. AfifOsseiran, Jose.F. Monserrat, Patrick Marsch, “Fundamentals of 5G Mobile Networks”, Cambridge University Press.

Reference Books:

1. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, John Wiley & Sons.
2. AmitabhaGhosh and RapeepatRatasuk “Essentials of LTE and LTE-A”, Cambridge University Press
3. Athanasios G. Kanatos, Konstantina S. Nikita, PanagiotisMathiopoulos, “New Directions in Wireless Communication Systems from Mobile to 5G”, CRC Press.
4. Theodore S. Rappaport, Robert W. Heath, Robert C. Danials, James N. Murdock “Millimeter Wave Wireless Communications”, Prentice Hall Communications.

Online Learning Resources:

HONOURS DEGREE IN ECE

Course Code	LOW POWER VLSI DESIGN	L	T	P	C
20A04H13		3	1	0	4
Pre-requisite	**Semester**				
VLSI Design					

Course Objectives:

- To understand the basic concepts related to low power circuit design.
- To implement Low power design approaches for system level and circuit level measures.
- To design different types of low voltage low power adders.
- To design and analyze different types of low voltage multipliers.
- To gain knowledge on different types of memories for efficient design of systems.

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the basic concepts related to low power circuit design.
- Implement Low power design approaches for system level and circuit level measures.
- Design different types of low voltage low power adders.
- Design and analyze different types of low voltage multipliers.
- Gain knowledge on different types of memories for efficient design of systems.

UNIT - I

Fundamentals: Need for low power circuit design, Sources of power dissipation – Static and dynamic power dissipation, short circuit power dissipation, Glitching power dissipation, Short channel effects –Drain induced barrier lowering and punch through, Surface scattering, Velocity saturation, Impact ionization, Hot electron effect.

UNIT - II

Low-Power Design Approaches: Low-Power design through Voltage scaling – VTCMOS circuits, MTCMOS circuits, Architectural level approach –Pipelining and parallel processing approaches. Switched capacitance minimization approaches: System level measures, Circuit level measures, Mask level measures.

UNIT - III

Low-Voltage Low-Power Adders: Introduction, Standard adder cells, CMOS Adder's architectures – Ripple carry adders, carry look ahead adders, Carry select adders, Carry save adders, Low-voltage low-power design techniques – Trends of technology and power supply voltage, low-voltage low-power logic styles.

UNIT - IV

Low-Voltage Low-Power Multipliers: Introduction, Overview of multiplication, Types of multiplier architectures, Braun multiplier, Baugh Wooley multiplier, Booth multiplier, Introduction to Wallace Tree Multiplier.

UNIT - V

Low-Voltage Low-Power Memories: Basics of ROM, Low-power ROM technology, future trends and development of ROMs, Basics of SRAM, Memory cell, Pre-charge and equalization circuit, Low-Power SRAM technologies, Basics of DRAM, Self-refresh circuit, Future trends and development of DRAM.

Textbooks:

1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

Reference Books:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. Low Power CMOS Design – AnanthaChandrakasan, IEEE Press/Wiley International, 1998.
3. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.

Online Learning Resources:

HONOURS DEGREE IN ECE

Course Code	MICRO ELECTRO-MECHANICAL SYSTEMS	L	T	P	C
20A04H14		3	1	0	4
Pre-requisite	Semester				

Applied Physics
Electronic Devices & Circuits
Networks , Signals and Systems

Course Objectives:

- To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
- To educate on the rudiments of micro fabrication techniques.
- To introduce various sensors and actuators
- To introduce different materials used for MEMS.
- To educate on the applications of MEMS to disciplines beyond electrical and mechanical engineering.

Course Outcomes (CO): At the end of this course, the students will be able to

- Explain electrical and mechanical principles of MEMS
- Describe working of electrostatic, thermal and magnetic sensors and actuators
- Demonstrate piezoelectric effect and its applications
- Categorize micromachining processes
- Describe operation of polymer and optical MEMS

UNIT - I

Introduction: Intrinsic characteristics of MEMS – Energy domains and Transducers-Sensors and Actuators – Introduction to Micro Fabrication – Silicon based MEMS processes – new materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor Devices – Stress and Strain Analysis – Flexural Beam Bending- Torsional Deflection.

UNIT - II

Sensors and Actuators-I: Electrostatic Sensors – Parallel Plate Capacitors – Applications – Interdigitated Finger Capacitor – Comb Drive Devices – Micro Grippers – Micro Motors – Thermal Sensing and Actuation – Thermal Expansion – Thermal Couples – Thermal Resistors – Thermal Bimorph – Applications – Magnetic Actuators – Micro magnetic Components – Case Studies of MEMS in Magnetic Actuators- Actuation using Shape Memory Alloys.

