JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

(Established by Govt. of A.P., Act. No. 30 of 2008)

ANANTHAPURAMU – 515 002 (A.P.) INDIA.

Course Structure for B.Tech-R15 Regulations

Food Technologyg

I B.Tech. - I Semester

S.No	Course code	Subject	*L	*T	*P	*Drg	*C
1.	15A52101	Functional English	3	1	-	-	3
2.	15A54101	Mathematics – I	3	1	-	-	3
3.	15A05101	Computer Programming	3	1	-	-	3
4.	15A56101	Engineering Physics	3	1	-	-	3
5.	15A03101	Engineering Drawing	-	-	-	6	3
6.	15A52102	English Language Communication Skills Lab	-	-	4	-	2
7.	15A56102	Engineering Physics Lab	-	-	4	-	2
8.	15A05102	Computer Programming Lab	-	-	4	-	2
		Total	12	4	12	6	21

I-II Semester

S.No	Course code	Subject	L	T	P	C
1.	15A52201	English for Professional Communication	3	1	-	3
2.	15A54201	Mathematics – II	3	1	-	3
3.	15A01201	Engineering Mechanics	3	1	-	3
4.	15A51101	Engineering Chemistry	3	1	-	3
5.	15A01101	Environmental Studies	3	1	-	3
6.	15A01202	Applied Mechanics Lab	-	-	4	2
7.	15A51102	Engineering Chemistry Lab	-	-	4	2
8.	15A99201	Engineering & IT Workshop	-	-	4	2
		Total	**15**	**5**	**12**	**21**

*** L - Lecture hours**
***T - Tutorial hours**
***P - Practical hours**
***Drg - Drawing**
***C - Credits**

II B. Tech – I Sem

S.No.	Course Code	Subject	L	T	P	C
1	15A54301	Mathematics - III	3	1	-	3
2	15A01301	Electrical and Mechanical Technology	3	1	-	3
3	15A01302	Building Materials and Construction	3	1	-	3
4	15A01303	Strength of Materials – I	3	1	-	3
5	15A01304	Surveying – I	3	1	-	3
6	15A01305	Fluid Mechanics	3	1	-	3
7	15A01306	Surveying Laboratory – I	-	-	4	2
8	15A01307	Strength of Materials Laboratory	-	-	4	2
		Total	**18**	**06**	**08**	**22**

II B. Tech – II Sem

S.No.	Course Code	Subject	L	T	P	C
1	15A54401	Probability and Statistics	3	1	-	3
2	15A52301	Managerial Economics & Financial Analysis	3	1	-	3
3	15A01401	Strength of Materials – II	3	1	-	3
4	15A01402	Surveying – II	3	1	-	3
5	15A01403	Structural Analysis – I	3	1	-	3
6	15A01404	Hydraulics & Hydraulic Machinery	3	1	-	3
7	15A01405	Fluid Mechanics & Hydraulic Machinery Laboratory	-	-	4	2
8	15A01406	Surveying Laboratory – II	-	-	4	2
9	15A01407	Comprehensive Online Examination-I	-	-	-	1
		Total	**18**	**06**	**08**	**23**

Note:- *Survey camp for a duration of two weeks to be conducted before the commencement of III B.Tech, I – Sem class work, in the II B.Tech, II – Sem break. This survey camp has to be evaluated for 50 marks by the internal faculty. It has a weightage of 2 credits. The marks and credits will be incorporated in IV – B.Tech, II – Sem marks memo.*

B.Tech III-I Semester (C.E)

S. No.	Course Code	Subject	L	T	P	C
1.	15A01501	Design and Drawing of RCC Structures	3	1	-	3
2.	15A01502	Estimation, Costing and Valuation	3	1	-	3
3.	15A01503	Geotechnical Engineering – I	3	1	-	3
4.	15A01504	Engineering Geology	3	1	-	3
5.	15A01505	Structural Analysis – II	3	1	-	3
6.	 15A01506 15A01507	**MOOCS-I*** 1. Cost Effective Housing Techniques 2. Water Harvesting and Conservation	3	1	-	3
7.	15A01508	Engineering Geology Laboratory	-	-	4	2
8.	15A01509	Geotechnical Engineering Laboratory	-	-	4	2
9.	15A99501	Audit course - Social Values & Ethics	2	0	2	0
		Total	**20**	**6**	**10**	**22**

B.Tech III-II Semester (C.E)

S. No.	Course Code	Subject	L	T	P	C
1.	15A01601	Concrete Technology	3	1	-	3
2.	15A01602	Design and Drawing of Steel Structures	3	1	-	3
3.	15A01603	Geotechnical Engineering – II	3	1	-	3
4.	15A01604	Transportation Engineering - I	3	1	-	3
5.	15A01605	Water Resources Engineering – I	3	1	-	3
6.	 15A01606 15A01607 15A01608	**CBCC-I** 1. Remote Sensing & GIS 2. Disaster Management & Mitigation 3. Intellectual Property Rights	3	1	-	3
7.	15A01609	Concrete Technology Laboratory	-	-	4	2
8.	15A01610	Transportation Engineering Laboratory	-	-	4	2
9.	15A52602	Advanced English Language Communication Skills (AELCS) Laboratory (Audit Course)	-	-	2	0
10.	15A01611	Comprehensive Online Examination-II	-	-	-	1
		Total	**18**	**06**	**12**	**23**

B.Tech IV-I Semester (C.E)

S. No.	Course Code	Subject	L	T	P	C
1.	15A01701	Finite Element Methods	3	1	-	3
2.	15A01702	Transportation Engineering - II	3	1	-	3
3.	15A01703	Environmental Engineering	3	1	-	3
4.	15A01704	Water Resources Engineering – II	3	1	-	3
5.	 15A01705 15A01706 15A01707	**CBCC-II** 1. Design and Drawing of Irrigation Structures 2. Ground Improvement Techniques 3. Air Pollution and Quality Control	3	1	-	3
6.	 15A01708 15A01709 15A01710	**CBCC-III** 1. Bridge Engineering 2. Earth Quake Resistant Design of Structures 3. Rehabilitation and Retrofitting of Structures	3	1	-	3
7.	15A01711	CAD Laboratory	-	-	4	2
8.	15A01712	Environmental Engineering Laboratory	-	-	4	2
		Total	**18**	**6**	**8**	**22**

B.Tech IV-II Semester (C.E)

S. No.	Course Code	Subject	L	T	P	C
1.	 15A01801 15A01802	**MOOCS – II*** 1. Urban Transportation Planning 2. Advanced Structural Engineering	3	1	-	3
2.	 15A01803 15A01804	**MOOCS – III*** 1. Prestressed Concrete 2. Environmental Impact Assessment and Management	3	1	-	3
3.	15A01805	Comprehensive Viva Voce	-	-	4	2
4.	15A01806	Technical Seminar	-	-	4	2
5.	15A01807	Project Work	-	-	24	10
6.	15A01808	Survey Camp**	-	-	-	2
		Total	**6**	**2**	**32**	**22**

Minor Discipline in Civil Engineering

S. No.	Course Code	Subject	L	T	P	C
1	15A01302	Building Materials and Construction	3	1	-	3
2	15A01502	Estimation, Costing and Valuation	3	1	-	3
3	15A01601	Concrete Technology	3	1	-	3
4	15A01703	Environmental Engineering	3	1	-	3
5	15M01101	Minor Discipline Project	-	-	-	8
		Total	**12**	**4**	**-**	**20**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech I-I Sem. (C.E)

L	T	P	C
3	1	0	3

(15A52101) FUNCTIONAL ENGLISH

(Common to All Branches)

Preamble:

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, and 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 pharmacy. The prescribed book serves the purpose of preparing them for everyday communication and to face the global competitions in future.

The 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 learner-centered. They should be encouraged to participate in the classroom activities keenly.

In addition to the exercises from the text done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

Objectives:

- To enable the students to communicate in English for academic and social purpose.
- To enable the students to acquire structure and written expressions required for their profession.
- To develop the listening skills of the students.
- To inculcate the habit of reading and critical thinking skills.
- To enhance the study skills of the students with emphasis on LSRW skills.

UNIT –I

Topics: Paragraph writing, writing letters, role play, reading graphs, prepositions, designing posters, tenses, making recommendations.

Text: ENVIRONMENTAL CONSCIOUSNESS' from *MINDSCAPES*
Climate Change - Green Cover – Pollution

UNIT –II

Topics: Compound nouns, imperatives, writing instructions, interpreting charts and pictures, note making, role play, prefixes, subject-verb agreement.

Text: EMERGING TECHNOLOGIES from *MINDSCAPES*
Solar Thermal Power - Cloud Computing - Nanotechnology

UNIT –III

Topics: Making conversations, homonyms and homophones, SMS and use of emotions, past participle for irregular verbs, group discussion, E - mail communication, antonyms, Preparing projects

Text: GLOBAL ISSUES from *MINDSCAPES*
Child Labour - Food Crisis - Genetic Modification - E-Waste - Assistive Technology

UNIT –IV

Topics: Group discussion, affixes, double consonants, debates, writing a book / film review, predicting and problem-solving-future tense, adverbs

Text: SPACE TREK from *MINDSCAPES*

Hubble Telescope - Chandrayan-2 - Anusat - Living Quarters - Space Tourism

UNIT –V

Topics: Compare and contrast, effective writing, group discussion, writing reports, writing advertisements, tweeting and blogging, types of interviews, framing questions.

Text: MEDIA MATTERS from *MINDSCAPES*

History of Media - Language and Media - Milestone in Media - Manipulation by Media - Entertainment Media - Interviews

Text Books:

1. MINDSCAPES: English for Technologists and Engineers, Orient Blackswan, 2014.

References:

1. A Practical Course in Effective English Speaking Skills by J.K.Gangal, PHI Publishers, New Delhi.2012
2. Technical Communication, Meenakshi Raman, Oxford University Press,2011.
3. Spoken English, R.K. Bansal & JB Harrison, Orient Longman,2013, 4Th edition.
4. Murphy's English Grammar with CD, Murphy, Cambridge University Press,3 Rd edition.
5. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO,2008.

Outcomes:

- Have improved communication in listening, speaking, reading and writing skills in general.
- Have developed their oral communication and fluency in group discussions and interviews.
- Have improved awareness of English in science and technology context.
- Have achieved familiarity with a variety of technical reports.

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B. Tech I-I Sem. (C.E)

L	T	P	C
3	1	0	3

(15A54101) MATHEMATICS – I

(Common to All Branches)

Objectives:

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

UNIT – I

Exact, linear and Bernoulli equations, Applications to first order equations; Orthogonal trajectories, Simple electric circuits.

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).

UNIT – II

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 – III

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.

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, Mc Graw Hill publishers.

4. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

Outcomes:

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

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B. Tech I-I Sem. (C.E)

L	T	P	C
3	1	0	3

(15A05101) COMPUTER PROGRAMMING

(Common to All Branches)

Objectives:

- Understand problem solving techniques
- Understand representation of a solution to a problem
- Understand the syntax and semantics of C programming language
- Understand the significance of Control structures
- Learn the features of C language

UNIT - I

Overview of Computers and Programming - Electronic Computers Then and Now - Computer Hardware - Computer Software - Algorithm - Flowcharts - Software Development Method - Applying the Software Development Method.

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.

UNIT - II

Selections Statements – Iteration Statements – Jump Statements- Expression Statements - Block Statements.

Single Dimensional Arrays – Generating a Pointer to an Array – Passing Single Dimension Arrays to Functions – Strings – Two

Dimensional Arrays – Indexing Pointers – Array Initialization – Variable Length Arrays

UNIT - III

Pointer Variables – Pointer Operators - Pointer Expressions – Pointers And Arrays – Multiple Indirection – Initializing Pointers – Pointers to Functions – C's Dynamic Allocation Functions – Problems with Pointers.

Understanding the scope of Functions – Scope Rules – Type Qualifiers – Storage Class Specifiers- Functions Arguments –The Return Statement.

UNIT - IV

Command line arguments – Recursion – Function Prototypes – Declaring Variable Length Parameter Lists

Structures – Arrays of Structures – Passing Structures to Functions – Structure Pointers – Arrays and Structures within Structures – Unions – Bit Fields – Enumerations – typedef

UNIT - V

Reading and Writing Characters – Reading and Writing Strings – Formatted Console I/O – Printf - Scanf – Standard C Vs Unix File I/O – Streams and Files – File System Basics – Fread and Fwrite – Fseek and Random Access I/O – Fprintf ( ) and Fscanf( ) – The Standard Streams – The Preprocessor Directives #define and #include.

Text Books:

1. "The Complete Reference C"- Fourth Edition- Herbert Schildt- McGrawHill Eduction.

2. "The C Programming Language" Second Edition- Brain W. Kernighan- Dennis M. Ritchie- Prentice Hall-India. (UNIT- I)

References:

1. Programming in C, Second Edition – Pradip Dey, Manas Ghosh, Oxford University Press.
2. "C From Theory to Practice"- George S. Tselikis- Nikolaos D. Tselikas- CRC Press.
3. "Programming with C"- R S Bichkar- University Press.
4. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education. (UNIT-I)
5. Computer Fundamentals and C Programming- Second Edition- P.Chenna Reddy- Available at Pothi.com (http://pothi.com/pothi/book/dr-p-chenna-reddy-computer-fundamentals-and-c-programming).

Outcomes:

- Apply problem solving techniques in designing the solutions for a wide-range of problems
- Choose appropriate control structure depending on the problem to be solved
- Modularize the problem and also solution

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B. Tech I-I Sem. (C.E)

L	T	P	C
3	1	0	3

(15A56101) ENGINEERING PHYSICS

(Common to CSE/EEE/CIVIL)

Objectives:

- To evoke interest on applications of superposition effects like interference and diffraction, the mechanisms of emission of light, achieving amplification of electromagnetic radiation through stimulated emission, study of propagation of light through transparent dielectric waveguides along with engineering applications.
- To enlighten the periodic arrangement of atoms in crystals, direction of Bragg planes, crystal structure determination by X-rays and non-destructive evaluation using ultrasonic techniques.
- To get an insight into the microscopic meaning of conductivity , classical and quantum free electron model, the effect of periodic potential on electron motion, evolution of band theory to distinguish materials and to understand electron transport mechanism in solids.
- To open new avenues of knowledge and understanding semiconductor based electronic devices , basic concepts and applications of semiconductors and magnetic materials have been introduced which find potential in the emerging micro device applications.
- To give an impetus on the subtle mechanism of superconductors in terms of conduction of electron pairs using BCS theory, different properties exhibited by them and their fascinating applications. Considering the significance of microminiaturization of electronic devices and significance of low dimensional materials, the basic concepts of nanomaterials, their synthesis, properties and applications in emerging technologies are elicited.

UNIT - I

PHYSICAL OPTICS, LASERS AND FIBRE OPTICS

Physical Optics: Interference (Review) – Interference in thin film by reflection –Newton's rings –Diffraction (Review) - Fraunhofer diffraction due to single slit, double slit and diffraction grating.

Lasers: Characteristics of laser – Spontaneous and stimulated emission of radiation – Einstein's coefficients — Population inversion – Excitation mechanism and optical resonator – Nd:YAG laser - He-Ne laser – Semiconductor Diode laser - Applications of lasers

Fiber optics: Introduction - construction and working principle of optical fiber –Numerical aperture and acceptance angle – Types of optical fibers – Attenuation and losses in Optical fibers –Block diagram of Optical fiber communication system – Applications of optical fibers

UNIT – II

CRYSTALLOGRAPHY AND ULTRASONICS

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 – Powder method.

Ultrasonics: Introduction – Production of ultrasonics by piezoelectric method – Properties and detection – Applications in non-destructive testing.

UNIT – III

QUANTUM MECHANICS AND ELECTRON THEORY

*Quantum Mechanics: M*atter waves – de'Broglie hypothesis and properties - Schrodinger's time dependent and independent wave equations – Physical significance of wave function - Particle in one dimensional infinite potential well.

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

UNIT – IV

SEMICONDUCTORS AND MAGNETIC MATERIALS

Semiconductors: Intrinsic and extrinsic semiconductors (Qualitative treatment) – Drift & diffusion currents and Einstein's equation – Hall effect - Direct and indirect band gap semiconductors – Formation of p-n junction.

Magnetic materials: Introduction and basic definitions – Origin of magnetic moments – Bohr magnetron – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials (Qualitative treatment) – Hysteresis - Soft and hard magnetic materials, applications of magnetic materials.

UNIT – V

SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS

Superconductivity: Introduction - Effect of magnetic field - Meissner effect – Type I and Type II superconductors – Flux quantization – Penetration depth - BCS theory (qualitative treatment) — Josephson effects –Applications of superconductors.

Physics of Nanomaterials: Introduction - Significance of nanoscale and types of nanomaterials – Physical properties: optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterials by Top down and bottom up approaches: ball mill, chemical vapour deposition, and sol gel –Applications of nanomaterials.

Text Books:

1. Engineering Physics – K.Thyagarajan, 5th Edition, MacGraw Hill Publishers, NewDelhi, 2014.

2. Physics for Engineers - N.K Verma, 1st Edition, PHI Learning Private Limited, New Delhi,2014.

References:

1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, 10th Edition, S.Chand and Company, New Delhi, 2014.
2. Engineering Physics – D K Pandey, S. Chaturvedi, 2nd Edition, Cengage Learning, New Delhi, 2013.
3. Engineering Physics – D.K Bhattacharya, Poonam Tandon, 1nd Edition, Oxford University Press, New Delhi, 2015.

Outcomes:

- The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fibre optics.
- The important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction are focused along with defects in crystals and ultrasonic non-destructive techniques.
- The discrepancies between the classical estimates and laboratory observations of physical properties exhibited by materials would be lifted through the understanding of quantum picture of subatomic world.
- The electronic and magnetic properties of materials were successfully explained by free electron theory and the bases for the band theory are focused.
- The properties and device applications of semiconducting and magnetic materials are illustrated.
- The importance of superconducting materials and nanomaterials along with their engineering applications are well elucidated.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech I-I Sem. (C.E)

L	T	P	C
3	1	0	3

(15A03101) ENGINEERING DRAWING

(Common to CSE/EEE/CIVIL)

Objectives:

- To gain and understanding of the basics of geometrical constructions of various planes and solids, understanding system of graphical representation of various objects and various views to draft and read the products to be designed and eventually for manufacturing applications.
- To learn about various projections, to understand complete dimensions and details of object.
- Ultimately student must get imaginary skill to put an idea of object, circuit, assembly of parts in black & white, to design a product and to understand the composition, which can be understood universally.

UNIT I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance- Conventions in Drawing-Lettering – BIS Conventions. Curves used in Engineering Practice. a) Conic Sections including the Rectangular Hyperbola- General method only, b) Cycloid, Epicycloid and Hypocycloid

UNIT II

Scales: Plain, Diagonal and Vernier;

Projection of Points: Principles of orthographic projection – Convention – First angle projections, projections of points.

UNIT III

Projections of Lines: lines inclined to one or both planes, Problems on projections, Finding True lengths.

Projections of Planes: Projections of regular plane surfaces- plane surfaces inclined to both planes.

UNIT IV

Projections of Solids: Projections of Regular Solids with axis inclined to both planes.

Developments of Solids: Development of Surfaces of Right Regular Solids-Prism, Cylinder, Pyramid, Cone.

UNIT V

Isometric and Orthographic Projections: Principles of isometric projection- Isometric Scale- Isometric Views- Conventions- Isometric Views of lines, Planes, Simple solids (cube, cylinder and cone). Isometric projections of spherical parts. Conversion of isometric Views to Orthographic Views.

***Text Books**:*

1. Engineering Drawing, N.D. Bhatt, 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, K.C. John, PHI,2013

5. Engineering Drawing, B.V.R. Guptha, J.K. Publishers

Outcomes:

- Drawing 2D and 3D diagrams of various objects.
- Learning conventions of Drawing, which is an Universal Language of Engineers.
- Drafting projections of points, planes and solids.

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B. Tech I-I Sem. (C.E)

L	T	P	C
0	0	4	2

(15A52102) 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.

Objectives:

- To enable students 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

UNIT - 1

1. Phonetics -importance
2. Introduction to Sounds of Speech
3. Vowels and consonants sounds
4. Phonetic Transcription

UNIT - II

5. Word Stress

6. Syllabification
7. Rules of word stress
8. Intonation

UNIT - III

9. Situational Dialogues
10. Role Plays
11. JAM
12. Describing people/objects/places

UNIT - IV

13. Debates
14. Group Discussions
15. Interview skills

UNIT - V

16. Video speech writing
17. Book reviews -oral and written

Minimum Requirements 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. Walden InfoTech Software.

References:

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. Spring Board Succes, Sharada Kouhik, Bindu Bajwa, Orient Blackswan, Hyderbad, 2010.

Outcomes:

- Become active participants in the learning process and acquire proficiency in spoken English.
- Speak with clarity and confidence thereby enhance employability skills.

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B. Tech I-I Sem. (C.E)

L	T	P	C
0	0	4	2

(15A56102) ENGINEERING PHYSICS LABORATORY

(Common to CSE/EEE/CIVIL)

Objectives:

- Will recognize the important of optical phenomenon like Interference and diffraction.
- Will understand the role of optical fiber parameters and signal losses in communication.
- Will recognize the importance of energy gap in the study of conductivity and hall effect in a semiconductor
- Will understand the applications of B H curve.
- Will acquire a practical knowledge of studying the crystal structure in terms of lattice constant.
- Will recognize the application of laser in finding the particle size and its role in diffraction studies.
- Will learn to synthesis of the nanomaterials and recognize its importance by knowing its nano particle size and its impact on its properties.

Any 10 of the following experiments has to be performed during the I year I semester

1. Determination of radius of curvature of a Plano-convex lens by forming Newton's rings.
2. Determination of wavelength of given source using diffraction grating in normal incidence method.
3. Determination of Numerical aperture, acceptance angle of an optical fiber.
4. Energy gap of a Semiconductor diode.
5. Hall effect – Determination of mobility of charge carriers.

6. B-H curve – Determination of hysteresis loss for a given magnetic material.
7. Determination of Crystallite size using X-ray pattern (powder) using debye-scheerer method.
8. Determination of particle size by using laser source.
9. Determination of dispersive power of a prism.
10. Determination of thickness of the thin wire using wedge Method.
11. Laser : Diffraction due to single slit
12. Laser : Diffraction due to double slit
13. Laser: Determination of wavelength using diffraction grating
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
15. Synthesis of nanomaterial by any suitable method.

References:

1. Engineering Physics Practicals – NU Age Publishing House, Hyderabad.
2. Engineering Practical physics – Cengage Learning, Delhi.

Outcomes:

- Would recognize the important of optical phenomenon like Interference and diffraction.
- Would have acquired the practical application knowledge of optical fiber, semiconductor, dieclectric and magnetic materials, crystal structure and lasers by the study of their relative parameters.
- Would recognize the significant importance of nanomaterials in various engineering fields.

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(15A05102) COMPUTER PROGRAMMING LAB

(Common to All branches)

Objectives:

- Learn C Programming language
- To make the student solve problems, implement algorithms using C language.

List of Experiments/Tasks

1. Practice DOS and LINUX Commands necessary for design of C Programs.
2. Study of the Editors, Integrated development environments, and Compilers in chosen platform.
3. Write, Edit, Debug, Compile and Execute Sample C programs to understand the programming environment.
4. Practice programs: Finding the sum of three numbers, exchange of two numbers, maximum of two numbers, To read and print variable values of all data types of C language, to find the size of all data types, to understand the priority and associativity of operators using expressions, to use different library functions of C language.
5. Write a program to find the roots of a Quadratic equation.
6. Write a program to compute the factorial of a given number.
7. Write a program to check whether the number is prime or not.
8. Write a program to find the series of prime numbers in the given range.
9. Write a program to generate Fibonacci numbers in the given range.
10. Write a program to find the maximum of a set of numbers.
11. Write a program to reverse the digits of a number.
12. Write a program to find the sum of the digits of a number.

13. Write a program to find the sum of positive and negative numbers in a given set of numbers.
14. Write a program to check for number palindrome.
15. Write a program to evaluate the sum of the following series up to 'n' terms $e^x=1+x+x^2/2!+x^3/3!+x^4/4!+$--------
16. Write a program to generate Pascal Triangle.
17. Write a program to read two matrices and print their sum and product in the matrix form.
18. Write a program to read matrix and perform the following operations.
    i. Find the sum of Diagonal Elements of a matrix.
    ii. Print Transpose of a matrix.
    iii. Print sum of even and odd numbers in a given matrix.
19. Write a program to accept a line of characters and print the number of Vowels, Consonants, blank spaces, digits and special characters.
20. Write a program to insert a substring in to a given string and delete few characters from the string. Don't use library functions related to strings.
21. Write a program to perform the operations addition, subtraction, multiplication of complex numbers.
22. Write a program to split a 'file' in to two files, say file1 and file2. Read lines into the 'file' from standard input. File1 should consist of odd numbered lines and file2 should consist of even numbered lines.
23. Write a program to merge two files.
24. Write a program to implement numerical methods Lagrange's interpolation, Trapezoidal rule.
25. Write a program to read a set of strings and sort them in alphabetical order.
26. Write a program to read two strings and perform the following operations without using built-in string Library functions and by using your own implementations of functions.
    i. String length determination ii .Compare Two Strings
    iii. Concatenate them, if they are not equal iv. String reversing

27. Write programs using recursion for finding Factorial of a number, GCD, LCM, and solving Towers of Hanoi problem.
28. Write a program to exchange two numbers using pointers.
29. Write a program to read student records into a file. Record consists of rollno, name and marks of a student in six subjects and class. Class field is empty initially. Compute the class of a student. The calculation of the class is as per JNTUA rules. Write the first class, second class, third class and failed students lists separately to another file.
30. A file consists of information about employee salary with fields employeeid, name, Basic, HRA, DA, IT, other-deductions, Gross and Net salary. Initially only employeeid, name, and basic have valid values. HRA is taken as 10% of the basic, DA is taken as 80% of basic, IT is 20% of the basic, other deductions is user specified. Compute the Gross and Net salary of the employee and update the file.
31. Write a program to perform Base (decimal, octal, hexadecimal, etc) conversion.
32. Write a program to find the square root of a number without using built-in library function.
33. Write a program to convert from string to number.
34. Write a program to implement pseudo random generator.
35. Write a program to generate multiplication tables from 11 to 20.
36. Write a program to express a four digit number in words. For example 1546 should be written as one thousand five hundred and forty six.
37. Write a program to generate a telephone bill. The contents of it and the rate calculation etc should be as per BSNL rules. Student is expected to gather the required information through the BSNL website.
38. Write a program to find the execution time of a program.
39. Design a file format to store a person's name, address, and other information. Write a program to read this file and produce a set of mailing labels

Note:

1. Instructors are advised to conduct the lab in LINUX/UNIX environment also
2. The above list consists of only sample programs. Instructors may choose other programs to illustrate certain concepts, wherever is necessary. Programs should be there on all the concepts studied in Theory. Instructors are advised to change atleast 25% of the programs every year until the next syllabus revision.

References:

1. "How to Solve it by Computer", R.G. Dromey, Pearson.
2. "The C Programming Language", Brian W. Kernighan, Dennis M. Ritchie, Pearson.
3. "Let us C", Yeswant Kanetkar, BPB publications
4. "Pointers in C", Yeswant Kanetkar, BPB publications.
5. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education.

Outcomes:

- Apply problem solving techniques to find solutions to problems
- Able to use C language features effectively and implement solutions using C language.
- Improve logical skills.

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(15A52201) ENGLISH FOR PROFESSIONAL COMMUNICATION

1. INTRODUCTION:

English is a global language and has international appeal and application. It is widely used in a variety of contexts and for varied purposes. The students would find it useful both for social and professional development. There is every need to help the students acquire skills useful to them in their career as well as workplace. They need to write a variety of documents and letters now extending into professional domain that cuts across business and research also. The syllabus has been designed to enhance communication skills of the students of engineering and pharmacy. The prescribed book serves the purpose of preparing them for everyday communication and to face the global competitions in future.

The 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 learner-centered. They should be encouraged to participate in the classroom activities keenly.

In addition to the exercises from the text 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 develop confidence in the students to use English in everyday situations.
2. To enable the students to read different discourses so that they appreciate English for science and technologies.
3. To improve familiarity with a variety of technical writings.
4. To enable the students to acquire structure and written expressions required for their profession.
5. To develop the listening skills of the students.

3. SYLLABUS:

UNIT –I

Topics: Group discussion, cause and effect, events and perspectives, debate, if conditional, essay writing.

Text: LESSONS FROM THE PAST from ***MINDSCAPES***

Importance of History - Differing Perspectives - Modern Corporatism - Lessons From The Past

UNIT-II

Topics: Idioms, essay writing, power point presentation, modals, listening and rewriting, preparing summary, debate, group discussion, role play, writing a book review, conversation

Text: 'ENERGY' from ***MINDSCAPES***

Renewable and Non-Renewable Sources - Alternative Sources - Conservation -Nuclear Energy

UNIT-III

Topics: Vocabulary, impromptu speech, creative writing, direct and indirect speech, fixed expressions, developing creative writing skills, accents, presentation skills, making posters, report writing

Text: 'ENGINEERING ETHICS' from ***MINDSCAPES***
Challenger Disaster - Biotechnology - Genetic Engineering - Protection From Natural Calamities

UNIT-IV

Topics: Vocabulary, Conversation, Collocation, Group discussion, Note-making, Clauses, Interpreting charts and tables , Report writing.

Text: 'TRAVEL AND TOURISM' from ***MINDSCAPES***
Advantages and Disadvantages of Travel - Tourism - Atithi Devo Bhava - Tourism in India

UNIT-V

Topics: Vocabulary, phrasal verbs, writing a profile, connectives, discourse markers, problem-solving, telephone skills, application letters, curriculum vitae, interviews (telephone and personal)

Text: 'GETTING JOB-READY' from ***MINDSCAPES***
SWOT Analysis - Companies And Ways Of Powering Growth - Preparing For Interviews

Prescribed Text

MINDSCAPES: English for Technologists and Engineers, Orient Blackswan, 2014.

REFERENCES:

1. **Effective Tech Communication,** Rizvi,Tata McGraw-Hill Education, 2007.
2. **Technical Communication,** Meenakshi Raman, Oxford University Press.
3. **English Conversations Practice,** Grant Taylor, Tata Mc GrawHill publications,2013**.**
4.**Practical English Grammar.** Thomson and Martinet, OUP, 2010.

Expected Outcomes:

At the end of the course, students would be expected to:

1. Have acquired ability to participate effectively in group discussions.
2. Have developed ability in writing in various contexts.
3. Have acquired a proper level of competence for employability.

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(15A54201) 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 solution of partial differential equations.

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.

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,

   Mc Graw Hill publishers.

3. 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 partial differential equations.

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(15A01201) ENGINEERING MECHANICS

OBJECTIVE: This course will serve as a basic course by introducing the concepts of basic mechanics which will help as a foundation to various courses.

UNIT – I

INTRODUCTION OF ENGINEERING MECHANICS – Basic concepts - System of Forces – Moment of Forces and its Application – Couples and Resultant of Force System – Equilibrium of System of Forces - Degrees of Freedom – Free body diagrams –Types of Supports – Support reactions for beams with different types of loading – concentrated, uniformly distributed and uniformly varying loading.

UNIT – II

FRICTION : Types of friction– laws of Friction – Limiting friction- Cone of limiting friction– static and Dynamic Frictions – Motion of bodies – Wedge, Screw jack and differential Screw jack.

UNIT – III

CENTROID AND CENTER OF GRAVITY: Centroids of simple figures – Centroids of Composite figures – Centre of Gravity of bodies – Area moment of Inertia - Parallel axis and perpendicular axis theorems - Moments of Inertia of Composite Figures.

MASS MOMENT OF INERTIA: Moment of Inertia of Simple solids – Moment of Inertia of composite masses.(Simple problems only)

UNIT – IV

KINEMATICS: Rectilinear and Curvilinear motion – Velocity and Acceleration – Motion of A Rigid Body – Types and their Analysis in Planar Motion.

KINETICS : Analysis as a particle and Analysis as a Rigid Body in Translation – Central Forces of motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies – Work Energy Method – Equation for Translation – Work Energy application to Particle Motion, Connection System – Fixed axis Rotation and Plane Motion.

UNIT – V

ANALYSIS OF PERFECT FRAMES: Types of frames – cantilever frames and simply supported frames – Analysis of frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

MECHANICAL VIBRATIONS: Definitions, Concepts-Simple Harmonic motion-Free vibrations-Simple Compound and Torsional pendulum- Numerical problems

TEXT BOOKS:

(1) Engineering Mechanics by Dr.R.k.Bansal, Lakshmi Publications.
(2) Engineering Mechanics by Shames & Rao – Pearson Education.

REFERENCES:

(1) Engineering Mechanics by Bhavakatti, New age pubilishers
(2) Engineering Mechanics by Seshigiri Rao, Universities Press, Hyderabad.
(3) Engineering Mechanics – B. Bhattacharyya, Oxford University Publications.

Outcomes

On successful completion of the course, the subject knowldge will be able to

1. Develop students to acquire knowledge of static and dynamic behavior of the bodies.
2. Develop students to acquire the knowledge, so that they can understand physical phenomenon with thehelp of various theories.
3. Develop students, who will be able to explain the physical phenomenon with help of diagrams.
4. Develop students with a broad vision with the skills of visualizing and developing their own ideas, and to convert those ideas in to engineering problems and solving those problems with the acquired knowledge of the Engineering Mechanics.

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(15A51101) ENGINEERING CHEMISTRY

(Common to All Branches)

Objectives:

- 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.
- The course main aim 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 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 the concepts of chemistry and apply to various materials for engineering applications.

UNIT – I WATER QUALITY AND TREATMENT

Impurities in water, Hardness of water and its Units, Disadvantages of hard water, Estimation of hardness by EDTA method, Numerical problems on hardness, Estimation of dissolved oxygen, Alkalinity, acidity and chlorides in water, Water treatment for domestic purpose (Chlorination, Bleaching powder, ozonisation)

Industrial Use of water:

For steam generation, troubles of Boilers: Scale & Sludge, Priming and Foaming, Caustic Embrittlement and Boiler Corrosion.

Treatment of Boiler Feed water:

Internal Treatment: Colloidal, Phosphate, Carbonate, Calgon and sodium aluminate treatment.

External Treatment: Ion-Exchange and Permutit processes.

Demineralisation of brackish water: Reverse Osmosis and Electrodialysis

UNIT – II POLYMERS

i)Introduction: Basic concepts of polymerisation, Types of poloymerisation (Chain Growth (Addition), Step growth (Condensation)), Mechanism: cationic, anionic, free radical and coordination covalent.

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

Elastomers

Natural Rubber; Processsing of natural rubbers, Compounding of Rubber

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

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

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

UNIT – III ELECTROCHEMISTRY

i) Galvanic cells, Nernest Equation, Numerical calculations, Batteries: Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries),Fuels cells: (Hydrogen-Oxygen and Methanol-Oxygen, Solid oxide)

ii) Corrosion: Introduction, type of corrosion (Concentration cell corrosion, Galvanic corrosion), Chemical (Dry) and Electrochemical (Wet) Theory of corrosion. Galvanic series, factors affecting the corrosion (Metal and environment). Prevention: Cathodic protection (Sacrificial anode and impressed current), Inhibitors (Anodic and cathodic), electroplating (Copper, nickel and chromium) and electroless plating (Copper and nickel)

UNIT – IV FUELS AND COMBUSTION

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

Solid Fuels: Coal-Classification and Analysis (proximate and ultimate), Coke :Characteristics of metallurgical coke, Manufacture of Metallurgical Coke by Otto Hoffmann's by product oven processes.

Liquid Fuels:

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

Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

Gaseous Fuels: Natural gas, Producer gas, Water gas, Coal gas and Biogas. Determination calorific value of Gases fuels by Junker's calorimeter.

Combustion: Basic principles and numerical problems, Flue Gas analysis by Orsat's apparatus.

UNIT – V CHEMISTRY OF ENGINEERING MATERIALS

i) Cement: Composition, Classification, preparation (Dry and Wet processes), Setting and Hardening (Hydration and Hydrolysis)

ii) Refractories: Introduction, Classification , properties and applications

iii) Lubricants: Introduction, classification (Solid, liquid, semi solid, emulsion and synthetic),Theory of lubrication (Thin film, Thick film & Extreme pressure) , properties of lubricants and applications.

iv) Carbon clusters: Fullerenes and Carbon Nano Tubes (CNT)

Text Books:

1. Engineering Chemistry, First Edition, Jayaveera KN, Subba Reddy GVand Ramachandraiah C, McGraw Hill Higher Education, New Delhi, 2013.
2. A Text Book of Enigneering Chemistry, 15th Edition, Jain and Jain, Dhanapathi Rai Publications, New Delhi, 2013.

References:

1. A Text book of Engineering Chemistry, 12th Edition, SS Dhara,Uma, S. Chand Publications, New Delhi, 2010.
2. Engineering Chemistry, First edition, K.B. Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH Publications India Pvt Limited, 2010.
3. Engineering Chemistry, First edition, Seshamaheswaramma K and Mridula Chugh, Pearson Education, 2013.

Outcomes: The student is expected to:

- Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially.
- Understand the electrochemical sources of energy
- Understand industrially based polymers, various engineering materials.

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(15A01101) ENVIRONMENTAL STUDIES

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 – 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 Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Pubilishers.

REFERENCES :

1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

Outcomes :

(1) Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.

(2) Students will realize the need to change their approach so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.

(3) Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.

(4) By studying environmental sciences, students is exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.

At the end of the course, it is expected that students will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting

polluted. This will enable every human being to live in a more sustainable manner.

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(15A01202) APPLIED MECHANICS LAB

OBJECTIVE: This lab is aimed at making the student understand the concepts of Engineering Mechanics through demonstrable experiments

LIST OF EXERCISES (Any EIGHT of the Following):

(1) Polygon Law of Coplanar Forces

To verify the Polygon Law of Coplanar Forces for a concurrent force system

(2) Support Reactions of a Beam

To find experimentally the reactions at the supports of a simply supported beam and verify the same with analytical values

(3) Bell Crank Lever

To verify the Principle of moments using the Bell Crank lever apparatus

(4) Friction Plane

To determine the coefficient of Static Friction between two surfaces

(5) Moment of Inertia of Flywheel

To find screw jack and determine the coefficient of friction between the threads of the screw

(6) Compound Pendulum

To estimate the acceleration due to gravity using a compound pendulum

(7) Single Gear Crab

To understand the gear arrangement and establish the law of machine

(8) Double Gear Crab

To compare the efficiency of Single and Double Gear Crab

(9) Differential Pulley Block

To establish law of machine

(10) Differential Axle and Wheel

To understand the velocity ratio of the machine and to interpret the law of machine

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(15A51102) ENGINEERING CHEMISTRY LAB

(Common to All Branches)

Objectives:

- Will learn practical understanding of the redox reaction
- 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. Estimation of iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
5. Determination of Alkalinity of Water
6. Determination of acidity of Water
7. Preparation of Phenol-Formaldehyde (Bakelite)

8. Determination of Viscosity of oils using Redwood Viscometer I

9. Determination of Viscosity of oils using Redwood Viscometer II

10. Determination of calorific value of gaseous fuels by Junker's Calorimeter

11. Conductometric estimation of strong acid using standard sodium hydroxide solution

12. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.

13. Potentio metric determination of iron using standard potassium dichromate

14. Colorometric estimation of manganese.

15. pH meter calibration and measurement of pH of water and various other samples.

(Any 10 experiments from the above list)

References:

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – Mendham J et al, Pearson Education, 2012.
2. Chemistry Practical– Lab Manual, First edition, Chandra Sekhar KB, Subba Reddy GV and Jayaveera KN, SM Enterprises, Hyderabad, 2014.

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 position to technically address the water related problems.

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(15A99201) ENGINEERING & I.T. WORKSHOP

ENGINEERING WORKSHOP

Course Objective:

The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc. There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials. Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work. Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students.

1. TRADES FOR EXERCISES:

a. Carpentry shop– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock
b. Fitting shop– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock

c. Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 guage G.I. sheet
d. House-wiring– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
e. Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.
f. Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint.

2. TRADES FOR DEMONSTRATION:

a. Plumbing
b. Machine Shop
c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

References:

1. *Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009*

2. *Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.*
3. *Engineering Practices Lab Manual, Jeyapoovan, SaravanaPandian, 4/e Vikas*
4. *Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.*

I.T. 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
- To learn about Networking of computers and use Internet facility for Browsing and Searching.

Learning Outcome:

- 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

Preparing your Computer (5 weeks)

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 (4 weeks)

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 (6 weeks)

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 color, 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, colors, 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.

Optional Tasks:

Task 11: Laboratory Equipment: Students may submit a report on specifications of various equipment that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop computer
- Server computer
- Switch (computer science related)
- Microprocessor kit
- Micro controller kit
- Lathe machine
- Generators
- Construction material
- Air conditioner
- UPS and Inverter
- RO system
- Electrical Rectifier
- CRO
- Function Generator
- Microwave benches

Task 12: Software: Students may submit a report on

specifications of various software that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. The software may be proprietary software or Free and Open source software. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop operating system
- Server operating system
- Antivirus software
- MATLAB
- CAD/CAM software
- AUTOCAD

References:

1. Introduction to Computers, Peter Norton, Mc Graw 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
(Established by Govt. of A.P., Act. No. 30 of 2008)
ANANTHAPURAMU – 515 002 (A.P.) INDIA.

Course Structure for B.Tech-R15 Regulations

Food Technology

II YEAR I SEMESTER

S.No.	Code	Subject	L	T	P	C
1	15A27301	Principles of Food Engineering-I	3	1	-	3
2	15A27302	Food Microbiology	3	1	-	3
3	15A27303	Post Harvest Engineering	3	1	-	3
4	15A27304	Food Biochemistry & Nutrition	3	1	-	3
5	15A27305	Principles of Food Processing & Preservation	3	1	-	3
6	15A27306	Cereals, Pulses & Oilseeds Processing Technology	3	1	-	3
7	15A27307	Food Microbiology Lab	-	-	4	2
8	15A27308	Food Product Lab-I (Cereals, Pulses & Oilseeds)	-	-	4	2
		Total	18	6	8	22

II YEAR II SEMESTER

S.No.	Code	Subject	L	T	P	C
1	15A27401	Principles of Food Engineering-II	3	1	-	3
2	15A54401	Probability & Statistics	3	1	-	3
3	15A27402	Fluid Mechanics in Food Process Engineering	3	1	-	3
4	15A27403	Food Chemistry	3	1	-	3
5	15A27404	Fruit and Vegetable Processing	3	1	-	3
6	15A27405	Mechanical Operations & Material Handling	3	1	-	3
7	15A27406	Fluid Mechanics Lab	-	-	4	2
8	15A27407	Mechanical Operations & Milling Lab	-	-	4	2
9	15A27408	Comprehensive Online Examination-I	-	-	-	1
		Total	18	6	8	23

III YEAR I SEMESTER

S.No.	Code	Subject	L	T	P	C
1	15A27501	Heat Transfer Operations	3	1	-	3
2	15A27502	Dairy & Dairy Products	3	1	-	3
3	15A27503	Processing of Spices & Plantation Crops	3	1	-	3
4	15A27504	Industrial Microbiology	3	1	-	3
5	15A27505	Food Analysis	3	1	-	3
6	15A27506	MOOCS-I Food Business Management	3	1	-	3
7	15A27507	Heat Transfer Operations Lab	-	-	4	2
8	15A27508	Food Product Lab-II (Fruits and Vegetables)	-	-	4	2
9	15A99501	Audit course – Social Values & Ethics	2	0	2	0
		Total	20	6	10	22

III YEAR II SEMESTER

S.No.	Code	Subject	L	T	P	C
1	15A27601	Food Quality & Sensory Evaluation of Food Products	3	1	-	3
2	15A27602	Instrumentation and Process Control	3	1	-	3
3	15A27603	Mass Transfer	3	1	-	3
4	15A27604	Meat & Poultry products	3	1	-	3
5	15A27605	Fish and Marine Products	3	1	-	3
6		Elective-I	3	1	-	3
	15A27606	Food Refrigeration & Cold Chain				
	15A27607	Thermal Operations				
	15A27608	Frozen food Technology				
7	15A27609	Mass Transfer Lab	-	-	4	2
8	15A27610	Food Product Lab-III (Meat, Poultry & Fish)	-	-	4	2
9	15A52602	Advanced English Language Communication Skills (AELCS) Laboratory (Audit Course)			2	-
10	15A27611	Comprehensive Online Examination - II	-	-	-	1
		Total	18	6	10	23

IV YEAR I SEMESTER

S.No.	Code	Subject	L	T	P	C
1	15A27701	Food Safety and Standards	3	1	-	3
2	15A27702	Byproduct Utilization and Waste Management in Food Industries	3	1	-	3
3	15A27703	Food Plant Utilities & Energy Conservation	3	1	-	3
4	15A27704	Food Packaging Technology	3	1	-	3
5		Elective -II	3	1	-	3
	15A27705	Food Extrusion Technology				
	15A27706	Bakery, Confectionery & Snack products				
	15A27707	Technology of Traditional foods				
6		Elective -III	3	1	-	3
	15A27708	Technology of Beverages				
	15A27709	Flavor Technology				
	15A27710	Specialty Foods: Nutraceuticals and Functional Foods				
7	15A27711	Food Analysis Lab	-	-	4	2
8	15A27712	Packaging Lab	-	-	4	2
Total			18	6	8	22

IV YEAR II SEMESTER

S.No.	Code	Subject	L	T	P	C
1	15A27801	MOOCS-II	3	1	0	3
		Plant Design and Process Economics				
2	15A27802	MOOCS -III	3	1	0	3
		Food Plant Sanitation & Hygiene				
3	15A27803	Comprehensive Viva Voce	0	0	4	2
4	15A27804	Technical Seminar	0	0	4	2
5	15A27805	Project work	0	0	24	12
Total			6	2	32	22

L – Theory T- Tutorial P – Practical/Drawing C – Credits

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-I Sem. (FT)	L	T	P	C
	3	1	0	3

(15A27301) PRINCIPLES OF FOOD ENGINEERING – I

Preamble:

The text prescribed for detailed study focuses on basic concepts like units and its conversion, fundamental laws and principles are useful to understand the subject.