UNIT - III

Sensors and Actuators-II: Piezoresistive Sensors – Piezoresistive Sensor Materials – Stress Analysis of Mechanical Elements – Applications to Inertia, Pressure, Tactile and Flow Sensors – Piezoelectric Sensors and Actuators – Piezoelectric Effects – Piezoelectric Materials – Applications to Inertia, Acoustic, Tactile and Flow Sensors.

UNIT - IV

Micromachining: Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching –Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case Studies –Basic Surface Micro Machining Processes – Structural and Sacrificial Materials – Acceleration of Sacrificial Etch – Striction and Antistriction Methods – LIGA Process – Assembly of 3D MEMS –Foundry Process.

UNIT - V

Polymer and Optical MEMS: Polymers in MEMS– Polimide – SU-8 – Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon – Application to Acceleration, Pressure, Flow and Tactile Sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

Textbooks:

1. Chang Liu, ‘Foundations of MEMS’, Pearson Education Inc., 2012.
2. Tai Ran Hsu, “MEMS & Micro Systems Design and Manufacture” Tata McGraw Hill, New Delhi, 2002.

Reference Books:

1. NadimMaluf, “An Introduction to Micro Electromechanical System Design”, Artech House, 2000.
2. Mohamed Gad-El-Hak, Editor, “The MEMS Handbook”, CRC Press Baco Raton, 2001.
3. Stephen D Senturia, ‘Microsystem Design’, Springer Publication, 2000.

Online Learning Resources:

MINORS IN
INTERNET OF THINGS

MINORS IN INTERNET OF THINGS

Course Code	INTRODUCTION TO INTERNET OF THINGS	L	T	P	C
20A4M11		3	1	0	4
Pre-requisite	Semester				

Basics of Electronics and Communication Engineering

Course Objectives:

- To understand the concepts of Internet of Things
- To identify hardware and software components of Internet of Things
- To analyze basic communication protocols
- To design IoT applications in different domain and be able to analyze their performance

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the concepts of Internet of Things
- Identify hardware and software components of Internet of Things
- Analyze basic communication protocols
- Design IoT applications in different domain and be able to analyze their performance

UNIT - I

Introduction to IoT: Architectural overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals-Devices and gateways, Data management, Business processes in IoT, Role of cloud in IoT

UNIT - II

Elements of IoT: Hardware components – computing (Arduino, Raspberry Pi), communication, Sensing, Actuation, I/O interfaces Software Components- Programming APIs (Using python/Arduino) for communication protocols-MQTT, Zigbee, Bluetooth, CoAP, UDP, TCP

UNIT - III

Sensing and Actuation: Definition of Sensor, Sensor features, Resolution, Classes, Different types of sensors, Actuator, Different types of Actuators, purpose of Sensors and Actuators in IoT

UNIT - IV

IoT Application Development: Solution frame work for IoT Applications-Implementation of Device integration, Data acquisition and Integration, Device data storage on cloud/local server, Authentication, authorization of Devices

UNIT - V

IoT Case Studies: IoT Case studies and mini projects based on industrial Automation,

Transportation, Agriculture, Healthcare, Home Automation

Textbooks:

1. Vijay Madisetti, ArshdeepBahga, “Internet of Things a Hands-On- Approach”,2014.
2. Adrian McEwen, “Designing the Internet of Things”, Wiley Publishers, 2013

Reference Books:

1. Dr SRN Reddy, RachitThukral and ManasiMishra ,” Introduction to Internet of Things”: A practical Approach” ETI Labs
2. Raj Kamal , “ Internet of Things: Architecture and Design”, McGraw Hill

Online Learning Resources:

MINORS IN INTERNET OF THINGS

Course Code	IOT WITH ARDUINO, ESP, AND RASPBERRY PI	L	T	P	C
20A4M12		3	1	0	4
Pre-requisite	**Semester**				

Introduction to Internet of Things

Course Objectives:

- To give students hands-on experience using different IoT architectures.
- To provide skills for interfacing sensors and actuators with different IoT architectures.
- To develop skills on data collection and logging in the cloud.

Course Outcomes (CO): At the end of this course, the students will be able to

- Implement different IoT architectures.
- Interface sensors and actuators with different IoT architectures.
- Develop skills on data collection and logging in the cloud.