Objectives:

- To familiarize the importance and usage of units.
- To understand the fundamental laws and principles and its application

UNIT – I

Introduction to Food Engineering: Definition of terms, System of measurements, The S.I System, Conversion of Units

UNIT – II

Steam Generation & Utilization: Concept of normal boiling point, Properties of Steam:Wet, dry saturated, superheated steam.Pressure-Enthalpy diagram, Steam Tables and their application, Problems; Boilers: Classification, Types, Criteria for selection, Maintenance & Applications

UNIT – III

Basic principles of Physics & Chemistry: Ideal Gas law and PVT relationships

Gases and Vapors: Behavior of Gases – Kinetic Theory of gases – Perfect Gas – Gas laws – Ideal gas laws – Real gas- Van der Waal's equation -pure component vapour pressure- partial pressure Dalton's law. Pure component volume-Amagat's law; Problems

UNIT – IV

Thermodynamics: Thermodynamic variables, Heat Capacity, Entropy, Laws of Thermodynamics, Various Thermodynamic processes (Adiabatic, Isothermal, Isobaric, Isocratic)

Basic concepts: definitions, approaches, thermodynamic systems, thermodynamic properties and equilibrium, state of a system, state diagram, path and process, different modes of work

Zeroth law of thermodynamics: concept of temperature, heat

First law of thermodynamics:Energy, enthalpy, specific heats, applications of first law, steady and unsteady flow analysis

Second law of thermodynamics: Kelvin-Planck and Clausius statements, reversible and irreversible processes, thermodynamic temperature scale, availability and irreversibility

Refrigeration: Basic concepts, Joule-Thomson effect, Refrigerants-Classification, Refrigeration Load, Problems, Refrigeration types (VCR, Absorption), Applications

UNIT – V

Measurement & Control of Process Parameters: Various Process Parameters, On-line & Off-line parameters, Critical & non-critical parameters, Measurement of various parameters, controlling methods (Manual, Automatic & Computer control)

Text Books

1. R.K. Rajput. 2007. Engineering Thermodynamics, 3rd Ed. Laxmi Publications (P) Ltd., Bangalore.
2. P.G. Smith, Introduction to Food Process Engineering, 2nd Edition, Lincoln, UK, 2010.
3. Warren L. McCabe, Julian Smith, Peter Harriott. 2004. Unit Operations of Chemical Engineering, 7th Ed. McGraw-Hill, Inc., NY, USA.
4. Christie John Geankoplis. 2003. Transport Processes and Separation Process Principles (Includes Unit Operations), 4th Ed. Prentice-Hall, NY, USA.

References

1. J.M. Smith, H.C. Van Ness and M.M. Abbott. 2005. Introduction to Chemical Engineering Thermodynamics, 7th Ed. McGraw-Hill, Inc., NY, USA.
2. R. Paul Singh and Dennis R. Heldman, Introduction to Food Engineering, 4th Edition, Academic Press, 2009.
3. Z. Berk, Food Process Engineering and Technology, Food Science and Technology, 1st Edition, International Series, Elsevier, 2009.
4. D. G. Rao, Fundamentals of food engineering, Prentice-Hall of India, New Delhi, 2010

Outcomes:

- Students will learn the importance of units.
- Students will understand the basic laws and principles and its application in food engineering

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B. Tech II-I Sem. (F.T.)	L	T	P	C
	3	1	0	3

(15A27302) FOOD MICROBIOLOGY

Preamble:

To make the student to understand the causes of food spoilage and predict the micro organism that can spoil a given food, when prepared, processed and stored under given condition and take corrective measures to control the spoilage and pathogenic micro organism in food. To help the students to understand the machines and their components so as to enable them manage the machineries in the food industries

Objectives:

- To understand the role of beneficial micro organisms in food processing and preservation.
- To list the major food spoilage microorganisms.
- To analyze methods used to control or destroy micro organism commonly found in food.

UNIT I

Introduction: Development and scope of Microbiology - Classification and Identification of Microorganisms –Bacteria, fungi, viruses, protozoa and bacteriophage Morphology, cultivation- Growth curve – microscopy – types- importance of micro organisms in food.

UNIT II

Isolation of Microorganisms:Methods of isolation and purification – preparation of media – types of nutritional media – staining techniques – Simple, differential and structural staining – preservation of the microbial culture- primary sources of micro organisms in food- Factors affecting the growth of microorganisms

UNIT III

Microbial spoilage in Foods: Types of micro organisms in food via meat, poultry, sea foods, vegetables, dairy products, fruits and vegetables. Assessing microbial population in food-meat, poultry, fish and dairy products- microbial spoilage of fruits, vegetables, cereal and bakery products, meat products and egg.

UNIT IV

Food Preservation:Preservation by Moist Heat-Heat Resistance of microorganisms and spores. Decimal reduction time (Dvalues), 12D concept, Thermal Death Time curves. Unitof lethality, determination of process lethality requirements, effective F values.Preservation by low temperature.The behaviour of microorganisms under freezing and refrigeration environment.Growth and lethal effects of low temperature treatments on microorganisms in raw and processed foods.

UNIT V

Harmful Micro-organism and Beneficial Micro-organism: Food borne diseases – food infection and food intoxication, toxins – symptoms, causes and control measures. Micro organisms as food- Single Cell Protein Fermented food- pickles, sauerkraut- vinegar and lactic acid.

Text Books

1. Pelczar,M.J., E.C.S. Chan and N.R. Krieg. "Microbiology". McGraw-Hill New York 1993.
2. Frazier, W.C. and Westhoff, D.C."Food Microbiology". Fourth Edition. Tata McGraw Hill Publishing Co. Ltd., New Delhi 2008.

References

1. Banwart, G.J,"Basic Food Microbiology" Van No Strand Reinhold Publishers, New York1989.
2. Jay, J.M., "Modern Food Microbiology". CBS Publishers& Distributors, New Delhi 2000.

Outcomes:

- The students become familiar with identification and its activity of microorganisms in various foods.
- The students would understand the spoilage of foods due to harmful microorganisms.
- The students also get to know the various methods to eliminate/inactivate the growth of microorganisms in different foods

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-I Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27303) POST HARVEST ENGINEERING

Preamble: The subject gives broad idea about importance of post harvest operations and equipment used for each operation.

Objective:

1. To explore the post harvest technology
2. To acquire the knowledge on reduction post harvest losses
3. To understand the working principles of equipment used for processing

UNIT – I

Overview of post harvest technology: Concept and science, production and post harvest losses, reasons for losses, importance of loss reduction; Water activity, water binding and its effect on enzymatic and non-enzymatic reactions and food texture, control of water activity and moisture, intermediate moisture foods.

UNIT – II

Post Harvest Handling operations; Cleaning: Cleaning of grains, washing of fruits and vegetables, types of cleaners, screens, types of screens, rotary screens, vibrating screens, machinery for cleaning of fruits and vegetables (air cleaners, washers), cleaning efficiency, care and maintenance; Sorting and grading: Sorting, grading, methods of grading; Grading- Size grading, colour grading, specific gravity grading; screening, equipment for grading of fruits and vegetables, grading efficiency, care and maintenance.

UNIT– III

Separation: Magnetic separator, destoners, electrostatic separators, pneumatic separator; Decorticating and shelling: Principles of working, design and constructional details, operating parameters, maintenance, etc. of various decorticators/dehullers/shellers, description of groundnut decorticators, maize shellers, etc.

UNIT – IV

Field Drying: Grain drying theory, grain dryers; Liquid dryers; Parboiling: process, changes during parboiling, parboiling methods, advantages and disadvantages of parboiling with respect to milling, nutritional and cooking quality of grain, significance of glass transition temperature.

UNIT – V

Milling: milling, polishing, grinding, milling equipment, dehuskers, polishers (abrasion, friction, water jet), flour milling machines, pulse milling machines, grinders, cutting machines, oil expellers, calculation of machine efficiency and power requirement.

Text Books

1. AmalenduChakraverty and R. Paul Singh. 2014. Post Harvest Technology and Food Process Engineering. CRC Press, Boca Raton, FL, USA.
2. A. Chakraverty. 2008. Post Harvest Technology of Cereals, Pulses and Oilseeds, 3rd Ed. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Don W. Green and Robert H. Perry. 2008. Perry's Chemical Engineers' Handbook. McGrawHill Co., Inc., NY, USA.
4. James G. Brennan. 2006. Food Processing Handbook. Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany.

References

1. K.M. Sahay and K.K. singh. 2001. Unit Operations of Agricultural Processing. Vikas Publishing House Pvt. Ltd., Noida, UP.
2. G. Boumans. 1985. Grain Handling and Storage. Elsevier Science Publishers, Amsterdam, The Netherlands.
3. R.L. Earle. 1983. Unit operations in Food Processing. Pergamon Press, New York, USA.
4. Carl W. Hall and Denny C. Davis. 1979. Processing Equipment for Agricultural Products. The AVI Publishing Company, Inc., Connecticut, MA, USA.
5. S.M. Henderson and R.L. Perry. 1966. Agricultural Process Engineering, 2nd Ed. The AVI Publishing Company, Inc., Connecticut, MA, USA.

Outcome:

- The student will learn the importance of post-harvest technology, production and losses
- The students will understand the types and different equipment used for operation

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-I Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27304) FOOD BIOCHEMISTRY & NUTRITION

Preamble:

This is an introductory course which gives the necessary details and information to get acquainted with the biochemistry of foods and classification of nutrients as well as nutritional importance.

Objectives:

At the end of this course, the student will have an idea about the various constituents of foods, sources, energy and nutritional requirements and their functions.

UNIT – I

Concepts of food and nutrition: Definition of terms – nutrition, malnutrition (undernutrition, overweight, obesity), health and nutritional status, functions of food, basic food groups – energy yielding, body building and protective, nutrients supplied by food, nutritional needs – requirements and recommended allowances of foods under normal conditions for all age groups. Nutrients: Sources, functions, digestion, absorption, assimilation and transport of carbohydrates, proteins and fats in human beings.

UNIT – II

Mechanism of enzyme action Introduction to enzymes, coenzymes, regulation of enzymatic activity, enzyme kinetics, inhibition effects of pH, allosteric enzymes, derivation of Michaelis-Menten Equation. Nucleic acids Definition and composition of RNA and DNA, structure of various components, viz, bases and sugars, hydrolysis of nucleic acids, structure of RNA and double helical structure of DNA

UNIT – III

Metabolism of carbohydrates Biological role of carbohydrates, glycolysis and respiration (TCA cycle), production of ATP- a brief description of electron transport chain, oxidative and substrate phosphorylation. Metabolism of lipids Biological role of lipids, breakdown of triglycerides and phospholipids, β-oxidation of long chain fatty acids, ketosis, biosynthesis of fatty acids, triglycerides and phospholipids.

UNIT – IV

Metabolism of proteins Breakdown of proteins, transamination, deamination, decarboxylation, nitrogen fixation, urea cycle. Minerals Functions, sources, factors affecting absorption of minerals, absorption promoters – Vit C for Fe, absorption inhibitors – phytates, tannins, oxalates, effect of deficiency – Calcium, phosphorus, iron, zinc, iodine, fluorine and copper.

UNIT – V

Vitamins and hormones Classification, functions, sources, effects of deficiency, fat soluble vit (A,D,E,K), water soluble vitamin (thiamine, riboflavin, niacin, cyanocobalamin, folic acid, and ascorbic acid), relationship between vitamins and hormones in terms of their biological role. Physico chemical and nutritional changes during processing Changes during food processing treatment – drying and dehydration, irradiation, freezing, fermentation, canning, restoration, enrichment, fortification and supplementation of foods

Text Books:

1. Gaile Moe, Danita Kelley, Jacqueline Berning and Carol Byrd-Bredbenner. 2013. Wardlaw's Perspectives in Nutrition: A Functional Approach. McGraw-Hill, Inc., NY, USA.
2. David L. Nelson and Michael M. Cox. 2012. Lehninger Principles of Biochemisry, 6th Ed. Macmillan Learning, NY, USA.
3. Donald Voet and Judith G. Voet. 2011. Biochemistry, 4th Ed. John Wiley and Sons, Inc., NY, USA.

References:

1. Carolyn D. Berdanier, Elaine B. Feldman and Johanna Dwyer. 2008. Handbook of Nutrition and Food, 2nd Ed. CRC Press, Boca Raton, FL, USA.
2. Bob B. Buchanan, Wilhelm Gruissem and Russell L. Jones. 2002. Biochemistry & Molecular Biology of Plants. John Wiley and Sons, Inc., NY, USA.
3. Jeremy M. Berg, John L. Tymoczko, LubertStryer and Gregory J. Gatto, Jr. 2002. Biochemisry, 7th Ed. W.H. Freeman and Company, NY, USA.

Outcome:

- Students will able to learn the usefulness of cells and organisms
- Students will understand the metabolic pathways
- Students will get information on types and importance of nutrients

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-I Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27305) PRINCIPLES OF FOOD PROCESSING & PRESERVATION

Preamble:
This course helps the students to apply basic food science knowledge and get to know biochemical changes occurring during various processing and preservation techniques.

Objective:

1. Emphasis on importance of food technology into reduce the spoilage and improve the quality
2. To explore the various preservation methods

UNIT – I
Definition and scope of Food Science and Technology, Historical development of food processing and preservation, general principles of food preservation.Degree of perishability of unmodified foods, Causes of quality deterioration and spoilage of perishable foods, intermediate moisture foods, wastage of foods.

UNIT – II
Preservation of foods by low temperatures: (A) Chilling temperatures: Consideration relating to storage of foods at chilling temperatures, Chilling injury, Applications and procedures, Controlled and Modified atmospheric storage of foods, Post storage Handling of foods.
(B) Freezing temperatures: Freezing process, Slow and quick freezing of foods;effect on foods, other occurrences associated with freezing of foods. Technological aspects of pre freezing, Actual freezing, Frozen storage and thawing of foods, Individual Quick Freezing.

UNIT – III
Preservation of foods by high temperatures: Basic concepts in thermal destruction of microorganisms D, Z and F values. Heat resistance and thermophilic microorganisms. Cooking, blanching, pasteurization and sterilization of foods. Extrusion, baking, roasting, frying, dielectric heating, ohmic, microwave and infrared heating. Assessing efficacy of thermal processing of foods, General process of canning of foods, Spoilage in canned foods.

Unit-IV
Preservation by water removal: (a) Principles, Technological aspects and application of evaporative concentration process; Freeze concentration and membrane process for food concentrations. (b) Principles, Technological aspects and application of drying and dehydration of foods, Cabinet, tunnel, belt, bin, drum, spray, vacuum, foam mat, fluidized-bed and freeze drying of foods.

UNIT – V

Chemical & Natural Preservatives: Classification, Principles, Radiations: Sources of radiations, units and dosages, effect on microorganisms and different nutrients; dose requirements for radiation preservation of foods., safe limits, irradiation mechanism and survival curve, technological aspects; applications of sugar and salt, antimicrobial agents, biological agents, Hurdle technology. Effects of various food processing operations on the nutritive value of foods.

Text Books:

1. Food Science, Norman N. Potter and J.H. Hotchkiss, Chapman and Hall, 5th Edition., 1998.
2. Food processing technology: principles and practice, P. J. Fellows, Taylor and Francis, 3rd Edition 2009.

References:

1. Principles of Food Science-Part-II: Physical Method of Food Preservation, M. Karel, O.R. Fennema and D.B. Lund, Marcel Dekkar Inc., 2nd Edition, 2001.
2. Principles of Food Preservation, V. Kyzlink, Elsevier Press, 2nd Edition, 2003.
3. Modern Food Microbiology, J. M. Jay, D. Van Nostrand, 7th Edition, 2005.

Outcomes:

Upon completion of this course students should be able to understand
1. The changes occurring during various food processing techniques
2. The changes during storage and preservation
3. The effect of enzymes on spoilage reactions of foods

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-I Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27306) CEREALS, PULSES & OILSEEDS PROCESSING TECHNOLOGY

Preamble:

This course covers fundamentals of cereals and pulses processing, equipments, products and storage requirements.

Objectives:

1. To learn about the processing of major cereals and pulses.
2. To gain knowledge about grain storage structure and handling devices.

UNIT – I

Importance of Cereals Pulses and Oilseeds, Composition, Structure and processing characteristics of Cereal grains, Legumes and Oilseeds, Post-harvest technology, Post processing practices for safe storage. Rice: Structure, types, composition, quality characteristics and physicochemical properties of Rice. Milling and parboiling of paddy, Curing and ageing of paddy and rice. Criteria and assessment of milling, cooking, nutritional and storage qualities of raw & parboiled rice. Processed rice products (flaked, expanded and puffed rice). By-products.

UNIT – II

Wheat-Structure, Composition, Types, quality characteristics for milling into flour and Semolina. Flour milling, Turbo grinding and air classification, Blending of flours, Flour grades and their suitability for baking purposes, Milling equipment and milled products (Dalia, Atta, Semolina and flour). Assessment of flour quality and characteristics, Macaroni products.Dough rheology- influence of flour constituents in dough rheology.

Baked products-Ingredients Technology and quality parameters: Bread, Biscuits and Cakes, Crackers.

UNIT – III

Other Cereals: Corn- Structure, types and composition. Dry and wet milling of Corn. Starch and conversion products. Processed corn products (popped corn, corn flakes etc.) Structure and composition of Barley, Malting of barley,Bajra, Jowar and other cereal grains and millets. Pearling of millets. Parched and snack products. Cereal Malts: Basic malting process, malting plant, malt storage, malt characteristics, malt extract, uses; Breakfast cereals.

UNIT – IV

Pulses: Pulses production, types, chemical composition, anti-nutritional factors, milling of pulses, milling equipment, factors affecting quality, secondary processing of pulses,

processed products, fermented products, traditional products, Value addition; effect of processing on nutritive value. Milling of legume-pulses by traditional and improved processes.

UNIT – V

Processing of oil seeds for direct use and consumption, Oil extraction methods- mechanical (Ghani and Expellers) and chemical methods (solvent extraction), Processing of extracted oil: Refining, Hydrogenation, Interesterification. Processing of deoiled cake into protein concentrates and isolates, Texturized vegetable protein, Functional protein preparations. Peanut butter, Margarine and Spread.

Text Books:

1. Hand Book of Cereal Science and Technology, K. Kulp and J. G. Ponte. Jr., CRC, 2nd Edition, 2000.
2. Cereals Processing Technology, G. Owens, Woodhead Publishing, 2nd Edtion, 2001.
3. Baking Technology and Engineering, Samuel A Matz, Springer, 1991.
4. Legumes: Chemistry, Technology and Human Nutrition, R.H. Mathews, Marcel Dekker, 1st Edition, 1989.
5. Bailey's Industrial Oil & Fat Products, D. Swer, John Wiley & Sons, 5th Edition, 2005.

References:

1. Cereals and Cereal products: Chemistry and Technology, Vol. 4, D.A.V. Dendy and B.J.Dobraszczyk, Springer, 1st Edition, 2001.
2. Rice: Chemistry and Technology, B.O.Juliano, AACC, 2nd Edition, 1985.
3. Wheat: Chemistry and Technology, Y.Pomeranz, AACC, 3rd Edition, 1988.
4. Malts and Malting, D. E. Briggs, Kluwer Academic Publication, 1st Edition, 1997.
5. Oils and Fats manual, A. Karleskind, Lavoisier Publisher, Paris, 1st Edition, 1996.

Outcome:

1. Students will get information about the classification of various grains
2. Students also exposed to various processing methods and machinery used
3. Students will learn value added products from all grains

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B. Tech II-I Sem. (F.T)	L	T	P	C
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(15A27307) FOOD MICROBIOLOGY LAB

Objectives:

This lab gives idea about counting microorganisms by various techniques in selected foods and identification of specific microorganisms in different foods

Laboratory Experiments:

1. Familiarization with common techniques for handling pure culture serial dilution, Inoculation, slide preparation incubation, counting etc.
2. Direct total, viable, and non-viable count of microorganisms in milk.
3. Preparation and sterilization of media and glass ware for microbial counts.
4-6. Determination of Standard Plate Count (SPC) in natural and/or processed foods like cereal and cereal products, vegetable and fruits, meat and meat products, fish and other sea foods, Eggs and poultry, milk and milk products; sugar, salts and spices.
7-9. Microbiological examination of some selected natural and processed foods like cereal and cereal products, vegetable and fruits, meat and meat products, fish and other sea foods, Eggs and poultry, milk and milk products; sugar, salts and spices.
10-12 Microbiological examination of potable water: Total and coliform count.
13-15. Enumeration of coliform organism in some selected processed foods like cereal and cereal products, vegetable and fruits, meat and meat products, fish and other sea foods, Eggs and poultry, milk and milk products; sugar, salts and spices.

Outcome:

- Students will learn the different techniques for growth of microorganisms and colony counting
- Students will able to identify the specific microorganism present in food by specific procedure.

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(15A27308) FOOD TECHNOLOGY LAB – I (CEREALS, PULSES AND OILSEEDS)

Objective:

- Determination of parameters by qualitative and quantitative methods
- Study on some important unit operations used for some grains
- Preparation of standard food products

Laboratory Experiments:

1. Determination of physical properties (Bulk Density, Porosity, Sphericity, Angle of repose, Test weight, Particle size, Sieve analysis) of different grains.
2. Determination of Gluten content, sedimentation value, alcoholic acidity, water absorption capacity and Polenske value of wheat flour.
3. Determination of adulterant ($NaHCO_3$) in wheat flour/ Maida.
4. Determination of alkali score and gelatinization temperature of rice.
5. Traditional and improved pre-treatments and their effect on dehusking of some legumes.
6. Removal of anti-nutritional compounds from selected pulses and oilseeds.
7. Study of cooking quality of Dhal.
8. Pearling of some millets.
9. Determination of yeast activity.
10. Determination of different quality parameters of oils.
11. Determination of efficiency of oil extraction techniques (mechanical expelling and solvent extraction).
12. Preparation of Bread.
13. Preparation of Biscuits.
14. Preparation of Cookies.
15. Preparation of Cake.
16. Preparation of Rusk.
17. Preparation of Crackers.
18. Visit to a Bakery, Confectionery Unit
19. Visit to a working modern roller flour mill and FCI godowns.
20. Visit to working rice mill.

Outcome:

1. Students are exposed to learn various parameters determination and quantification
2. Students will able to prepare and understand the technology involved in foods from grains
3. Students will acquire more knowledge by visiting industries

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B. Tech II-II Sem. (FT)	L	T	P	C
	3	1	0	3

(15A27401) PRINCIPLES OF FOOD ENGINEERING II

Preamble: The subject covers the all basic concepts related to engineering and also these fundamentals are useful for selection, design of equipment and in food industries.

Objectives:

To impart knowledge to the students on basic concepts and applications ofPsychrometric chart, humidifiers and dehumidifiers. Problems on material and energy balance, importance of dimensional analysis and engineering properties of foods.

UNIT – I

Humidity & Humidification: Humidity & Relative Humidity, Saturation Humidity, Percentage Humidity, Humid Heat, Humid volume, Dew point, Enthalpy of Humid air, Dry bulb temperature, Wet bulb temperature, Problems, Psychrometric chart-Utilization, problems; Humidifiers &Dehumidifiers, Applications

Water activity – concepts and importance. sorption isotherms, three stages of water, phase diagram for water, vapour pressure-temperature curve for water, heat requirement for vaporization, measurement of humidity

UNIT – II

Material balance: Law of Conservation of mass- Process flow diagram-system boundaries - overall mass balance – component mass balance –basis and tie material- Continuous vs. Batch-Recycle and by pass-unsteady state -mass balance problems on concentration, dehydration, evaporation, crystallization, mixing –solvent extraction –multi stage process. Problems

UNIT – III

Energy balance and evaluation of Heat requirements: Heat capacity – gases – solids – liquids -Latent heat – sensible heat -energy balance for a closed system and open system - total energy balances. Energy balance problems in heat exchangers –Drying. Problems

UNIT – IV

Dimensional Analysis Dimensional Consistency, Fundamental -derived units. Definitions of some basic physical quantities – Force, momentum, pressure, work and energy, power, heat and enthalpy.Mole – atomical molar mass, Conversion of Dimensional equations – Uses, Methods (Rayleigh's &Buckingham's) Examples: Nusselts Number, Reynolds number, Prandtl's number, Froude's number.

UNIT – V

Engineering properties of Food Materials: Mass- volume- area related properties of foods, rheological properties of fluid foods & solid foods, thermal properties of frozen & unfrozen foods, electrical conductivity of foods, dielectric properties of foods, colorometric properties of foods, surface properties, ultrasound properties.

Text Books

1. M.A.Rao, Syed S.H. Rizvi, Ashim K. Datta 2005. Engineering Properties of Foods, 3rd Edition, Taylor & Francis Group, CRC Press.
2. R.K. Rajput. 2007. Engineering Thermodynamics, 3rd Ed. Laxmi Publications (P) Ltd., Bangalore.
3. P.G. Smith, Introduction to Food Process Engineering, 2nd Edition, Lincoln, UK, 2010.
4. Warren L. McCabe, Julian Smith, Peter Harriott. 2004. Unit Operations of Chemical Engineering, 7th Ed. McGraw-Hill, Inc., NY, USA.
5. Christie John Geankoplis. 2003. Transport Processes and Separation Process Principles (Includes Unit Operations), 4th Ed. Prentice-Hall, NY, USA.

References

1. J.M. Smith, H.C. Van Ness and M.M. Abbott. 2005. Introduction to Chemical Engineering Thermodynamics, 7th Ed. McGraw-Hill, Inc., NY, USA.
2. R. Paul Singh and Dennis R. Heldman, Introduction to Food Engineering, 4th Edition, Academic Press, 2009.
3. Z. Berk, Food Process Engineering and Technology, Food Science and Technology, 1st Edition, International Series, Elsevier, 2009.
4. D. G. Rao, Fundamentals of food engineering, Prentice-Hall of India, New Delhi, 2010

Outcomes:

- Understand the fundamental concepts of psychrometry
- Learn about the material and energy balances for equipment sizing
- Gain knowledge on properties of foods and its applicability

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B. Tech II-II Sem. (F.T.)

L	T	P	C
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(15A54401) PROBABILITY AND STATISTICS

(Common to CSE, IT, Civil, Mech.)

Objectives: To help the students in getting a thorough understanding of the fundamentals of probability and usage of statistical techniques like testing of hypothesis, Statistical Quality Control and Queuing theory

UNIT – I

Basic concepts of Probability – Random variables – Expectation – Discrete and continuous Distributions – Distribution functions. Binomial and poison distributions Normal distribution – Related properties.

UNIT – II

Test of Hypothesis: Population and Sample - Confidence interval of mean from Normal distribution - Statistical hypothesis - Null and Alternative hypothesis - Level of significance. Test of significance - Test based on normal distribution - Z test for means and proportions.

UNIT – III

Small samples - t- test for one sample and two sample problem and paired t-test, F-test and Chi-square test (testing of goodness of fit and independence).

UNIT – IV

Statistical Quality Control: Concept of quality of a manufactured product -Defects and Defectives - Causes of variations - Random and assignable - The principle of Shewhart Control Chart-Charts for attribute and variable quality characteristics- Constructions and operation of $\overline{X}$ - Chart, R-Chart, p - Chart and C-Chart.

UNIT – V

Queuing Theory: Pure Birth and Death process, M/M/1 & M/M/S & their related simple problems.

TEXT BOOKS:

1. Probability & Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.
2. Probability & Statistics for engineers by Dr. J. Ravichandran WILEY-INDIA publishers.

REFERENCES:

1. Probability & Statistics by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publications.
2. Statistical methods by S.P. Gupta, S.Chand publications.
3. Probability & Statistics for Science and Engineering by G.Shanker Rao, Universities Press.
4. Probability and Statistics for Engineering and Sciences by Jay L.Devore, CENGAGE.
5. Probability and Statistics by R.A. Jhonson and Gupta C.B.

Outcomes: The student will be able to analyze the problems of engineering & industry using the techniques of testing of hypothesis, Statistical Quality Control and Queuing theory and draw appropriate inferences.

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	3	1	0	3

(15A27402) FLUID MECHANICS IN FOOD PROCESS ENGINEERING

Preamble:

The subject covers properties of fluids and its flow characteristics, flow through pipes. Importance of dimensional analysis and its applicability. Types and Selection of pumps.

Objectives:

1. The basic concepts and fluid-flow phenomena and the kinematics of flow
2. To enable the students to design efficient water conveyance systems like canals, channels and pipes from places of origin to delivery points by acquiring knowledge on the principles of mechanics of fluids, water measurement and regulation

UNIT – I

Introduction and Properties of Fluids Properties of Fluids: Concept of fluid mechanics, definition of fluid, fluid continuum, density, specific weight Viscosity: Newtonian and Non-Newtonian fluids, kinematic viscosity, dynamic viscosity, variation of temperature with viscosity Surface tension, vapour pressure, incompressible and compressible fluids, ideal and real fluids

UNIT – II

Fluid Mechanics Pressure Measurement: Static pressure of liquids, absolute and gauge pressures, mechanical pressure gauges, pressure measurement by manometers Forces on plane surfaces, forces on curved surfaces, Buoyant forces (Archimedes' Principle). Dynamics of Fluid Flow Euler's equation of motion, application of Euler's equation Bernoulli's equation, applications of Bernoulli's equation, cavitation, momentum

UNIT – III

Kinematics of Fluid Motion Classification of Flow: Method of describing fluid motion, classification of flow: steady and unsteady; uniform and non-uniform; one, two and three dimensional flow Laminar and turbulent flows, streamline, pathline and streaklineAcceleration equations, continuity equations, circulation and vorticity, flownet

UNIT – IV

Analysis of Flow Through Pipes Energy losses in pipe lines, minor losses in pipe lines due to enlargement, contraction, bends and pipe fitting Equivalent Length and Equivalent Pipes, Concept of equivalent length and equivalent pipes Problems in Pipe Flow, Determination of pipe diameter, determination of discharge, determination of head loss Flow Measurements Measurement of Flow in Pipes, Venturimeter, flow nozzle, sharp edged concentric orifice

meter, bend meter, rotameter. Measurement of Velocity, Pitot tube, hot wire anemometer, current meter.

UNIT – V

Fluid Machines Pumps: classification, centrifugal pumps, submersible pumps, reciprocating pumps, positive displacement pump. Centrifugal pumps: Pumps in series and parallel, basic equations applied to centrifugal pump, loss of head due to changed discharge, static head, total head, manometric head, manometer efficiency, operating characteristics of centrifugal pumps. Submersible pumps: Reciprocating pumps: working of reciprocating pump, double acting pump, instantaneous rate of discharge, acceleration of piston and water, gear pump.

Text Books

1. P.G. Smith, Introduction to Food Process Engineering, 2nd Edition, Lincoln, UK, 2010.
2. R. Paul Singh and Dennis R. Heldman, Introduction to Food Engineering, 4th Edition, Academic Press, 2009.
3. Christie John Geankoplis. 2003. Transport Processes and Separation Process Principles (Includes Unit Operations), 4th Ed. Prentice-Hall, NY, USA.

References

1. Modi, P. M. and Seth, S.M. 1973. Hydraulics and Fluid Mechanics, Standard Book House, Delhi
2. Chow, V. T. 1983. Open Channel Hydraulics, Mc Graw Hill Book Co., New Delhi
3. Jagdish Lal, 1985. Fluid Mechanics and Hydraulics. Metropolitan Book Co. Private Limited., New Delhi

Outcome:

By the end of the course the students will be able to

1. gain knowledge on Bernoullies theory, Buckingham's Pi theorem, Hagen-Poiseuille equation
2. gain the knowledge on mechanical gauges, flow of fluids in the pumps, and Archimedies principles and theory
3. understand flow through mouth pieces, flow through orifices and pumps

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B. Tech II-II Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27403) FOOD CHEMISTRY

Preamble:

This subject covers each and every macro, micro nutrients. The classification, changes during processing of foods.

Objective:

- To impart knowledge to the students on the chemistry of macronutrients and its application in food industry.
- To understand different chemical and enzymatic chemical reactions occurring in foods.

UNIT- I

Food Science: Food requirements - Consumer safety – Objectives of food science – Constituents of food – Food as a source of energy – Energy requirement in human body – Food health and disease. Water – Role of water – Dietary requirements and sources – Important physical properties of water – concept of water activity – Water binding in foods – water activity and activity of microorganisms – Controlling of water activity in foods – Experimental determination of water activity in foods.

UNIT - II

Carbohydrates: Chemistry of carbohydrates – composition and structure- Definition, classification, importance, monosaccharides -structure and propertiesdisarcharides-maltose, lactose, sucrose.Oligo saccharidesraffinose.Polysaccharides-starch, cellulose, pectins, seed gum, sea weed and algal polysaccharides. Dietary sources – Functional properties of dietary carbohydrates- Biological role of Dietary fibre– Nutrition - Flavor and colour development Sweetness – Texturing characteristics of carbohydrates – Plasticizing action and Humectancy of carbohydrates; Non-nutritive sweeteners.

UNIT - III

Fats and Oils: Definition and classification –biological role and uses of lipids – Fat group classification – Dietary sources – Fatty acids in foods nomenclature – Triglycerides – composition and structure – Physical properties of triglycerides – Polymorphism of triglycerides – Plasticizing properties of fats – Enrobing fats – Emulsifying properties of fats – Rancidity and reversion of fats.

UNIT - IV

Proteins and Enzymes: Classification, structure and functions – Role of proteins and requirements – Aminoacids-Definition, classification, properties, Functions of proteins in foods – physical and chemical properties of proteins, Important protein sources– Milk, Meat,

Fish, Egg and Cereal proteins – Enzymes – Endogenous enzymes in foods and their activity – Enzymes as food processing aids.

UNIT -V

Vitamins and Minerals: Definition –Classification, general sources, structure, properties, functions and dietary requirements – deficiency symptoms and toxicity of fat soluble and water soluble vitamins. Role of minerals – Food colours and flavors – Food additives – classification and purpose – Role of thickeners, sweeteners, stabilizers, emulsifiers, leaveners, colours, flavoring agents, preservatives – examples.

Food Pigments &Flavouring Agents: Importance, types and sources of pigments — their changes during processing & storages.

Text Books

1. Sivasankar, B, "Food processing and preservation" Prentice – Hall of India Pvt. Ltd. New Delhi 2002.

2. Fox, B. A. and Cameron, A.G., "Food Science, Nutrition and Health", 5th Edition, Edward Arnold, London 2005.

References:

1. Srinivasan Damodaran, Kirk L. Parkin, and O.R. Fennema, E, "Food Chemistry" 4th Edition, CRC Press, New York2007.

Outcome:

By the end of the course, the students will be able

i. to gain knowledge on different chemical & enzymatic reactions occurring in foods

ii. understand Industrial application of different macronutrients

iii. apply their knowledge of biomolecules to understand the changes that occur in foods during processing.

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	3	1	0	3

(15A27404) FRUIT AND VEGETABLE PROCESSING

Preamble:

This course enables the students to gain a sound knowledge about the processing and preservation technologies of fruits and vegetables.

Objective:

At the end of this course the students get a detailed background about

1. Various methods used for preserving fruits and vegetables.
2. Different operations involved in processing fruits and vegetables
3. Technology behind intermediate moisture and minimally processed fruit and vegetable.

UNIT – I

Production and processing scenario of fruits and vegetables in India and world; Scope of fruit and vegetable processing industry in India; Overview of principles and preservation methods of fruits and vegetables; Supply chain of fresh fruits and vegetables;

UNIT – II

Primary processing and pack house handling of fruits and vegetables; Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables; Storage of Fresh Fruits and Vegetables: Containers: Tin, glass and other packaging materials used in fruits and vegetables preservations. Canning and bottling, effect of canning and bottling on nutritive value, spoilage of canned foods, spoilage organisms, detection and control.

UNIT – III

Preparation and preservation of Juice, Squash, Syrup, Sherbet, Nectar, Cordial, Crush etc.;FSSAI specifications,Processing and equipment for above products; Preparation, preservation and equipment for manufacture of crystallized fruits and preserves, Jam, Jelly and Marmalades, defects in making, Candies; FSSAI specifications.

UNIT – IV

Preparation, preservation and equipment for manufacture of Chutney, Pickles, Sauce, Puree, Paste, Ketchup; Toffee, Cheese, Lather. Production of Pectin and Vinegar; Commercial processing technology of selected fruits and vegetables for production of various value added processed products;FSSAI specifications.

UNIT – V

Minimally processed Fruits and Vegetables: Factors affecting shelf life and the quality of minimally processed fruits and vegetables, physiology and biochemistry of fresh cut fruits.

Dehydration of Fruits and Vegetables:Methods; packaging, storage, quality control. Products: Dehydrated, Wafers and Papads, Soup powders; Food additives: Use in fruit and vegetable preservation; Restructured fruits & Vegetables; FSSAI specifications.

Text Books:

1. Giridharlal, Siddappa andTandon. Preservation of fruits and vegetables.ICAR, New Delhi.
2. Sudhir Gupta (Compiled). Fruits and Vegetables Processing Hand Book.EIRI, Delhi.
3. Srivastava.P.R. and Sanjeev Kumar. Fruit and vegetable preservation - 3rd Edition. International Publishers, Delhi.

References:

1. Norman Potter.Food Science.CBS publishers and distributors,New Delhi.
2. Joshi and Pandey.Biotechnology: Food Fermentation, Volume-II. Educational Publishing and Distributing Co
3. EIRI Board of Consultants and Engineers. Manufacture of Snacks, Namkeen, Papads and Potato products-EIRI.

Outcomes:

By the end of the course, the students will be able to

- train the students in the field of Fruit and Vegetable Processing.
- enable the students learn different preservation techniques to curb post-harvest losses in the field of agriculture.
- learn processing of fruits & vegetables - different preservation techniques to improve the shelf life of seasonal fruits.
- understand the importance of FSSAI Specifications

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	3	1	0	3

(15A27405) MECHANICAL OPERATIONS AND MATERIAL HANDLING

Preamble: The broad idea of this subject mentions about each individual operation and its applicability in food processing.

Objective:
To impart knowledge to the students on principles, operation and maintenance of various food processing equipment namely mixing, forming, size reduction,cutting and grinding equipment. centrifugation, filtration material handling equipment like belt, screw and pneumatic conveyors, bucket elevator.

UNIT – I

Geometrical, physical, functional and growth property of foods. Cleaning, sorting and grading of foods. Peeling, decortications, deseeding of fruits, dehulling of grains, blanching of vegetables. Size Reduction: Principles and types of size reduction equipment, disintegration of fibrous materials. Principles of comminution, Types of comminuting equipment. Energy and power requirement, Crushers, Grinders, Mechanical expression of edible oil.

UNIT – II

Sedimentation: Theory and principles of sedimentation, minimum area for continuous sedimentation, applications in food industry. Filtration: Principle of Constant pressure and constant rate filtration and types of filtration equipment, Settling classifiers and Flotation Screening, types of screen. Centrifugation: Principle of settling and centrifugation, devices for centrifugal separation.Membrane separation processes: Reverse osmosis, nano-filtration, ultrafiltration, microfiltration, dialysis and pervaporation.

UNIT – III

Mixing: Mixing of liquids and solids (powder), mixing equipment, mixing index and mixing time, Agitation and blending, types of agitators, power consumption in mixing. Scope and importance of material handling devices; Study of different material handling systems: Classification, principles of operation, conveyor system selection/design; Separation/Grading: Theory and principles: Types of separators – Disk, Indent cylinder, spiral and specific gravity, stone, inclined belt, pneumatic and aspirator separators- separation based on fluidization techniques – magnetic, cyclone and colour separator.

UNIT – IV

Belt conveyor: Principle, characteristics, design, relationship between belt speed and width, capacity, inclined belt conveyors, idler spacing, belt tension, drive tension, belt tripper; Chain conveyor: Principle of operation, advantages, disadvantages, capacity and speed, conveying chain; Screw conveyor: Principle of operation, capacity, power, troughs, loading and discharge, inclined and vertical screw conveyors;

UNIT – V

Bucket elevator: Principle, classification, operation, advantages, disadvantages, capacity, speed, bucket pickup, bucket discharge, relationship between belt speed, pickup and bucket discharge, buckets types; Pneumatic conveying system: Capacity and power requirement, types, air/product separators; Gravity conveyor design considerations, capacity and power requirement. Storage: Methods of storage, silos and bins, hoppers.

Text Books:

1. Earle R.L. Unit operations in Food Engineering.
2. Fellows P.J. Food Processing Technology, Principles and Practice. Wood Head Publishing Ltd., Cambridge, England.
3. HSE (Health and Safety Executive) information sheet no.24
4. Singh R. P and Heldman D.R. Introduction to Food Engineering. 3rd Edn.
5. Smith P.G. Introduction to Food Process Engineering.

References:

1. Cabe Mc., Smith J.C and Harriot P. Unit operations of Chemical Engineering. McGraw Hill Publishers. New Delhi.
2. Mohesinin N. N. Physical properties of Plant and Animal materials.
3. Stanley E.C. Fundamentals of Food Engineering. AVI Publishers. Westport. USA.
4. Sahay K.M and Singh K.K. Unit operations of Agricultural Processing. Vikas Publishing House Pvt. Ltd. New Delhi.
5. Chakraverty A. Post-Harvest Technology of Cereals, Pulses and Oilseeds.Oxford & IBH Publishers. New Delhi.

Outcome:

By the end of the course, the students will be able to

i) understand different food processing equipment that are being used in food industries

ii) study about the principles, operation and maintenance of food processing equipment viz., material handling, cleaning, grading, mixing, forming, size reduction, cutting, grinding, centrifugation, filtration, evaporation and drying

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B. Tech II-II Sem. (F.T)	L	T	P	C
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(15A27406) FLUID MECHANICS LAB

Objective:

To impart knowledge on coefficient of discharge, friction factor, pressure drop on different fluids. Importance of pipe fittings and application of various pumps in food industry.

Laboratory Experiments:

1. To determine the coefficient of discharge of an orifice (or a mouth piece) of a given shape.
2. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number.
3. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
4. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
5. To study the variation of friction factor, 'f' for turbulent flow in smooth and rough commercial pipes.
6. To determine the loss coefficients for the pipe fittings.
7. To verify Bernoulli's equation experimentally.
8. To determine the flow rate and coefficient of discharge using Venturimeter.
9. To measure discharge through Rotameter.
10. To determine the Reynolds number and types of flow (Laminar or Turbulent), the flow rate and coefficient of discharge using Orifice meter.
11. To determine losses due to pipe fitting, sudden enlargement and contraction.
12. Measurement of viscosity and surface tension of liquids.
13. To determine the characteristics of centrifugal pump and to find out total head, pump efficiency and overall efficiency of pump.
14. Study of various types of pipes and pipe fittings.
15. Study of different types of valves.
16. Study of reciprocating pump.
17. Determination of frictional coefficient of given pipe.

Outcome:

By the end of the course the students will be able to

i. know the measurement of fluid pressure, measurement of discharge and measurement of time

ii. know how to determine the Coefficient of discharge from the pitot tube experiment

iii. know how to measure the water level from 'U' tube manometer

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B. Tech II-II Sem. (F.T)	L	T	P	C
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(15A27407) MECHANICAL OPERATIONS & MILLING LAB

Objectives:

To impart practical orientation of usage of different mills, concept of terminal and settling velocity. Calculation of filter cake resistances.