UNIT - I

IoT- Introduction and its components, IoT building blocks, Sensors and Actuators, IoT Devices, IoT boards (Arduino Uno, ESP 8266-12E Node MCU, and Raspberry Pi 3).

UNIT - II

Arduino Uno: Getting started with the Uno boards, blink program, connection of sensors to the Uno board, reading values of sensors from the Uno board, interrupts.

Case study: Temperature/Humidity Control;

Case Study: Sending values Temperature/Humidity values to the Internet via GSM module.

UNIT - III

ESP 8266-12E Node MCU: Getting started with the ESP board, Micropython and Esplorer IDE, Flushing the ESP8266 board with micropython, connecting sensors to the ESP board, Connecting ESP board to WiFi, Interfacing ESP with the Cloud (REST API-GET, POST, MQTT), interrupts, comparison of ESP32 board with the ESP8266 board.

Case Study: Switching light on /off remotely.

Case Study: Voice-based Home Automation for switching lights on/off (Android phone – Google Assistant (Assistant <-> IFTTT), MQTT (ESP <-> IFTTT), ESP 8266 <-> Lights)

UNIT - IV

Raspberry Pi 3: RPi3 introduction and installing the Raspbian Stretch OS, Headles Computer and RPi3 configuration to connect through SSH via Ethernet, Headless - connecting RPi3 remotely without Ethernet cable via SSH, IP address, RPi 3 - Testing the GPIO pins through Scripts.

UNIT - V

Raspberry Pi3 Interfacing: Interfacing with Sensor DHT11, Raspberry pi3 python library install and reading sensor feed, 'Plug and play ' type cloud platform overview for integration to IOT devices, 'Plug and play' cloud platform for integration to IOT device - actuator (LED), Plug and play platform – Custom widget (DHT11-Sensor) integration through Python.

New: Raspeberry Pi 4 Vs Raspberry Pi3 Mobel B Comparison, LoRawan /LPWAN – Overview.

Textbooks:

1. Rao, M. (2018). Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects. Packt Publishing Ltd.
2. Arduino for Beginners: Essential Skills Every Maker Needs, Baichtal, J. (2013).. Pearson Education.
3. Internet of Things with ESP8266, Schwartz, M. (2016)..Packt Publishing Ltd.

Reference Books:

1. “Getting started with Raspberry Pi”, Richardson, M., & Wallace, S. (2012)., O’Reilly Publisher Media, Inc

Online Learning Resources:

MINORS IN INTERNET OF THINGS

Course Code	COMMUNICATION PROTOCOLS FOR IOT	L	T	P	C
20A4M13		3	1	0	4
Pre-requisite	**Semester**				

Introduction to Internet of Things

Course Objectives:

- To discuss the characteristics, technologies, and protocols related to IoT
- To study the architecture of Arduino, and Raspberry Pi
- To demonstrate applications of IoT
- To understand business models associated with IoT

Course Outcomes (CO): At the end of this course, the students will be able to

- Identify the main components of Internet of Things
- Program the sensors and controller as part of IoT
- Assess different Internet of Things technologies and their applications.
- Learn basic circuits, sensors and interfacing, data conversion process and shield libraries to interface with the real world
- Understand various challenges in designing IoT devices
- Demonstrate and build the project successfully by hardware/sensor requirements, coding, emulating and testing.

UNIT - I

IoT Fundamentals: Definition & Characteristics of IoT - Challenges and Issues - Physical Design of IoT, Logical Design of IoT - IoT Functional Blocks, Security. IoT Reference Architecture, Software Design Control Units – Communication modules – Bluetooth – Zigbee – WIFI – GPS- IOT Protocols (IPv6, 6LoWPAN, RPL, CoAP etc..), MQTT, Wired Communication, Power Source.

UNIT - II

Technologies behind IoT: Technologies behind IoT, four pillars of IOT paradigm, - RFID, Wireless Sensor Networks, SCADA (Supervisory Control and Data Acquisition), M2M - IOT Enabling Technologies – Big Data Analytics, Cloud Computing, Embedded Systems, Programming the microcontroller for IoT

UNIT - III

Communication Protocols for IoT: Working principles of sensors – IOT deployment for Raspberry Pi /Arduino/Equivalent platform – Reading from Sensors, Communication: Connecting microcontroller with mobile devices – communication through Bluetooth, WIFI and USB - Contiki OS- Cooja Simulator.

UNIT - IV

Resource management in IoT: Resource management in IoT: Clustering, Clustering for Scalability, Clustering for routing, Clustering Protocols for IOT, From the internet of things to the web of things, The Future Web of Things – Set up cloud environment –Cloud access from sensors– Data Analytics for IOT- Rest Architectures- The web of Things, Resource Identification and Identifier, Richardson Maturity Model.