Laboratory Experiments:

1. Particle size distribution using sieve shaker.
2. To find out the screen effectiveness of a given sample by vibratory screen/destoner
3. Estimation of work index of material using Ball Mill
4. Mixing experimentation and determination of mixing index.
5. Determination of power consumption in mixing/agitation.
6. Determination of equivalent and specific cake resistance.
7. Determine the terminal velocity of Cyclone separator.
8. Separation by gravity separator
9. Studies on membranes separation processes.
10. Settling velocity of a particle by sedimentation.
11. Determination of 'g' by using disc bowl centrifuge

Outcome:

By the end of the course, the students will be able to
i. determine the Screen efficiency
ii. size reduction by various mills
iii. power requirement for mixing
iv. importance of terminal and settling velocity for designing cyclone separator and settling tanks.

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B. Tech III-I Sem. (FT)	L	T	P	C
	3	1	0	3

(15A27501) HEAT TRANSFER OPERATIONS

Preamble:

This subject deals with fundamentals of heat transfer mechanisms, emphasis on heat transfer equipment like heat exchangers and evaporators and their selection and applications in food industry.

Objectives:

To impart knowledge to students on different modes of heat transfer through extended surfaces, study of heat exchanges and evaporators.

UNIT I

Introduction to heat transfer and general concepts of heat transfer by conduction, convection and radiation. Conduction: Basic concepts of conduction in solids, liquids and gases, steady state temperature fields and one dimensional conduction without heat generation, e.g., through plane walls, cylindrical and spherical surfaces, composite layers, etc. Insulation materials, critical and optimum insulation thickness. Extended surfaces, fins and their practical applications. Introduction to unsteady state heat transfer.

UNIT II

Convection: Fundamentals of convection, Basic concepts and definitions, natural and forced convection, hydrodynamic and thermal boundary layers, laminar and turbulent heat transfer inside and outside tubes, Dimensional analysis, determination of individual and overall heat transfer coefficients and their temperature dependence, heat transfer in molten metals.

UNIT III

Radiation: Basic laws of heat transfer by radiation, black body and gray body concepts, view factors, Kirchoff's law, solar radiations, combined heat transfer coefficients by convection and radiation.

UNIT IV

Heat Transfer with Phase Change: Condensation of pure and mixed vapors, film wise and drop wise condensation, loading in condensers and basic calculation on condensers, heat transfer in boiling liquids, boiling heat transfer coefficients. Heat Transfer Equipment: Classification, principles and design criteria, types of exchangers, viz., double pipe, shell and tube, plate type, extended surface, Furnaces and their classification and application.

UNIT V

Evaporation: Elementary principles, parts of evaporator, types of evaporators. Single and multiple effect evaporators and their area calculations, boiling point elevation, selection, types of energy use, thermovapour recompression, mechanical vapor recompression. Fouling prevention, cleaning and hygiene. Applications in food processing.

Text Books:

1. Coulson, J.M. & Richardson, J.F. "Chemical Engineering:Vol-1", 6th ed. Butterworth-Heinemann(1999)
2. Holman, J.P.: "Heat Transfer" 9 th ed. McGraw Hill (1989).

References:

1. McAdams W.H. "Heat Transmission", 3rd ed., McGraw-Hill, (1954)
2. Kern D.Q. "Process Heat Transfer" McGraw Hill Book (1950)
3. Badger W.L. &Bancharo J.T.,"Introduction to chemical engineering" Tata McGraw Hill

Outcomes:

- Students acquire knowledge from different modes of heat transfer, extended surfaces, boiling and condensation process and principles of heat exchangers which are very essential in dairy and food industries

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	3	1	0	3

(15A27502) DAIRY AND DAIRY PRODUCTS

Preamble:

This text focuses on physico-chemical properties of milk, equipment used in processing of milk and milk products. Study of different milk products processing and its storage.

Objectives:

To impart knowledge to the students on milk and milk products processing, manufacturing of indigenous milk products, packaging and storage of milk and milk products

UNIT-I

Fluid Milk: Composition of milk and factors affecting it. Physico-chemical characteristics of milk and milk constituents. Production and collection, cooling and transportation of milk. Tests for milk quality and Adulteration.Pasteurization and Sterilization: Process and equipment for milk pasteurization, direct and indirect sterilization; Ultra - High - Temperature (UHT) sterilization. Fouling of pasteurizers and sterilizers. Aseptic packaging.

UNIT-II

Homogenizers: principle of operation, design calculation for laminar and turbulent regimes, technology of homogenized milk production. Technology and standards of commercial liquid milk products: Toned, Double Toned Products, Reconstituted, Recombined, Standardized and Fermented Milks etc, FSSAI Specifications.Dairy Chemistry & Microbiology: Roles of lipids, proteins, carbohydrates, minerals, vitamins and enzymes, importance of psychrophilic, mesophilic and thermophilic spoilage organisms in storage.

UNIT – III

Dairy Products Manufacturing: Process Technology and standards of manufacturing of Fermented Products like dahi,shrikhand; lassi; mattha/Chhas and Other Milk Products (Casein, Whey Proteins, Lactose Etc.). Manufacturing of Indigenous dairy products like milk based puddings/ desserts- kheer; payasam; gajar-ka-halwa, FSSAI Specifications.

UNIT – IV

Definition, Classification, Composition and physico-chemical properties of Cream. Production processes and quality control. Butter: Definition, Classification, Composition and methods of manufacture, Packaging and storage. Butter oil/Ghee. Ice cream: Definition, Classification and Composition, Constituents and their role. Preparation of mixes and

freezing of Ice cream, Overrun, Judging, Grading, and defects of Ice cream, FSSAI Specifications.

UNIT – V

Evaporated and Condensed milk: Method of manufacture, Packaging and storage. Defects, Causes, and prevention. Roller and Spray Drying of milk solids. Instantization. Flow ability, Dustiness, Reconstituability, Dispersability, Wettability, Sinkability and appearance of milk powders. Manufacture of Casein, Whey protein, Lactose from milk or use in formulated foods, FSSAI Specifications.

Text Books:

1. Applied Dairy Microbiology, E. H. Marth and J. L. Eteele, Marcel Dekker, 2nd Edition, 2001.
2. Dairy Science Technology, P. Walstra, J.T.M.Wouters and T.J. Geurts, CRC press, 2nd Edition, 2006.
3. Dairy Technology: Principles of Milk Properties and Processing, P. Walstra, T.J. Geurts, A. Noomen, and J.S. Van Boekel, Marcel Dekker, Illustrated Edition, 1999.

References:

1. Milk and Dairy Product Technology, E. Spreer, Marcel Dekker, 2nd Edition, 1998.
2. Modern Dairy Technology, Vol. 1: Advances in Milk Processing, R.K.Robinson, Aspen Publishers, 2nd Edition, 1999.
3. Modern Dairy Technology, Vol. 2: Advances in Milk Products, R. K. Robinson, Aspen Publishers, 2nd Edition, 1996.
4. Outlines of Dairy Technology, Sukumar De, Oxford University Press, 3rd Edition, 2006.
5. Milk and Milk Products, C. Eckles, W. Combs, and H. Macy, Tata McGraw Hill, 3rd Edition, 2003.

Outcomes:

By the end of the course, the students will be able to

i. Know about milk, its constituents, nutritive value, collection and its hygienic handling practices

ii. Study about Pasteurization, Homogenization and Sterilization of milk

iii. Learn about manufacture of cream, butter, ghee, yoghurt, cheese, ice-cream, indigenous milk products and milk confectionery

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	3	1	0	3

(15A27503) PROCESSING OF SPICES AND PLANTATION CROPS

Preamble:

The subject covers the importance of spices and processing of major and minor spices, plantation crops and medicinal crops and secondary and tertiary processing.

Objective:

To impart knowledge about spice processing and their marketable standards, plantation crops and their importance in Indian economy, post-harvest technology of spices, value added products of spices, packaging of processed spices, food, medicinal and pharmaceutical uses of different spices.

UNIT – I

Importance and Processing of Spices:Classification, chemical composition and principal constituents, History of usage & Spice trade in India and the world.

Spices – production and importance – stage of harvesting and harvesting methods – processing of major and minor spices – Ginger, Chilli, Turmeric, Onion and Garlic, Pepper, Cardamom. Herbs, leaves and Spartan seasonings and their processing and utilization – Unit operations involved – equipment used- value addition of spices.

UNIT – II

Processing of minor Spices:Herbs, leaves and Spartan seasonings and their processing and utilization – All spice, Annie seed, Sweet basil; Caraway seed, Cassia, Cinnamon; Clove, Coriander, Cumin, Dill seed; Fennel seed, Nutmeg, Mace, Mint, Marjoram. Rosemary, saffron, sage; Savory, thyme, ajowan; Asafetida, curry leaves – Unit operations involved – equipment used- value addition of spices.

UNIT – III

Processing of Plantation Crops:Tea Processing Composition and production of tea leaves; processing of tea leaves; CTC tea, black tea, green tea and Oolong tea, grading and packaging; processing of instant tea Coffee Processing Production and processing of coffee cherries by wet and dry method; processing technology for coffee; preparation of brew; processing technology for instant coffee and decaffeinated coffee.

UNIT – IV

Processing of Plantation Crops:Cocoa processing Cocoa bean- introduction, history and composition; processing of cocoa bean; processed products of cocoa.Coconut, Arecanut, Vanilla and Cashew nut– production and importance – harvesting and stages of harvest – drying, cleaning and grading, processing methods, process and equipment – value added products – grading and types – packaging and storage

Unit – V Processing of Medicinal Crops:Importance of medicinal crops – production and export status – processing of medicinal crops – equipment used – principles and operations – active components in various medicinal plants – application and uses – extraction methods
Extraction of Principal Constituents in Spices
Spice Oils & Oleoresins:Flavour extraction from Spices by different methods.

Text books

1. Pandey, P. H, "Post-Harvest Engineering of Horticultural Crops through Objectives". SarojPrakasam, Allahabad 2002.
2. Pruthi, J.S, "Major Spices of India – Crop Management and Post-Harvest Technology". Indian Council of Agricultural Research, KrishiAnusandhanBhavan, Pusa, New Delhi. PP. 514, (1998)
3. ASTA, "Official analytical methods of the American Spice Trade Association", Fourth Edition 1997.

References

1. Purseglove, J.W., E.G.Brown, G.L.Green and S.R.J.Robbins, "Cardamom – Chemistry. Spices, Vol. I, Tropical Agricultural Series", Longman, London, 1: 605. (1981)
2. Quality Assurance in Spices and Spice Products – Modern Methods of Analysis by J S Pruthi, Allied Publishers Limited, New Delhi.

Outcome:

By the end of the course, the students will be able to
i. know History of spices, uses of spices, classification of processed spices according to marketing standards, packaging and different grades
ii. learn about flavor development during processing, classification of spices according to economic importance, post-harvest technology and treatments, specifications for marketed products

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	3	1	0	3

(15A27504) INDUSTRIAL MICROBIOLOGY

Preamble:

This subject emphasis on basic concepts of bio processing, fermentation technology, kinetics of microbial growth, up and downstream processing and production of useful enzymes.

Objective:

To impart the knowledge to students about
a) Fermentation technology and its application in Food industry
b) Industrially important Microorganisms and their application in food industry

UNIT – I

Basic concepts: Historical development of bioprocess technology, an overview of traditional and modern applications of biotech process, Outline of integrated bioprocess and various (upstream and downstream)unit operations involved in biochemical engineering, generalized process flow sheets.

UNIT – II

Kinetics of microbial growth and product formation. Phases of cell growth in batch cultures, Simple unstructured kinetic models for microbial growth, Monod model, Growth of filamentous organisms. Growth associated (primary) and non-growth associated (secondary) product formation kinetics.

UNIT – III

Fermentation process: Basic design and construction of fermenter and ancillaries, main parameters to be monitored and controlled in fermentation processes. Overview of aerobic and anaerobic fermentation processes and their application in biotech industry, Solid substrate and submerged fermentation and its application. Fermenter types; Modeling of batch, fed batch and continuous Fermenters.

UNIT – IV

Down stream processing operations; Cell disruption, Solid- Liquid and Liquid- Liquid Separation processes, Extraction, Micro Filtration membrane filtration and centrifugal separation techniques, Chromatographic techniques for separation, drying of products; Biochemical process control and instrumentation. Immobilized enzyme technology: enzyme immobilization, industrial processes, utilization and regeneration of cofactors. Immobilized enzyme kinetics: effect of external mass transfer resistance, analysis of intraparticle diffusion and reaction.

UNIT – V

Industrial production of important products; Production of pectic Enzymes- sub merged fermentation and semisolid fermentation Techniques: Industrial production of Glucose transforming enzymes; Organisms involved, production, purification and immobilization of (a) Glucose isomerase and (b) Glucose Oxidase. Industrial scale production of Bakers' yeast and Brewer's yeast; Microbial oil production and Bio pesticides.

Text Books:

1. Biochemical Engineering Fundamentals, J. E. Bailey, F. Oilis, Tata Mc Graw Hill, 2nd Edition, 2010.
2. Bioprocess Engineering- Basic Concepts, M. L. Shuller, F. Kargi, PHI, 2nd Edition, 2002.
3. Principles of Fermentation Technology, P.F. Stanbary, A. Whitaker, Hall, 2nd Edition, Aditya Books Pvt. Ltd., 2008.

References:

1. Industrial microbiology, S.C. Prescott and C.G. Dunn, Agrobios (India), 1st Edition, 2007.
2. Industrial Microbiology, A. H. Patel, McMillan India Ltd., 2nd Edition, 2009.
3. Biosensors for Food Analysis, A. Scott, Royal Society of Chemistry, UK, 1st Edition, 1998.
4. Biochemical Engineering: A Textbook for Engineers, Chemists and Biologists, Shigeo Katoh and Fumitake Yoshida, Wiley VCH, 1st Edition, 2009.

Outcome:

By the end of the course, the students will be able to
i) know about Industrial fermentation techniques
ii) know about different Industrially important micro organisms
iii) know about different growth regulators (Hormones)
iv) know about different products produced by Industrial fermentation process

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(15A27505) FOOD ANALYSIS

Preamble:

The subject deals with the basic concepts of food analysis, principles of analytical techniques, separation techniques and rapid result methods.

Objective:

To impart knowledge to the students on the Techniques in food analysis
To ready them with the Analytical techniques in Quality control laboratory.

UNIT – I

Sampling and sampling techniques. Proximate analysis- Moisture, ash, crude fat, crude fibre, crude protein and carbohydrates by difference. Principles and methods of food analysis.

UNIT – II

Basic principles: Refractometry, polarimetry, densitometry, HPLC, GLC, spectrophotometry, electrophoresis, automatic amino acid analyzer.

UNIT – III

Determination of starch. Test for unsaturation of fats, rancidity of fats. Quantitative analysis of protein by Biuret method, Ninhydrin method, Lowry's method and Dye-binding method Bioassays for protein quality of grains.

UNIT – IV

Chemical, microbiological, flurometric and colorimetric methods of analysis of fat soluble and water soluble vitamins.

UNIT – V

Principles and methods for estimation of minerals: Atomic absorption spectroscopy, colorimetric, titrimetric and gravimetric methods Methods for determining physical and rheological properties of food.

Text Books:

1. S.S. Nilson, Food Analysis, Aspen Publishers, Gaithery Berg, Mary Land. AOAC methods For Food Analysis.
2. Y. Pomeranz and C.E. Meloan, Food Analysis, Theory and practice, A.V.I Publishing Company, INC West Port, Connecticut, U.S.A.,
3. Jayaraman, J. 1980. Laboratory Manual in Biochemistry. Wiley Eastern Publishers, New Delhi.

References:

1. Plummer, D.T. 1979. An introduction to Practical Biochemistry. Tata Mc Graw-Hill Publishing Co., New Delhi.
2. Sadasivam, S. and Manickam, A. 1996. Biochemical methods for Agricultural Sciences. New Age International Publisher, New Delhi.
3. ManoRanjanKalia First Edition 2002, Food Analysis and Quality Control. Kalyani Publishers, New Delhi, Hyderabad.

Outcomes:

- understand the concepts of Techniques in food analysis,
- understand proximate analysis of foods
- understand Biochemical methods and approaches used in Food analysis

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(15A27506) FOOD BUSINESS MANAGEMENT (MOOC I)

Preamble:

The subject describes the concept of business and its functions, various management strategies useful in food industry.

Objective:

To impart knowledge to the students on different managements and their functions and activities.

UNIT – I

Business - meaning - characteristics of business - divisions of business - industry – commerce. Management: Theories of Management, Functions of management - Planning - nature of planning - importance of planning - kinds of enterprise plans - planning premises - forecasting - steps in forecasting

UNIT – II

Organization - Meaning - importance - features of all organization structures - views of organization - process of organization - principles of organization.Staffing and directing - nature of direction - principles of direction- communication - Motivation.Controlling - nature of controlling- requirements of good control system. Co-ordination - features of co-ordination-techniques of co-ordination.Fixed capital - factors determining fixed capital requirements - sources of fixed capital working capital - gross and net classification-determinants and sources

UNIT – III

Human resource development - man power planning - manpower utilization - current man power assessment - future man power demand - employment trends. Career planning - elements of career planning - criteria in developing career planningorganization plans for career planning. Personnel Management - importance - objectives - scope of Personal Management

UNIT – IV

Marketing Management - Definition - Meaning - Importance - Marketing mix - 4Ps of Marketing - Product - Place - Price - Promotion - 4 c’s of marketing mix. Different Process of Marketing- Market Segmentation - Methods of market Segmentation Target marketing - Market Penetration- Market positioning. Product life cycle - Introduction stage - Growth - Maturity - Saturation - Decline - why Products fail - Extending the life cycle of a product.

UNIT – V

Materials management - meaning - scope - material control - purchase managementfunctions of purchase department.Objectives of purchase department- steps in purchasing - store keeping - objectives and functions of store keeping.Company laws: Company Act, 1956: Nature and Types of companies-formation-memorandum of association-articles of association-kinds of shares-duties of directors-winding up.

Text Books:

1. Greg A.Baker, Orlen Grunewald, William D. Gorman,Introduction to food and agribusiness management: Prentice Hall, 2002.
2. K.Aswathappa, Human Resource and Personnel Management, Tata McGraw Hill,2002
3. M.Y.Khan, P.K.Jain, Financial Management – Text and problems, Tata McGraw Hill, 2010.
4. P.SubbaRao, International business- Text and cases, Himalaya publishing house, 2012.
5. RajanSaxena, Marketing Management, Tata McGraw Hill, 2011
6. S.S Gulshan, G.K. Kapoor,Business law including company law, New age Publishers, 2008
7. Weihrich and Aryasri,Principles of Management: Koontz, Tata McGraw Hill, 2004.

References:

1. BiswanthGhosh, Human Resource Development and Management, Vikas Publishing, 2010.
2. Gary Dessler, Human Resource Management, PHI Private Limited, New Delhi, 2007
3. Jawaharlal, Advanced Management Accounting, S. Chand and Company Limited, New Delhi,2010.
4. K. Aswathappa, Essentials of business environment, Himalaya publishing, 2000.
5. Philip Kotler, Marketing Management, Prentice Hall/ Pearson Education, 2011.
6. Sundaram and Black, International Business Environment, Text and cases, PHI Private Limited, 2012.

Outcome:

By the end of the course, the students will be able to

i. gain knowledge on different managements like resource management, organization management, marketing management and in addition to emphasis on food business management.

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(15A27507) HEAT TRANSFER OPERATIONS LAB

Objectives:

To determine the thermal conductivity of different materials and heat transfer coefficient of heat exchangers.

Laboratory Experiments:

1. To find the thermal conductivity of metallic rod at different temperature and draw the temperature profile for steady and unsteady state conduction.
2. To find out the thermal conductivity of insulating powder.
3. To find the thermal conductivity of liquid / gases.
4. To find the emissivity of grey plate with respect to black plate
5. To study the critical heat flux behaviour of a liquid
6. To find the heat transfer coefficient for parallel and counter current flow condition for a Double pipe heat exchanger
7. To study the shell & Tube heat exchanger and find the heat duty and Over all heat transfer coefficient for parallel flow condition.
8. To study the shell & Tube heat exchanger and find the heat duty and Over all heat transfer coefficient for counter flow condition.
9. Compare the heat duty for parallel &Counter flow and find the energy saving.
10. To study the Plate heat exchanger and find the Overall heat transfer coefficient
11. To study the performance of heat pipe.
12. To find the heat transfer coefficient for open pan evaporator for steady and unsteady state condition.
13. To study Single/Double/Tripple effect Evaporator and find its Steam economy.

Outcome:

learn efficient design of heat exchangers on the basis of overall heat transfer coefficient and LMTD

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(15A27508) FOOD TECHNOLOGY LAB – II (FRUITS AND VEGETABLES)

Objectives:

Estimation of preservatives like benzoic acid and SO_2, different processed products from fruit and vegetables and each operation importance.

Laboratory Experiments:

1. Estimation of benzoic acid & SO_2
2. Pectin determination in fruits and vegetable products.
3. Preparation fruit juices e.g. carambola, orange, pineapple, mango etc.
4. Canning of fruits and vegetables
5. Extraction of Pectin (identification pectin rich foods, chemistry and interaction of pectin with other components)
6. Preparation of jams and jellies, marmalade, crystallized & glazed fruit, preserves and candies (knowledge on selection of fruits)
7. Preparation of Syrup, Squash, Crush
8. Preparation of tuti-fruti
9. Preparation of pickles, chutneys
10. Preparation of tomato products
11. Preparation of Papain
12. Drying of fruit and vegetables (Soup powders, dried products)
13. Visit to a Canning Plant
14. Visit to Fruits and Vegetable processing industries; processing of Mushrooms.

Outcome:

The students will learn the all processing methodology of fruit and vegetable products and significance of each unit operation.

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(15A99501) SOCIAL VALUES & ETHICS (AUDIT COURSE)

(Common to all Branches)

UNIT - I

Introduction and Basic Concepts of Society: Family and Society: Concept of family, community, PRIs and other community based organizations and society, growing up in the family – dynamics and impact, Human values, Gender Justice.

Channels of Youth Moments for National Building: NSS & NCC: History, philosophy, aims & objectives; Emblems, flags, mottos, songs, badge etc.; Organizational structure, roles and responsibilities of various NSS functionaries. **Nehru Yuva Kendra (NYK):** Activities – Socio Cultural and Sports.

UNIT – II

Activities of NSS, NCC, NYK:

Citizenship: Basic Features Constitution of India, Fundamental Rights and Fundamental Duties, Human Rights, Consumer awareness and the legal rights of the consumer, RTI.

Youth and Crime: Sociological and psychological Factors influencing youth crime, Peer Mentoring in preventing crimes, Awareness about Anti-Ragging, Cyber Crime and its prevention, Juvenile Justice

Social Harmony and National Integration: Indian history and culture, Role of youth in peace-building and conflict resolution, Role of youth in Nation building.

UNIT – III

Environment Issues: Environment conservation, enrichment and Sustainability, Climate change, Waste management, Natural resource management (Rain water harvesting, energy conservation, waste land development, soil conservations and afforestation).

Health, Hygiene & Sanitation: Definition, needs and scope of health education, Food and Nutrition, Safe drinking water, Sanitation, Swachh Bharat Abhiyan.

Disaster Management: Introduction to Disaster Management, classification of disasters, Role of youth in Disaster Management. Home Nursing, First Aid.

Civil/ Self Defense: Civil defense services, aims and objectives of civil defense, Need for self defense training – Teakwondo, Judo, karate etc.,

UNIT – IV

Gender Sensitization: Understanding Gender – Gender inequality – Role of Family, Society and State; Challenges – Declining Sex Ratio – Sexual Harassment – Domestic Violence; Gender Equality – Initiatives of Government – Schemes, Law; Initiates of NGOs – Awareness, Movements;

UNIT - V

Physical Education : Games & Sports: Health and Recreation – Biolagical basis of Physical activity – benefiets of exercise – Physical, Psychological, Social; Physiology of Musucular Activity, Respiration, Blood Circulation**.**

Yoga: Basics of Yoga – Yoga Protocol, Postures, Asanas, Pranayama: Introduction of Kriyas, Bandhas and Mudras.

TEXT BOOKS:

1. NSS MANUAL
2. SOCIETY AND ENVIRONMENT: A.S.Chauha, Jain Brothers Publications, 6th Edition, 2006
3. INDIAN SOCIAL PROBLEM: G.R.Madan, Asian Publisher House
4. INDIAN SOCIAL PROBLEM: Ram Ahuja, Rawat Publications
5. HUMAN SOCIETY: Kingsley Davis, Macmillan
6. SOCIETY: Mac Iver D Page, Macmillan
7. SOCIOLOGY – THEMES AND PERSPECTIVES: Michael Honalambos, Oxford University Press
8. CONSTITUTION OF INDIA: D.D.Basu, Lexis Nexis Butterworth Publishers
9. National Youth Policy 2014 (available on www.yas.nic.in)
10. TOWARS A WORLD OF EQUALS: A.Suneetha, Uma Bhrugudanda, Duggirala Vasantha, Rama Melkote, Vasudha Nagraj, Asma Rasheed, Gogu Shyamala, Deepa Streenivas and Susie Tharu
11. LIGHT ON YOGA : B.K.S.Iyengar, Penguin Random House Publishers

www.un.org www.india.gov.in www.yas.nic.in
http://www.who.int/countries/ind/en/
http://www.ndma.gov.in
http://ayush.gov.in/event/common-yoga-protocol-2016-0

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(15A27601) FOOD QUALITY & SENSORY EVALUATION OF FOOD PRODUCTS

Preamble:

The text prescribed for detailed study focuses on food quality and its functions, principles, statistical approach, standards and sensory evaluation tests and instrumental measurements.

Objectives:

To enhance the knowledge on quality of foods and safety concerns in all stages of food distribution system, evaluation of sensory attributes by different qualitative and quantitative tests.

UNIT – I

Quality and Assurance: Definition, scope, importance and difference, Total quality control and (TQC) Total quality management (TQM), Statistical quality control. Definition, importance, scope and difference between food quality and food safety. Food quality and quality attributes - Classification of quality attributes and their role in food quality, objectives, importance and functions of quality control, principles of quality assurance.

UNIT – II

Raw materials & Finished product quality: Quality parameters and evaluation procedures: Appearance, Color, Texture, Viscosity, Consistency, Flavour etc.International standards, food additives, introduction and importance, classification of preservatives, colouring agents, emulsifying and stabilizing agents, antioxidants. Various methods/ techniques for the assessment of quality of different foods, instrumental analysis of quality control.

UNIT – III

Different ways of testing texture of different foods, grading and marking standards and specification for finished products, food adulteration- introduction and various ways of adulteration, consumer studies and different types of consumer studies, introduction to HACCP, implementation in food industry. Food safety and quality control Food grade standards for different processed products

UNIT – IV

Introduction to sensory analysis, Factors influencing sensory measurements, Sensory quality parameters –Size, shape, texture, aroma, taste, color and gloss, threshold and dilution tests, different tests for sensory evaluation– discrimination, descriptive, affective, flavour profile and tests, ranking tests.

Laboratory quality measurements; Types of tests, panel selection and testing environment, serving procedures, instruction to judges, difference tests, directional difference tests, classification of difference tests, two sample and three sample tests, multisampling tests, ranking, scoring, hedonic scaling, dilution procedures, descriptive sensory analysis, contour method.

UNIT – V

Instrumental measurements of sensory attribute of foods, sensory characteristics of foods, types of tests, methods of sensory evaluation of their food products, Electronic noses and tongues: Sensors for food flavour and freshness, electronic noses, tongues and testers; Introduction to flavour assessment, modelling the human nose, electronic nose, electronic tongue. Texture profile analysis. Correlation between instrumental and Sensory analysis of food quality attributes. Computer-aided sensory evaluation of food and beverage, statistical analysis of sensory and objective analysis data.

Text Books:

1. Imteaz Ali. Food Quality Assurance – Principles and Practices.CHIPS, Texas.
2. Multon. J.L. Quality Control for Food and Agricultural Products.CHIPS, Texas.
3. Amerine, Pangborn. M.A. and Roseiur.Principles of Sensory Evaluation of Food.
4. Birk, G.G. Berman and Parker.K.J.Sensory Properties of Food.Applied Science, London.

References:

1. Pattee.Evaluation of Food quality of fruits and vegetables. AVI publishers, Westport.
2. Ranganna.S. Handbook of Analysis and Quality Control – Fruits and Vegetable Products. Tata Mc Graw Hill, New Delhi
3. BIS standards on Sensory Evaluation

Outcomes:

Student explored on need of quality and safety in food products, maintenance of quality product to consumer with increasing sensory parameters of food.

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(15A27602) INSTRUMENTATION AND PROCESS CONTROL

Preamble:

To impart knowledge to the students on instrumentation and process controls used in food industry**.**

Objectives:

1) understand the different instruments used in different operations of food industries
2) know about working principles of different instruments used in different operations

UNIT – I

Introduction, definitions, characteristics of instruments, functional elements, performance characteristics of instrumentation systems-static and dynamic characteristics; Temperature and temperature scales; Various types of thermometers; thermocouples, resistance thermometers and pyrometers;

UNIT – II

Pressure and pressure scales, manometers, pressure elements differential pressure; Liquid level measurement, different methods of liquid level measurement; Flow measurement: Kinds of flow, rate of flow, total flow differential pressure meters, variable area meters, food flow metering; Weight measurement: Mechanical scale, electronic tank scale, conveyor scale;

UNIT – III

Measurement of moisture content, specific gravity, measurement of humidity, measurement of viscosity, turbidity, color, measurement of density, brix, pH, enzyme sensors, automatic valves; Transmission: Pneumatic and electrical; Control elements, control actions, pneumatic and electrical control systems;

UNIT – IV

Process control: Definition, simple system analysis, dynamic behaviour of simple process, Laplace transform, process control hardware; Frequency response analysis, frequency response characteristics, Bode diagram and Nyquist plots and stability analysis; Transducers: Classification, self-generating transducers, variable parameter type, digital, actuating and controlling devices;

UNIT – V

Controllers and indicators: Temperature control, electronic controllers, flow ratio control, atmosphere control, timers and indicators, food sorting and grading control, discrete

controllers, adaptive and intelligent controllers; Computer-based monitoring and control: Importance, hardware features of data acquisition and control computer, signal interfacing, examples in food processing.

Text Books

1. Measurement Systems: Applications and Design. E O Doeblin and D N Manik, Tata McGraw Hill, 5th Edition, 2003.
2. Bela G. Liptak. 2003. Instrument Engineer's Handbook, Vol. I and II, 4th Ed. CRC Press, Boca Raton, FL, USA.
3. Curtis D. Johnson. 2003. Process Control Instrumentation Technology, 7th Ed. Prentice Hall of India Pvt. Ltd., New Delhi.
4. D.V.S. Murty. 2004. Transducers and Instrumentation. Prentice-Hall of India Pvt. Ltd. New Delhi.

References

1. Process Control. Peter Harriot, Tata McGraw Hill.
2. Industrial Instrumentation, D. Patranabis, McGraw Hill, 2nd Edition,2001.
3. Automatic Control Systems. B C Kuo, Prentice Hall, 7th Edition, 2002.
4. Process system Analysis & Control, D.R. Coughanoowr, McGraw Hill Publication

Outcomes:

- The students become familiar with the identification of different instruments and controls used in various operations
- solutions to tackle the problems encountered in use and operation of different instruments

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B. Tech III-II Sem. (F.T)	L	T	P	C
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(15A27603) MASS TRANSFER

Preamble:

This course deals with principles of mass transfer and momentum transfer and their respective applications in the food industry

Objectives:

Basic concepts of mass transferand mechanism of mass transfer operations like distillation, extraction, leaching, crystallization and drying.

UNIT – I

Mass Transfer Laws: Review of Fick's 1st law for molecular diffusion, molecular diffusion in biological solutions and gels, molecular diffusion in solids, diffusion coefficients in gas, liquid and solid, numerical solution of steady state diffusion, Fick's 2nd law and unsteady state operation, mass transfer coefficients, interphase mass transfer, diffusion of gases in porous solids and capillaries.

UNIT – II

Physical Chemistry of Mass Transfer Operations in Food Processing: fugacity, activity, water Relation to foods: roles of water and activity in foods; control of water activity by addition of solute and moisture removal; measurement of water activity; different models of sorption isotherms, their limitations and applicability, prediction and moderation of water activity of foods. Drying: types of drying, constant and falling rate, equilibrium moisture content, drying curve and drying time, types of dryers.

UNIT – III

Gas Absorption: Equilibrium solubility of gases in liquids, ideal and non-ideal solutions. Equipment: Gas dispersed- bubble columns, tray towers, liquid dispersed-venturi scrubbers, wetted wall towers, spray tower, packed towers. Concept of NTU, HTU and HEPT. Ideal stage and stage efficiency. Adsorption and Ion Exchange: Types of Adsorption, nature of adsorbents, adsorption equilibrium, adsorption of a single component from a gas mixture/liquid solution. Multistage cross current and counter current adsorption, continuous contact adsorption. Principle of ion exchange, equilibria and rate of ion-exchange.

UNIT – IV

Distillation: Vapour liquid equlibria, boiling point diagram, relative volatility, enthalpy concentration diagram, flash vapourization, differential distillation, steam distillation, azeotropic distillation and extractive distillation for binary system. Continuous rectification,

McCabe Thiele method, bubble cap distillation column. Crystallization-rate of crystallization, crystallization equilibrium. Super saturation – Crystallizers type – batch and continuous. Centrifuge – types.

UNIT – V

Solid-liquid extraction: Countercurrent, co-current, multistage continuous contact operations. Liquid-liquid extraction: Ternary liquid–liquid equilibrium and tie line data, choice of solvents, extraction equipment. Leaching principle and equipment.

Outcome:

Students are exposed to mass transfer laws and concerning unit operations and their principles, equipment used.

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(15A27604) MEAT AND POULTRY PRODUCTS

Preamble:

This subject covers the scope and importance of meat and poultry processing, and their value added products, various preservation methods, equipment used.

Objectives:

To enable the students to learn about national and international prospects of Meat industry along with processing and preservation technology of Meat, Egg and Poultry Products.

UNIT – I

Sources and importance of meat and poultry; Status of Meat and poultry industry in India; World production of meat and poultry, consumption pattern and nutritive value; characteristics and structure of meat and poultry muscle. Abattoir design and layout.Preslaughter operations and slaughtering operations for animals; stunning, methods of stunning –bleeding-skinning of animals. Ante-mortem inspection, Evaluation of animal carcasses.

UNIT – II

Post slaughter care-post mortem and Biochemical changes in meat-rigour mortis – Factors affecting post-mortem changes, properties and shelf life of meat; meat tenderization-artificial tenderization-muscle stretching-mechanical disruption by artificial enzymes.Mechanical deboning, grading and aging; Preservation of meat by chilling, freezing, pickling, curing, cooking and smoking, dehydration, radiation, chemical and biological preservatives; Meat emulsions; Eating and cooking quality of meat.

UNIT – III

Meat cutting and handling; Preparation, preservation and equipment for manufacture of smoked meat and its quality evaluation; Preparation, packaging and equipment for manufacture of dehydrated meat products and their quality evaluation; Preparation, preservation and equipment for manufacture of meat sausagesand their quality evaluation;, comminuted meat products: ham, bacon, meat analogues; effect of processing on nutritive value; hygiene in meat processing, spoilage of meat, contaminants and naturally occurring toxicants;

UNIT – IV

Poultry: Pre-slaughter care and consideration; Operations in preparation of dressed poultry, its storage and marketing, processing of poultry. Egg: structure, composition, nutritive value,

egg products, dehydrated egg powder. Effect of processing on nutritive value; additives used in poultry products;

UNIT – V

Meat plant sanitation and safety; By-products of meat, poultry and eggs and their utilization; Safety standards in meat industry: HACCP/ISO/FSSAI/Kosher/Halal.

Text Books

1. Vikas Nanda. 2014. Meat, Egg and Poultry Science & Technology. I.K. International Publishing House Pvt. Ltd., New Delhi.
2. B.D. Sharma and Kinshuki Sharma. 2011. Outlines of Meat Science and Technology. Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi.
3. Howard J. Swatland. 2004. Meat Cuts and Muscle Foods, 2nd Ed. Nottingham Univ. Press, Nottingham.
4. B.D. Sharma. 2003. Modern Abattoir Practices and Animal Byproducts Technology. Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi.

References

1. B.D. Sharma. 1999. Meat and Meat Products Technology Including Poultry Products Technology. Jaypee Brothers Medical Publishers Pvt. Ltd, New Delhi.
2. Alan H. Varnam and Jane P. Sutherland. 1995. Meat and Meat Products: Technology, Chemistry and Microbiology. Chapman & Hall, London.
3. William J. Stadelman and Owen J. Cotterill. 1995. Egg Science and Technology, 4th Ed. Food Products Press, NY, USA.
4. R.A. Lawrie. 1985. Meat Science, 4th Ed. Pergamon Press, Oxford, UK.

Outcome:

Composition and structure of Meat, Egg, Poultry & effective preservation techniques along with concepts of value addition & quality assessment of Meat and sanitary measures in meat industry.

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B. Tech III-II Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27605) FISH AND MARINE PRODUCTS

Preamble:

This subject focus on scope and status of marine industry, various processed products with different preservation techniques, novel methods.

Objectives:

To impart knowledge on fisheries and other marine foods, their nutritional composition and processing technologies

UNIT – I

Fisheries resources, global and Indian scenario; Types of fish and other marine products; Classification of fish (fresh water and marine), composition of fish, characteristics of fresh fish and quality assessment, spoilage of fish- microbiological, physiological, biochemical; Relationship between chilling and storage life.

UNIT – II

Methods of Preservation of fish: Drying, Salting, Smoking and Curing. General aspects of fish freezing, changes in quality during chilled and frozen storage; Principles of canning, effect of heat processing on fish, storage of canned fish, preprocess operations, post-process operations, cannery operations for specific canned products;

UNIT – III

Fish products: Introduction, fish muscle proteins, surimi process, traditional and modern surimi production lines, quality of surimi products, comparison of surimi and fish mince products; Preparation protocols of indigenous products: Fish sauce and paste.

UNIT – IV

Novel methods; Low dose irradiation; High pressure treatment, MAP, vacuum packaging, gas packaging; Oxygen absorbents and CO_2 generators, ethanol vapour generation, hurdle barrier concept, value added fish products, packaging; Sea food quality assurance, HACCP, EU hygienic regulations and ISO 9000 standards; New kinds of quality and safety problems emerging in sea food processing and preservation.

UNIT – V

Fish by products - production of fish meal, fish protein extracts, fish protein hydrolysates,fish protein concentrate, fish liver oil and fish sauce and other important byproducts; Quality control of processed fish; Fish processing industries in India.

Text books

1. D.P. Sen. 2005. Advances in Fish Processing Technology. Allied Publishers Pvt. Ltd., Delhi.
2. Brigitte Maas-van Berkel, Brigiet van den Boogaard and CorlienHeijnen. 2004. Preservation of Fish and Meat. Agromisa Foundation, Wageningen.
3. FAO. 2003. Code of Practices of Canned Fishery products. FAO, UN, Rome.
4. Brend W. Rautenstrauss and Thomas Liehr. 2002. Fish Technology. Springer-Verlag, US.
5. G.M. Hall. 1997. Fish Processing Technology, 2nd Ed. Chapman & Hall, London, UK.

References

1. C.O. Chichester and H.D. Graham. 1973. Microbial safety of Fishery products. Academic Press, New York.
2.American Public Health Association. 1970. Recommended Procedures for the Bacteriological examination of Seawater and shell fish. APHA, USA.
3. George Borstorm. 1961. Fish as Food - Vol. I, II, III and IV. Academic Press, New York.
4. K. Gopakumar. View Larger ImageTextbook of Fish Processing Technology. ICAR, New Delhi. y Charles L. Cutting. Processing and Preservation of Fish. Agro Bios, New Delhi.

Outcomes:

By the end of the course, the students will be able to

- gain knowledge in the areas of fish and other marine food preservation and processing technology

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B. Tech III-II Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27606) FOOD REFRIGERATION AND COLD CHAIN
ELECTIVE – I

Preamble:

This subject emphasis on principles of refrigeration, role of equipment in refrigeration system, cycles, refrigeration load calculations and commercial applications in food industry.

Objectives:

i. To know the equipment available to store perishable items for a long time
ii. To understand to increase the storage life of food items

UNIT – I

Principles of refrigeration: Definition, background with second law of thermodynamics, unit of refrigerating capacity, coefficient of performance; Production of low temperatures: Expansion of a liquid with flashing, reversible/ irreversible adiabatic expansion of a gas/ real gas, thermoelectric cooling, adiabatic demagnetization; Air refrigerators working on reverse Carnot cycle: Carnot cycle, reversed Carnot cycle, selection of operating temperatures;

UNIT – II

Air refrigerators working on Bell Coleman cycle: Reversed Brayton or Joule or Bell Coleman cycle, analysis of gas cycle, polytropic and multistage compression; Vapour refrigeration: Vapor as a refrigerant in reversed Carnot cycle with p-V and T-s diagrams, limitations of reversed Carnot cycle; Vapour compression system: Modifications in reverse Carnot cycle with vapour as a refrigerant (dry Vs wet compression, throttling Vs isentropic expansion), representation of vapor compression cycle on pressure- enthalpy diagram, super heating, sub cooling;

UNIT – III

Liquid-vapour regenerative heat exchanger for vapour compression system, effect of suction vapour super heat and liquidsub cooling, actual vapour compression cycle; Vapour-absorption refrigeration system: Process, calculations, maximum coefficient of performance of a heat operated refrigerating machine, Common refrigerants and their properties: classification, nomenclature, desirable properties of refrigerants- physical, chemical, safety, thermodynamic and economical; Azeotropes; Components of vapour compression refrigeration system, evaporator, compressor, condenser and expansion valve;

UNIT – IV

Ice manufacture, principles and systems of ice production, Treatment of water for making ice, brines, freezing tanks, ice cans, air agitation, quality of ice; Cold storage: Cold store, design of cold storage for different categories of food resources, size and shape, construction and material, insulation, vapour barriers, floors, frost-heave, interior finish and fitting, evaporators, automated cold stores, security of operations; Refrigerated transport: Handling and distribution, cold chain, refrigerated product handling, order picking, refrigerated vans, refrigerated display;

UNIT – V

Air-conditioning: Meaning, factors affecting comfort air-conditioning, classification, sensible heat factor, industrial air-conditioning, problems on sensible heat factor; Winter/summer/year round air-conditioning, unitary air-conditioning systems, central air-conditioning, physiological principles in air-conditioning, air distribution and duct design methods; design of complete air-conditioning systems; humidifiers and dehumidifiers; Cooling load calculations: Load sources, product cooling, conducted heat, convected heat, internal heat sources, heat of respiration, peak load; etc.

Text Books:

1. Arora, C. P. 1993. Refrigeration and Air Conditioning. Tata MC Graw Hill Publishing Co.Ltd., New Delhi.

References:

1. Adithan, M. and Laroiya, S. C. 1991. Practical Refrigeration and Air Conditioning. Wiley Estern Ltd., New Delhi

Outcome:

By the end of the course, the students will

i. understand the different equipment useful to store the food items for a long period.

ii. understand to increase the storage life of food items

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B. Tech III-II Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27607) THERMAL OPERATIONS

ELECTIVE – I

Preamble:

This subject covers all the aspects of thermal properties and pasteurization, sterilization and UHT processing, newer technologies like ohmic, radio frequency and etc.

Objectives:

To impart the knowledge on thermal operations and advances in thermal processing.

UNIT – I

Thermal properties of food constituents and foods. Overview of thermal operations carried out in dairy and food processing.

UNIT – II

Pasteurization and Sterilization: microbial destruction in batch and continuous sterilization; kinetics of loss of nutrients in sterilization; batch and continuous pasteurization, Indirect and direct methods of UHT processing; aseptic packaging; Steam generation and culinary steam production.

UNIT – III

Innovations in Thermal Food Processes: Ohmic heating in Food processes, radio frequency dielectric heating, infrared heating, and pressure assisted thermal processing, pH assisted thermal processing, time-temperature integrators for thermal process evaluation, and laser based packaging sterilization in aseptic processing.

UNIT – IV

Modelling and Simulation: Direct calculation of survival ratio and iso thermal time equivalent in heat preservation processes, computational fluid dynamics in thermal processing. Optimization, Control of Thermal processes for Shelf-Stable Products: Regulatory considerations, Critical factors related to the design of thermal treatments for the products packaged prior to treatment, Critical factors related to the design of thermal treatments for the products packaged prior to aseptic packaging, Qualification of heat stabilization equipment, Design and validation of thermal treatments, Heat destruction parameters and sterilization value.

UNIT – V

Measurement and validation of thermal processes: Setting the target process value, Validation methods: Objectives and Principles, Temperature measurement approaches, Process establishment methods, Process calculation methods. Online control and automation:Online control and strategies- batch processing, plant automation for automatic batch retort systems.

Text Books

1. Heat Transfer (in SI Units). Holman, J. P., Tata McGraw Hill, 9th Edition (Special Indian Edition), 2008.
2. Fundamentals of Heat and Mass Transfer. F. P. Incropera, and P. W.David, Wiley, 3rd Edition, 1990.