UNIT - V

Applications of IoT: Applications of IoT, Business models for IoT, Green energy buildings and infrastructure, Smart farming, Smart retailing and Smart fleet management, Recent trends

Textbooks:

1. Simone Cirani, Gianluigi Ferrari, Marco Picone, Luca Veltri. Internet of Things: Architectures, Protocols and Standards, 1 st edition, Wiley Publications, 2019.
2. Bahga, Arshdeep, and Vijay Madisetti. Internet of Things: A hands-on approach, 1st edition, University press, 2014.

Reference Books:

1. Vermesan, Ovidiu, and Peter Friess, eds. Internet of things-from research and innovation to market deployment, 1st edition, Aalborg: River publishers, 2014.
2. Tsiatsis, Vlasios, Tsiatsis, Vlasios, StamatisKarnouskos, Jan Holler, David Boyle, and Catherine Mulligan, Internet of Things: technologies and applications for a new age of intelligence, 2nd edition, Academic Press, 2018.

Online Learning Resources:

MINORS IN INTERNET OF THINGS

Course Code	INDUSTRIAL IOT	L	T	P	C
20A4m14		3	1	0	4
Pre-requisite	**Semester**				

Introduction to Internet of Things

Course Objectives:

- To acquire theoretical knowledge on Industrial Internet of Things.
- To apply suitable machine learning techniques for data handling and to gain knowledge from it.
- To evaluate the performance of algorithms for sensors and data transmission.

Course Outcomes (CO): At the end of this course, the students will be able to

- Understand the characteristics of Internet of Things and its industry strategies.
- Apply various Internet of Things models to appropriate problems.
- Identify and integrate more than one technology to enhance the performance.
- Understand the sensors and data transmission used in Internet of Things.
- Analyze the co-occurrence of data to find interesting frequent patterns.
- Pre-process the data before applying to any real-world problem and can evaluate its performance

UNIT - I

Overview of Internet of Things: Introduction, IOT Architecture, Application –based IOT protocols, Cloud Computing, Fog Computing, Sensor Cloud, Big Data. Overview of Industry 4.0 and Industrial Internet of Things: IIoT- Prerequisites of IIOT, Basics of CPS, CPS and IIOT, Applications of IIoT.

UNIT - II

Industrial Internet of Things: Introduction, Industrial Internet Systems, Industrial sensing, Industrial sensing, Industrial Processes. Business Models and Reference Architecture of IIoT: Definition of a business model, Business models of IOT, Business models of IIOT.

UNIT - III

Key and On-site Technologies: Key Technologies: Off-site Technologies- Introduction, Cloud Computing- Necessity, Cloud Computing and IIoT, Industrial Cloud Platform Providers, SLA, Requirements of Industry 4.0, Fog Computing. On-site Technologies- Introduction, Augmented Reality- History, Categorization, Applications, Virtual Reality- History, Categorization, Applications.

UNIT - IV

Sensors and Data Transmission: Sensors: Introduction to Sensors, Characteristics-Sensor calibration, Sensor profile, Operating voltage, Sensor Categories. Actuators: Introduction, Thermal Actuators, Hydraulic Actuators, Pneumatic Actuators, Electromechanical Actuators.

Industrial Data Transmission: Foundation fieldbus, Profibus, HART, Interbus, Bitbus.

UNIT - V

Machine learning and Data science, applications in healthcare: Machine Learning and Data Science in Industries - Introduction, Machine Learning, Categorization on ML, Applications and Data Science of ML in industries, Deep Learning, Applications of Deep Learning in industries.

Applications of Healthcare in Industries: Smart Devices, Advanced Technologies using in Healthcare, Open Research Issues to be Addressed.

Textbooks:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
2. Industrial IoT. Available online: https://medium.com/iotforall/whatproduct-managers-need-to-know-about-industrial-iot-8c92eec1d9d2

Reference Books:

1. IIoT Cloud Platforms. Available online: https://fr.farnell.com/willthere-be-a-dominant-iiot-cloud-platform.
2. Kajima, T. and Kawamura, Y., 1995. Development of a high-speed solenoid valve: Investigation of solenoids. IEEE Transactions on industrial electronics, 42(1), pp.1-8.

Online Learning Resources:

1. https://www.coursera.org/learn/industrial-internet-of-things
2. https://www.coursera.org/specializations/developing-industrial-iot