References

1. Fundamentals of Heat and Mass Transfer, R.C. Sachdeva, Wiley Eastern Limited, 3rd Edition, 2001.
2. Fundamental of Food Process Engineering, R.T. Toledo, CBS publishers, 3rd Edition, 1980.
3. Engineering Heat Transfer, C.P. Gupta and R. Prakash Nemchand and Brothers, 4th Edition,1994.

Outcome:

Students are explored to novel technologies in thermal processing and principles, equipment used, advantages and disadvantages.

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B. Tech III-II Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27608) FROZEN FOOD TECHNOLOGY

ELECTIVE – I

Preamble:

This subject emphasis on fundamentals of freezing, methods and types of freezers, packaging and latest technologies.

Objectives:

The principles involved in freezing, properties of frozen foods, calculation of freezing time, selection of freezer and emerging technologies for frozen foods.

UNIT-I

Fundamentals of Freezing: Physical chemical principles in freezing, glass transition in frozen food systems, refrigeration cycles, microbiology of frozen foods, thermo physical properties of frozen foods, mathematical modeling of freezing process

UNIT-II

Facilities for the cold chain: Freezing methods and equipment, cold store design and maintenance, transportation of frozen foods, retail display equipment and management, monitoring and control of cold chain.

UNIT-III

Freezing Technology: The freezing process, freezing capacity, mechanical refrigeration, cryogenic refrigeration systems, freezing time calculations, freezer selection, economics of freezing, freezing equipment, belt freezers, fluidized bed freezers, contact freezers, cryogenic freezers, liquid carbon dioxide freezers, IQF freezing, form freezing, physical storage and distribution of frozen foods, frozen food supply chain.

UNIT-IV

Emerging technologies of food freezing: Ultra sound accelerated freezing, high pressure shift freezing, electro static field assisted food freezing, antifreeze proteins.

UNIT-V

Packaging of frozen foods: Introduction to frozen food packaging, plastic packaging of frozen foods, packaging of frozen foods with other materials, active and intelligent packaging, vacuum packaging, edible coatings and films and their applications on frozen foods.

Text Books:

1. De wan sun, Handbook of Frozen food processing and packaging 2nd Edition, CRC Press, 2012.
2. Judith A. Evans, Frozen Food Science and Technology, Blackwell publishing ltd, 2008.

References:

1. Mallett. C. P., Frozen Food Technology, Blackie Academic and Professional, 1993.
2. Pruthi. J. S., Quick Freezing Preservation of Foods, Volume II, ISBN, 1999.

Outcome:

Students will get knowledge on

1. Basics in freezing, different freezing methods, advantages and disadvantages
2. New technologies and their scope
3. Packaging for frozen foods
4. Mathematical modelling

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B. Tech III-II Sem. (F.T)	L	T	P	C
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(15A27609) MASS TRANSFER LAB

Objectives:

To learn the separation factor for all mass transfer operations like distillation, absorption, solid-liquid and liquid-liquid extraction.

Laboratory Experiments:

1. Determination of water activity of different foods.
2. Determination of depression of freezing point
3. Determination of Boiling point elevation and solute concentration
4. Studies on Humidification/ Dehumidification columns.
5. Psychrometric chart and psychrometers.
6. Studies on Bubble cap/ tray/ fractional column
7. Studies on extraction column.
8. Separation factors of the experiments with differential distillation.
9. Separation factors of the experiments with flash vaporization.
10. Separation factors of the experiments with vapour liquid equilibrium.
11. Separation factors of the experiments with liquid – liquid extraction.
12. Separation factors of the experiments with solid –liquid extraction.
13. Separation factors of the experiments with ion exchange.
14. Separation factors of the experiments with membrane separation.
15. Studies on Bubble cap/ tray/ fractional column.
16. Studies on Absorption columns.
17. Studies on crystallization and adsorption.

Outcome:

Students will understand the separation techniques, significance of water activity, working principle of various mass transfer equipment.

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B. Tech III-II Sem. (F.T)	L	T	P	C
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(15A27610) FOOD PRODUCT LAB III (MEAT, POULTRY AND FISH)

Objective:

To learn the different preservation methods for meat, poultry and fish and preparation of value added products.

Laboratory Experiments:

1. Study of post-mortem changes; Meat cutting and handling
2. Preservation of meat by curing and pickling
3. Value added meat products
4. Evaluation of quality and grading of eggs
5. Preservation of shell eggs
6. Preparation of value added poultry meat products
7. Value added egg products
8. Study of anatomy and dressing of fish
9. Study of anatomy and dressing of prawn and other marine products
10. Preservation of fish: Drying, pickling
11. Preparation of value added sea products: Cutlets, bullets, wafers
12. Preparation and evaluation of meat sausages
13. Preparation and evaluation of meat/ chicken patties
14. Estimation of TVB and TMA
15. Visit to Abattoir
16. Visit to fish and prawn processing industry

Outcome:

By the end of the course, the students will

- learn different methods of slaughter, Postmortem changes, preservation techniques and methods of value addition to meat
- develop practical skills in preservation and processing technology of fish and marine products

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B. Tech III-II Sem. (F.T)	L	T	P	C
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(15A52602) ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS (AELCS) LAB (Audit Course)

1. INTRODUCTION

With increased globalization and rapidly changing industry expectations, employers are looking for the wide cluster of skills to cater to the changing demand. 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 and to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Taking part in social and professional communication.

1. 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 English Communication Skills (AECS) Lab:

UNIT-I: COMMUNICATION SKILLS

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary Development

4. Common Errors

UNIT-II: WRITING SKILLS

1. Report writing
2. Resume Preparation
3. E-mail Writing

UNIT-III: PRESENTATION SKILLS

1. Oral presentation
2. Power point presentation
3. Poster presentation

UNIT-IV: GETTING READY FOR JOB

1. Debates
2. Group discussions
3. Job Interviews

UNIT-V: INTERPERSONAL SKILLS

1. Time Management
2. Problem Solving & Decision Making
3. Etiquettes

4. LEARNING OUTCOMES:

- Accomplishment of sound vocabulary and its proper use contextually
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities
-

5. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) 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 G

1. **Walden Infotech: Advanced English Communication Skills Lab**
2. **K-VAN SOLUTIONS-Advanced English Language Communication Skills lab**
3. **DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.**
4. **TOEFL & GRE**(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
5. **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 3rd Edn. 2015.
3. **Essay Writing for Exams, Audrone Raskauskiene, Irena Ragaisience & Ramute Zemaitience,OUP, 2016**
4. **Soft Skills for Everyone,** Butterfield Jeff, Cengage Publications, 2011.
5. **Management Shapers Series** by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. **Campus to Corporate,** Gangadhar Joshi, Sage Publications, 2015
7. **Communicative English,**E Suresh Kumar & P.Sreehari, Orient Blackswan, 2009.
8. **English for Success in Competitive Exams,** Philip Sunil Solomon OUP, 2015

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B. Tech IV-I Sem. (FT)	L	T	P	C
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(15A27701) FOOD SAFETY STANDARDS

Preamble:

This course deals about the laws and regulations concerning food safety in India and rest of the world.

Objectives:

To impart the knowledge to students about

a) Importance of Food safety and standards
b) Various laws and regulations in India and rest of the world
c) Implementation Protocol

UNIT – I

Definition, Importance, Scope and Factors affecting Food Safety. Principles of food safety – Establishment: design and facilities - emergency preparedness – Maintenance cleaning and sanitation – personal hygienic – packaging and labelling – transportation – traceability – recall procedure. GATT, WTO, TBT, SPS, FAO: Overview of Organizational structure, Objectives and Functions.

UNIT – II

Codex Alimentarius – PRP – GMP – GHP – GAP - GRAS- SSOP, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control. Food storage.HACCP - principles – Hazard analysis – determine CCP – establish critical limit – establish monitoring procedure – establish corrective action – record keeping – verification – AOQL (Average Outgoing Quality Limit) – HACCP plan chart.Risk Analysis.

UNIT – III

ISO-Origin, Members, Governance, Committees, Procedure employed in development and issue of standards. ISO/TC 34, ISO 9000 series, ISO 22000:2005, Comparison of ISO 9001:2008 vs. ISO 22000:2005

History of food adulteration and evolution of standards. Intentional and unintentional - Preservatives - antioxidants, sweeteners, flavours, colours, vitamins, stabilizers - indirect additives - organic resides - inorganic residues and contaminants.

UNIT – IV

FSSAI, Essential Commodities Act, BIS, organizational chart – prohibition and regulation of sales – Laboratory and sampling analysis – scope and objective of industry – food safety policy – environmental policy – glass policy – jewellery policy – visitor policy.

UNIT – V

Implementation of food safety for a desired food processing industry. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Text books

1. Food safety and standards regulations, 2010.
2. General requirements (Food Hygiene) of the Codex Alimentarius, Volume II. Food and Agriculture organization of the United Nations.

References

1. The ministry of health and family welfare, The Gazette of India: Extraordinary, Part- III, section

Outcomes:

The students get knowledge on

1. Need of food safety
2. Scope and importance of all food laws & regulations
3. ISO,CODEX and FSSAI
4. Implementation of food laws by governing authorities

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B. Tech IV-I Sem. (F.T.)	L	T	P	C
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(15A27702) BY PRODUCT UTILIZATION AND WASTE MANAGEMENT IN FOOD INDUSTRIES

Preamble:

Utilization of wastage from food products into useful products, these products can be used as vital food ingredient, packaging material and raw material to other industries.

Objectives:

To impart knowledge to the student on the food industry byproducts like Fruits and vegetables by-products, Cereal byproducts utilization, byproducts from Sugar industry, byproducts from alcoholic beverages, byproducts from dairy industry.

UNIT – I

Introduction to Industrial by - products and waste –facts and figures in India and world-Potentials and prospects of developing by-products Industry in India. Agricultural wastes and agro based industries - Types of By-products in agro - based industries - commercial compounds obtained from by-products.

UNIT – II

By-products of Cereals - by-products of cereals processing - Rice and corn milling byproducts, Husk Utilization. By-product utilization of Legume seeds. By-products of oilseed Industry - Oil seed cake utilization.

UNIT – III

By- products of vegetable and fruit processing Industry - various wastes obtained in different fruit processing industries - pectin extraction from apple pomace - tartaric acid extraction, oxalic acid. Fruit pits- kernel oil production, Citrus oil production, Value added products from culled fruit, peels and rinds.

UNIT – IV

By-products of fruit and vegetable fermentation - wine and vinegar. By-products of meat, poultry and egg processing Industry - Abattoir By-products. By-products of meat, poultry and egg processing Industry - By-products of fish processing units.

UNIT – V

By-products of spices and plantation crops. By-products of Alcoholic Fermentation Industries. By-products of Sugar Industry. By-products of Bakery Industry. By-products of

dairy industry, Classification, Principle and method of utilization - Whey utilization - demineralization of whey - Lactose preparation, Casein preparation - Utilization of Ghee residue - protein hydrolysates.

Text books

1. A Chakraverty, Post-Harvest Technology of Cereals, Pulses and Oil Seeds. Oxford and IBH Publishing Co. Ltd., Calcutta
2. Giridharlal, Siddappa and GL Tandon, ICAR. Preservation of fruits and vegetables, New Delhi.
3. Sudheer Gupta (Compiled), EIRI Fruits & Vegetables Processing Hand Book, Delhi.
4. R.P. Srivastava, Sanjeev Kumar, Fruit and vegetable preservation-3rd Edition, International Publishers, Delhi.
5. Norman N. Potter. Food Science.

References

1. Sukumar De, Outlines of Dairy Technology. Oxford University Press. New Delhi.
2. Ervan. Food from Wastes.
3. Sharma, B.D. Modern Abattoir Practices and Animal by Products Technology, Jaypee Brothers Medical Publishers Pvt. Ltd, New Delhi
4. P. Chereminost. Food Protein sources - Fire Energy from Solid Waste
5. B.H. Webb and E.O.Whittier, By-Products from Milk - AVI Publishers Co., West port, Connecticut, USA.

Outcomes:

By the end of the course, the students will be able to

i. understand the conceptsof Agricultural wastes and agro based industries

ii. understand the industrial application of Food Industry By-Products like Oil seed cake utilization

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B. Tech IV-I Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27703) FOOD PLANT UTILITIES & ENERGY CONSERVATION

Preamble:

This subject focuses on different utilities like water, steam, electricity and its properties, production of consumption of these sources in the food plant.

Objective:

To give brief idea about the utilities that are required/used in food industry and their sources and importance.

UNIT – I

Introduction Classification of various utilities and services in food industry. Water use in Food Processing Industry Water supply system: Pumps of different types, operational aspects, piping system for fresh water, chilled water etc., fittings and control, water requirement for cleaning and processing, water quality, water purification and softening Water use in food processing: Different types of water requirements in food processing plants, types of water use, waste water sources, water wastage minimization, water loadings per unit mass of raw material. Water conservation: Water and waste water management, economic use of water, water filtration and recirculation.

UNIT – II

Steam uses in Food Industry Steam uses in food industry: Food processing operations in which steam is used, temperature, pressure and quantity of steam required in various food processing operations Steam generation system: Components of a boiler system, fuels used in boilers, energy analysis for a steam generation system, heat loss from boiler system, boiler design consideration. Energy conservation technologies for steam generation system, Energy saving through optimal design and operation of boiler, energy recovery from flue gas, energy recovery from blow down water, maintenance of boiler. Steam distribution system: Components of steam distribution, heat loss and energy efficiency of a steam distribution system. Energy conservation technologies for steam distribution system: Steam trap maintenance, condensate recovery, repairing of steam leaks, insulation improvements. Economical analysis of energy efficiency improvement, cogeneration.

UNIT – III

Electric Energy uses in Food Industry Power and Electrical System: Types of electrical loads, electric loads, sources of energy losses in power and electrical systems, low power factor, improper motor load, poor control. Power management for demand control, power factor improvement, replacement with high efficiency motors, replacement with electronic

adjustable motors. Energy conservation in heat exchangers: Energy conservation through heat transfer enhancement techniques, energy conservation through cleaning of fouling layer, energy conservation through optimization of heat exchanger design, energy conservation through heat exchanger network retrofit.

UNIT – IV

Waste-Heat Recovery in Food Processing Facilities Quantity and quality of waste heat in food processing facilities, waste heat utilization, heat exchangers for waste heat recovery, heat pumps for waste heat recovery. Waste Disposal and its Utilization Industrial waste, sewage, influent, effluent, sludge, dissolved oxygen, biological oxygen demand, chemical oxygen demand.

UNIT – V

Planning and Design of Service Facilities in Food Industry Estimation of utilities requirements: Lighting, ventilation, drainage, CIP system, dust removal, fire protection etc. Maintenance of facilities: Design and installation of piping system, codes for building, electricity, boiler room, plumbing and pipe colouring, maintenance of the service facilities. Services required in offices, laboratories, locker and toilet facilities, canteen, parking lots and roads, loading docks, garage, repair and maintenance shop, ware houses etc.

Text Books

1. Energy Efficiency and Management in Food Processing Facilities, by Lijun Wang. Published by CRC Press, 2008
2. Energy-saving Techniques for the Food Industry by M. E. Casper. Published by Noyes Data Corp., 1977
3. Chilton's Food Engineering. Published by Chilton Co., 1979 Reference book

References

1. Thermal Engineering in SI Units, P.L. Ballaney, 23rd Edition, Khanna Publishers, Delhi., 2003.
2. Refrigeration and Air conditioning, C.P. Arora, Tata McGraw Hill Publishing Co. Ltd. 3rd Edition, New Delhi. 2008.
1. A Survey of Water Use in the Food Industry by W. E. Whitman, S. D. Holdsworth. Published by British Food Manufacturing Industries Research Association.

Outcome:

Students will understand the importance of plant utilities, and resources and utilization in food plant.

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	3	1	0	3

(15A27704) FOOD PACKAGING TECHNOLOGY

Preamble:

This course was designed to know about the importance of packaging for foods, different food packaging materials, interactions between food and packaging materials and also novel food packaging techniques.

Objectives:

a) The need for Optimum Packaging of foods, and
b) About different packaging materials, and machinery used to protect food products and increase their shelf life

UNIT – I

Introduction: Importance and Functions of Food Packaging, Type of packaging materials;Selection of packaging material for different foods:Cereals, Meat, Poultry, Fish, Milk, Vegetables, Fruits, Spices and Carbonated Beverages. Selective properties of packaging film; Tests on packaging materials - Mechanical strength (Tension, notch and tearing strengths), Gas and water vapour transmission rates; Methods of packaging and packaging equipment.

UNIT – II

Cellulosic and Polymeric packaging materials and forms: Food grade polymeric packaging materials, Rigid plastic packages. Films: Oriented, Co-extruded, Laminates and Metallised; Cellophane, Olefins, Polyamides, Polyesters, PVC, PVDC, PVA, Inomers, Copolymers, Polycarbonates, Phenoxy, Acrylic and Polyurethane. Their mechanical sealing and barrier properties.

UNIT – III

Glass and Metal containers: Glass: Composition, Properties, Bottle making and Closures for glass containers. Metal: Bulk containers, Tin-plate containers, Tin free steel containers, Aluminium containers, Latest development in metal cans and protective lacquers. Testing of Packaging Material: Destructive & Non destructive test, testing of rigid, semi rigid and flexible packaging material, Shelf life study etc. Corrosion and toxicity of packaging material.

UNIT – IV

Food product characteristics and package requirement, Interactions between packaging material and foods. Selection of materials, Forms, Machinery and methods for fresh produce

UNIT – V

Advances in Food Packaging: Smart packaging, Intelligent Packaging, Active Packaging and Antimicrobial packaging, Retortable pouches, biodegradable and edibles packaging materials and films. Package printing, Barcodes & Labelling; Packaging Laws and Regulations, Evaluation of food packaging materials and package performance.

Textbooks

1. Food Packaging Principles and Practices. G. L. Robertson, Marcell Decker, 2nd Edition, 2006.
2. Innovation in Food Packaging. J.H. Han (Ed), Elsivier Publications, 1st Edition, 2005.
3. Food Packaging: Principles and Practices. G. L. Robertson, CRC Press, 2nd Edition, 2005.
4. M. Mahadeviah and R.V. Gowramma Food Packaging Materials

References

1. Food Packaging Technology. R. Coles, D. McDowell and M. J. Kirwan, CRC Press, 1st Edition, 2003.
2. Novel Food Packaging Techniques. R. Ahvenainen (Ed), Woodhead Publishing, 1st Edition, 2003.
3. Food Packaging Science and Technology. K. L. Yam, D.S. Lee and L. Piergiovanni, CRC Press, 1st Edition,2008.
4. S. Saclarow and R.C. Griffin Principles of Food Packaging Trends in Food Science & Technology Proceedings of IFCON-1988

Outcome:

By the end of the course, the students will be able to know
i) about different types of paper based packaging material
ii) about different types of plastic based package material
iii) about metal and glass based packaging material
iv) about advanced packaging techniques and packaging machinery

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B. Tech IV-I Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27705) FOOD EXTRUSION TECHNOLOGY

ELECTIVE – II

Preamble:

This course deals with the significance of extrusion technology over other technologies. Steps involved in extrusion process. Application of this technology in order to produce various food products.

Objectives:

To impart knowledge to the students about extrusion technology, principle of working, classification of extruders according to process and construction, extruded products and their processing.

UNIT – I

Extrusion definition, introduction to extruders and their principles, types of extruders. Extruders in the food industry: History and uses of extruders in the food industry. Single screw extruder: principle of working, net flow, factors affecting extrusion process, co-kneaders.

UNIT – II

Twin screw extruder: counter rotating and co-rotating twin screw extruder. Process characteristics of the twin screw extruder: feeding, screw design, screw speed, screw configurations, die design. Barrel temperature and heat transfer, adiabatic operation, heat transfer operations and energy balances. Problems associated with twin screw extruder.

UNIT – III

Pre-conditioning of raw materials used in extrusion process, Pre-conditioning operations and benefits of pre-conditioning and devolatilization. Interpreted-flight expanders - extruders, dry extruders. Chemical and nutritional changes in food during extrusion. Practical considerations in extrusion processing: pre-extrusion processes, cooker extruder Profiling.

UNIT – IV

Practical considerations in extrusion processing: Addition and substraction of materials, shaping and forming at the die, post extrusion processes. Breakfast cereals: introduction, type of cooking - High shear cooking process, steam cookers, low shear, low pressure cookers and continuous steam pre-cooking, available brands.

UNIT – V

Breakfast cereal processes: traditional and extrusion methods, classification of breakfast cereals - flaked cereals, oven puffed cereals, gun puffed cereals, shredded products. Texturized vegetable protein: Definition, processing techniques, and foods. Snack food extrusion: Direct expanded (DX) and third generation (3G) Snacks: types, available brands, co- extruded snacks and indirect-expanded products.

Text books

1. Richardson P. Thermal Technologies in Food Processing. Wood head Publishers, Cambridge
2. Guy R. Extrusion Cooking, Technologies and Applications. Wood head Publishing Limited, Abington, Cambridge.
3. Fast R.B. and Caldwell E.F. Breakfast Cereals and How they are made. (2000) American Association of Cereal Chemists., St. Paul, Minnesota.

References

1. Frame N.D. The Technology of Extrusion Cooking. (1994) Blackie Academic & Professional, New York.
2. Harper J.M. Extrusion of Foods. Vol. 1&2 (1991) CRC Press, Inc; Boca Raton, Florida.
3. O'Connor C. Extrusion Technology for the Food Industry. (1987) Elsevier Applied Science, New York.

Outcomes:

By the end of the course, the students will be able to

i. learn about use of extrusion technology in food industry

ii. study about Extrusion cooking, preconditioning of raw material, types of extruders and operating parameters

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B. Tech IV-I Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27706) BAKERY, CONFECTIONERY & SNACK PRODUCTS

ELECTIVE – II

Preamble:

This course was designed to know the status of bakery and confectionery industry. Study of various bakery & confectionery, snack products. Significance of dough rheology.

Objectives:

i) To train the students in Bakery & Confectionery and to impart knowledge about different raw materials used and their role.

ii) To impart knowledge on different equipment, processing of different Products and their packaging & Quality maintenance.

UNIT – I

Current status, growth rate, and economic importance of Bakery and Confectionery Industry in India.Raw materials for bakery and confectionery products- Essential and optional. FSSAI Specification of raw materials.

UNIT – II

Bakery Products:Ingredients, assessing quality of ingredients & processes for breads, bread rolls, sweet yeast dough products, biscuits, cookies & crackers, cake specialties, pies and pastries,doughnuts; rusks; other baked products.product quality characteristics, faults and corrective measures for above bakery products.Assessing quality of products, FSSAI Specifications.

UNIT – III

Dough rheology, Bakerymachinery and equipment: Weighing Equipment- Manual scale, Automatic weigh, liquid measuring. Mixingblenders, Horizontal and vertical planetary, continuous mixers. Make up equipment- Divider, Rounder, Proofer, moulder. Baking equipment – different oven, slicer.

UNIT – IV

Confectionery and chocolate products: Chocolate, fondant, caramels, fudge,hard-boiled candies, toffees, fruit drops, chewing and bubble gums, cocoa products and other confections: - ingredients, equipment& processes, packaging, storage and quality testing, product quality parameters, faults, causes and corrective measures, FSSAI Specifications.

UNIT – V

Snack foods: Types, specifications, compositions, ingredients, formulations, processing, equipment, packaging, storage and quality testing; Snack food seasonings; Breakfast cereals, macaroni products and malts: Specifications, compositions, ingredients, formulations, processing, equipment, packaging, storage and quality testing, FSSAI Specifications.

Textbooks

1. Bakery Technology and Engineering. S. A. Matz, CBS Publications, 3rd Edition, 2003.
2. Cereals as Food and Feed. S. A. Matz, CBS Publications, 2nd Edition, 2001.
3. Baking Science and Technology. E. J. Pyler, Sosland Publishing Company, 3rd Edition, 2009.
4. Bernard. W. Minifie., PhD "Chocolate, Cocoa, and confectionery" (Science and Technology), 3rd edition,CBS publishers and Distributors,New Delhi110002.

References

1. Industrial Chocolate Manufacture. T. Beckette, Wiley-Blackwell, 4th Illustrated Edition, 2005.
2. Dough rheology and baked product texture. F. Faubion, CBS Publications, 1st Edition (Indian reprint), 1997.
3. Chocolate, Cocoa and Confectionery. B.W. Minifie, CBS Publications, 3rd Edition, 1997.
4. "The complete Technology book on bakery products" by NIIR Board.

Outcome:

By the end of the course, the students will have
i. knowledge in the all areas of Bakery and Confectionery and their processing methods, equipment used and operating procedure and etc.

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B. Tech IV-I Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27707) TECHNOLOGY OF TRADITIONAL INDIAN FOODS

ELECTIVE – II

Preamble:

This course emphasis on importance and significance of traditional foods in all parts of India. Processing and advantages of those foods.

Objective:

- To know the all indigenous foods and their significance
- Various methods of processing
- Standardization of traditional foods and its health benefits

UNIT – I

Processing & Preservation methods of Sweets & Desserts: Kulfi, Falooda, Kheer, khurchan, khoa/mawa, Rabri, jalebi, imarti, Gulabjamun, Peda, petha, rewdi, gajak, milk cake, balushahi, balmithai, singoni, Ras-malayi, Gulqand, ghevar, rasgolla, chamcham, son halwa, son papri, several varieties of halwa, laddu, barfi &rasgolla.

UNIT – II

Processing & Preservation methods of Snacks: Gujiya, kachauri, samosa, mirchibada, kofta, potato chips, banana-chips, mathri, bhujiya, fried dhals, bhujia, shakarpara, pakoda, vada.

UNIT – III

Processing & Preservation methods of Fermented Foods: Idli, dosa, Vada, khammandhokla, Dahi (Curd), Srikhand.

UNIT – IV

Processing & Preservation methods of Baked Products: Biscuits, Toast, Candies, Cookies, Breads, Roti, Naan, Tandoori Roti, parantha, kulcha, puri, bhatura.

UNIT – V

Processing & Preservation methods of Preserves & Beverages: Murabba, sharbat, pana, aampapad, sharbat, coconut water, tea, milk (khas, rose), Alcoholic Beverages (palm wine, fenny, bhang & Indian beer)

Text Books

1. Handbook of Indigenous Fermented Foods. K.H. Steinkrus (Ed), Marcel Dekkar Inc. 2nd Edition, 1998.

2. Outlines of Dairy Technology. Sukumar De, Oxford University Press, 1st Edition (PB), 2009.

References

1. The Food of India. P. Wickramasinghe, and C. Selva Rajah (Eds), Oberoi Group, Periplus, 1st Edition, 2001.
2. Technology of Indian Milk Products. R. P. Aneja, B.N. Mathur, R.C. Chandan,and A.K. Banerjee, (Eds), Dairy India YearBook, 2009.
3. Fundamentals of Indian Cooking. Rakesh Mangal, Subling Publication,2nd Edition, 2003.

Outcome:

Students acquire knowledge on all Indian ethnic foods, history and scope, processing techniques and its uses.

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B. Tech IV-I Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27708) TECHNOLOGY OF BEVERAGES
ELECTIVE – III

Preamble:

The text describes the various beverages that can be manufactured. Rawmaterials and other ingredients used in beverage processing. Quality parameters for waterand threshold levels.

Objectives:

This subject taught the different types of beverages and its commercial application, processing and quality control in beverage industry. Equipment used and sanitation methods for cleaning equipment.

UNIT – I

Beverage-definition-ingredients- water, carbon dioxide, bulk and intense sweeteners, water miscible and water dispersible flavouring agents, colours – natural and artificial, Micro and nanoemulsions of flavors and colors in beverages, preservatives, emulsifiers and stabilizers.

UNIT – II

Technology for alcoholic beverages: Raw materials Malt, hops, adjuncts, water, yeast quality and handling. Beer manufacturing process malting, preparation of sweet wort, brewing, fermentation, pasteurization and packaging. Beer defects and Spoilage.Wine-fermentation-types –red and white. Wine defects and spoilage.Equipment and machinery for Wine, Beer, Whiskey, Brandy, and Rum. Cereal Fermentation. Packaging and storage of different beverages, FSSAI Specifications.

UNIT – III

Equipment and machinery for carbonated beverages, water treatment, syrup preparation, filling system, packaging containers and closures, handling of empty containers and cleaning, carbonation, filling, inspection and quality control.

UNIT – IV

Technology for non-carbonated beverages: Raw materials quality and handling. Coffee bean preparation-processing-brewing-decaffeination- instant coffee-Teatypes-black, green and oolong- fruit juices, nectars, squash, RTS beverages, isotonic Beverages, FSSAI Specifications. Flash pasteurization, Canning and Aseptic Packaging of beverages. Equipment and machinery used.

UNIT – V

Effective application of quality controls- sanitation and hygiene in beverage industry-Quality of water used in beverages - threshold limits of various ingredients according to FSSAI, EFSA and FDA – Absolute requirements of Soluble solids and titratable acidity in beverages. Water: RO, Mineral water specifications.

Text books

1. Ashurst, P.R, "Chemistry and technology of Soft drink and fruit juices", 2nd edition, Blackwell Publishing Ltd. 2005.
2. Steen, D.P and Ashurst, P.R, "Carbonated soft drinks – Formulation and manufacture", Blackwell Publishing Ltd. 2000.
3. ShankunthalaManay, N. and Shadakdharaswamy, M, "Foods – Facts and Principles", New Age International Pvt. Ltd, 3rd revised edition 2000.
4. Charles, W.Bamforth, "Food, fermentation and microorganisms", Blackwell Science Publishing Ltd. 2005.

References

1. AmalenduChakraverty et al, "Handbook of Post-Harvest Technology", Ed: Marcel Dekker Inc. (Special Indian edition) 2000.
2. Robert.W.Hutkins, "Microbiology and Technology of Fermented foods", IFT Press, Blackwell Publishing Ltd. 2006.
3. "Brewing yeast and fermentation Chris Boulton and David Quain", Blackwell Science Ltd
4. "Prevention of Food Adulteration Acts and Rules Manual".

Outcome:

- Students will acquire knowledge on technology of beverages and its scope and comparison of various processing of beverages. Quality standards by FSSAI, EFSA and FDA.

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B. Tech IV-I Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27709) FLAVOUR TECHNOLOGY
ELECTIVE – III

Preamble:

This course mainly focus on significance of flavor, sensory perception of flavor and its interactions with different foods. Uses of flavourings in foods.

Objective:

To expose the students to flavor technology, in that the sources of flavours and methods of extraction. Flavor compound present in different foods and specifications for flavours by BIS/FSSAI.

UNIT – I

Food flavor and its importance to consumers and food processors. Flavor and nutrition. Sources, extraction, delivery systems, and analyses (chemical, instrumental, and sensory) of flavours and flavorings in foods.

UNIT – II

Sensory perception of flavor: Senses of taste and smell, tasting versus sniffing, astringency, pungency, interaction of senses in flavor perception; taste, odour and acceptance of flavor stimuli. Chemistry of substances responsible for taste and flavor-taste sensations, flavour enhancers, flavourpotentiators or modifiers. Methodology of sensory evaluation and determination of threshold levels as specified by BIS.

UNIT – III

Flavoring constituents of various foods like meat, fish, milk, vegetables, fruits, fats & oils, spices & herbs, cereals and pulses. Flavor changes during processing, preservation, packaging, and storage of foods. Roles as sulfur compounds, fatty acids, amino acids, terpenoids, lactic acidethanol in food flavours. Process and reaction flavours/volatiles in foods.

UNIT – IV

Spices and herbs as food flavorings: Processing of basil, mint, saffron, cloves, tamarind, ginger, cardamom, chill, pepper etc.

UNIT – V

Determination of hygroscopic nature and shelf life/acceptance of foods. Natural, Nature identical and Synthetic flavors: Definitions, chemical composition/constituents, extraction

and preparation of flavors, Stability and utility of flavor preparations. Methods used in flavor evaluation. BIS Specifications/FSSAI restrictions for use of certain constituents in flavoring materials.

Textbooks:

1. Flavor Chemistry and Technology. G. Reineccius, Taylor & Francis Publishers, 2nd Edition, 2006.
2. Food Chemistry. O.R. Fennema, Food Science & Technology series, CRC press, New York, 4th Edition, 2007.

References:

1. Spices and Flavor Technology. J.S. Pruthi, ICAR Publications, 2nd Edition, 1998.

Outcome:

- Students will understand the concept of flavor and its applications in various foods.
- Consumer perception towards flavor resultant to that development of new flavours.

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B. Tech IV-I Sem. (F.T)	L	T	P	C
	3	1	0	3

(15A27710) SPECIALTY FOODS: NUTRACEUTICALS AND FUNCTIONAL FOODS

ELECTIVE – III

Preamble:

This course will cover the classification, brief history and the impact of nutraceuticals and functional foods on health and disease prevention. Nutraceuticals to be covered in the course include isoprenoids, isoflavones, flavanoids, carotenoids, lycopene, garlic, omega 3 fatty acids, sphingolipids, vitamin E and antioxidants, herbal products in foods. Also marketing issues related to functional foods and nutraceuticals as well as stability testing will be reviewed.

Objectives:

1. To understand the interrelationship between nutraceuticals and health maintenance.
2. Cite the evidence supporting the efficacy and safety of nutraceutical and functional food products
3. To explain the metabolic consequences of nutraceuticals and functional foods.
4. Describe the physiologic and biochemical changes associated with consumption of nutraceuticals

UNIT – I

Introduction, definition, Modification in the definition of nutraceuticals.Classification of nutraceuticals, Nutraceuticals market scenario, formulation considerations.Challenges for Nutraceuticals.

UNIT – II

Nutraceuticals value of spices and seasoning – Turmeric, Mustard, Chilli, Cumin, Fenugreek, Black Cumin, Fennel, Asafoetidia, Garlic, Ginger, Onion, Clove, Cardamom Etc., Nutraceuticals from Fruits And Vegetables- Mango, Apple, Grapes, Bel, Banana, Broccoli, Tomato, Bitter Melon, Bitter Orange.

UNIT – III

Omega -3 fatty acids from fish- Typical properties, structural formula, functional category. CLA- typical properties, structural formula, functional category.Application in Nutraceuticals.Calcium, chromium, copper, iodine, iron, magnesium, Zn- mechanism of action, bioavailability, uses and deficiency, dietary sources.

UNIT – IV

Definition, classification – Type of classification (Probiotics, probiotics and synbiotics: Taxonomy and important features of probiotic microorganisms. Health effects of probiotics including mechanism of action. Probiotics in various foods: fermented milk products, non-milk products etc. Prebiotics. Definition, chemistry, sources, metabolism and bioavailability, effect of processing, physiological effects, effects on human health and potential applications in risk reduction of diseases, perspective for food applications for the following: Non-digestible carbohydrates/oligosaccharides: Dietary fibre, Resistant starch, Gums.

UNIT – V

Phytosterol, Fatty Acids, Carotenoids, Anthocyanins, Carotenoids, Amino Acids, Water Soluble Vitamins, Free radical biology and antioxidant activity of nutraceuticals. Regulations of Nutraceuticals and Functional Foods in India and rest of the world.

Text Books

1. Yashwant Pathak, "Handbook of Nutraceuticals and Functional Foods. Vol. 1. (Ingredients, formulations, and applications)" CRC Press 2005.
2. Robert Wildman, "Handbook of Nutraceuticals and Functional Foods". 2nd edition. CRC Press 2001.
3. Human nutrition: A textbook of nutrition in health and disease. B. T. Burton, Mc Graw Hill, 3rd Edition, 2002.
4. Nutrition and Dietetics. S. A. Joshi, Tata Mc Graw Hill Co. Ltd., 2nd Edition, 2003.

References

1. Dietetics. B. Shrilakshmi, New Age International (P) Ltd., New Delhi, 5th Edition, 2005.
2. Nutrition and Dietetic Foods, A. E. Bender, Chem. Pub. Co. New York, 2nd Edition, 2004.
3. Basic Nutrition in Health and Disease. P. S. Howe, W. B. Saunders Company, London, 2nd Edition, 2003.
4. Kramer, Hoppe and Packer,"Nutraceuticals in Health and Disease Prevention", Marcel Dekker, Inc., NY 2001.
5. Bao and Fenwick, "Phytochemicals in Helath and Disease", Marcel Decker, Inc. NY 2004.

Outcome:

- Students will get know the nutraceuticals and its active components in different foods, regulations on nutraceuticals in India.

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B. Tech IV-I Sem. (F.T)	L	T	P	C
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(15A27711) FOOD ANALYSIS LAB

Objectives:

To expertise the students to analyze the proximate composition and other important constituents present in the food.

Laboratory Experiments:

1. Sampling plan; Sampling requirements, Sample collection and preparation for analysis procedures and methods
2. Determination of pH
3. Determination of moisture content of foods by oven drying and distillation methods
4. Determination of Total and Acid insoluble ash content in foods
5. Determination of crude fat content by solvent extraction methods in foods
6. Determination of crude Protein by Kjeldhal Lowry method & other methods
7. Determination of reducing and total sugar content in foods
8. Determination of crude fibre content in foods
9. Determination of specific mineral contents in foods such as Calcium, Iron, Phosphorus, Chloride etc.
10. Determination of specific vitamin content of food such as ascorbic acid, carotenes etc.
11. Determination of specific Natural and/ or added Colouring Matters in foods
12. Determination of specific added food Preservatives in foods

Outcome:

By the end of the practical exercises, the students will be able to

i. adapt suitable method for food analysis

ii. apply the knowledge of Techniques in Food Analysis,

iii. differentiate between Qualitative identification and Quantitative estimations

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B. Tech IV-I Sem. (F.T)	L	T	P	C
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(15A27712) PACKAGING LAB

Objectives:

To learn the identification of various packaging materials and testing of packaging material quality, shelf life related calculations.

Laboratory Experiments:

1. Identification of different types of packaging and packaging materials
2. Measurement of thickness of paper, paper boards and other packaging materials
3. Measurement of basic weight and grammage of paper and paperboards
4. Measurement of water absorption of paper, paper boards
5. Measurement of bursting strength of paper, paper boards
6. Measurement of tear resistance of papers
7. Measurement of puncture resistance of paper and paperboard
8. Measurement of tensile strength of paper, paper boards
9. Measurement of grease resistance of papers
10. Determination of gas and water transmission rate of package films
11. Drop test, Box compression test
12. Identification of plastic films
13. Shelf life calculations for food products
14. Head space analysis of packaged food
15. Determination of tensile strength of given material;
16. Introduction of students with the latest trends in packaging from websites and magazines

Outcome:

By the end of the Practical exercises, the students will be able to

i) know about measurement of thickness, grammages, Brust strength of different packaging materials

ii) know about measurement of Tensile strength, water vapour transmission rate (WVTR)

iii) know about the pre-packing practices for packaging fruit & vegetables

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B. Tech IV-II Sem. (F.T.)

L	T	P	C
3	1	0	3

(15A27801) PLANT DESIGN AND PROCESS ECONOMICS

MOOCS – II

Preamble:

This subject broadly covers the principles and types of plant layout and design, peculiarities of food plant layouts, sale up and pilot plant studies.

Objectives:

To impart knowledge on food plant layout and design of food industries and it's considering factors, cost economics and etc.

UNIT – I

Introduction to Plant Design, Peculiarities of food processing industries, Process Development, Process selection, Flow sheet preparation, sketching techniques, Equipment numbering, Stream designation, Material and energy balances.

Plant Design basis, Selection of equipment, specification and design of equipment's, Optimisation of different process equipment, materials of construction, Plant location, Plant layout and installation, Safety, Start up, Shutdown and Operating guidelines.

UNIT – II

Development and presentation of the layout, selection of site and Location of plant, General points of consideration for designing food plant, floor plant types of layouts, Food building planning, preparation of machinery layout for fruit, vegetables and meat-size reduction machinery layout.

UNIT – III

Evaporation plant layout-single, multiple, vacuum and film evaporators-types and concepts, drying plant layout, drying process, dryer types, selection of dryers. Baking oven and frying plant-types, concepts and layout. Filling closing and labelling of plant layout. Organization and trends in plant layout - sample layout, installation procedure for food processing plant.

UNIT – IV

Cost Engineering Time value of money and equivalence, Interest, cost comparisons by present worth, Annual equivalent cost and capitalised cost methods, Uniform gradient and series. Depreciation, Taxes and Insurances, Nature of depreciation, Methods of determining

depreciation, depreciation rates in current Indian situation, Types of taxes and insurances, Procedure for cost comparison after taxes.

UNIT – V

Cost Estimation- Types of cost estimation, capital investment cost, fixed capital cost, working capital cost, start-up costs, process equipment cost estimation, cost index, Equipment costs due to inflation, Battery limit investments, estimation of plant cost, Estimation of total product cost, Manufacturing cost, General expenses. Profitability Criteria of profitability, Payout period, Return on investment, Present value, Cash flow analysis, Alternative investment analysis, Sensitive analysis in project profitability. Preparation of techno-economic feasibility report.

Text books

1. Antonio Lopez-Gomez, Gustavo V. Barbosa-Canovas, Food plant design, CRC press 2005.
2. George D. Saravacos and Zacharias B. Maroulis, Food Plant Economics, CRC Press 2007.

References

1. Peters M., Timmerhaus K. & Ronald W., Plant Design & Economics for Chemical Engineers, McGraw Hill
2. James R Couper, Process Engg. Economics (Chemical Industries) CRC Press 3. Aries & Newton, Chemical Engg. Cost Estimation, McGraw Hill.

Outcomes:

By the end of the course, the students will

i. acquire knowledge on theoretical aspects to be considered for site selection, layout selection and design considerations for a food plant

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech IV-II Sem. (F.T.)	L	T	P	C
	3	1	0	3

(15A27802) FOOD PLANT SANITATION& HYGIENE
MOOCS – III

Preamble:

This subject deals with importance of food plant sanitation hygiene, principles of sanitation and hygiene.

Objective:

To explore the knowledge on types of sanitizers and methods to eradicate the pests and good hygienic practices by individual and organization.

UNIT – I

Sanitation and food industry Sanitation, importance of sanitation in food plants, sanitation laws and guidelines, establishment of sanitary practices. Food contamination sources, Sources of contamination, contamination of foods, protection against contamination

UNIT – II

Cleaning compounds and sanitizers Classification, selection of cleaning compounds, handling and storage, precautions, sanitizing methods – thermal, steam, hot water, radiation, HHP, Vaccum/Steam/Vaccum, chemical sanitizers – chlorine, iodine, bromine, quaternary ammonium compound, acid sanitizers, detergent formulations, iodophores

UNIT – III

Pest and Rodent Control Insect infestation, cockroaches, rodents, birds, use of pesticides, integrated pest management. Sanitary design and construction for food processing plant Site selection, site preparation, building construction considerations, pest control design, construction materials

UNIT – IV

Water quality and treatment Characteristics of drinking water – physical (temperature, colour, turbidity, taste and odour), chemical (pH, hardness, alkalinity), microbiological (total plate count, E.Coli, Streptococcus faecalis), waste disposal – industrial waste, influent, effluent, biological oxygen demand, chemical oxygen demand, tolerance limits for industrial effluent discharged into surface water, water treatment – primary (screening, sedimentation, floatation), secondary (trickling filters, activated sludge method, lagoons), tertiary (chemical coagulation and flocculation process), utilization of waste from food processing industry

UNIT – V

Personal hygiene and sanitary food handling Personal hygiene, employee hygiene, sanitary food handling, role of employee supervision, employee responsibility. Role of HACCP in sanitation HACCP, HACCP development, interface with GMP and SSOPs, HACCP principles, organization, implementation and maintenance

Textbooks

1. Food Hygiene and Sanitation. S. Roday, Tata McGraw Hill, 1st Edition, 1998.
2. Principles of Food Sanitation. N. G. Marriott, Springer, 5th Edition, 2006.
3. Hobbs Food Poisoning and Food Hygiene. Jim Mclauchlin and Christine Little (Eds), 7th Edition, 2007.

References

1.Food Plant Sanitation, Marcell Dekker Inc by Bernard L Bruinsma, J Richard Gorham
2. Sanitation in Food Processing. John Troller, Academic Press, 2nd Edition, 1993.

Outcome:

Students are exposed to different sanitizers for cleaning the equipment and methods of hygienic practices.

Jawaharlal Nehru Technological University Anantapur

(Established by Govt. of A.P., Act. No. 30 of 2008)

Ananthapuramu–515 002 (A.P) India

B.Tech. in Food Technology

Course Structure and Syllabi under R19 Regulations

JNTUA Curriculum
FOOD TECHNOLOGY B. Tech Course Structure

S.No.	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counselling	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

Semester - I (Theory - 3, Lab - 4)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A54101	Algebra and Calculus	BS	3-1-0	4
2.	19A51103T	Fundamental Chemistry	BS	3-0-0	3
3.	19A05101T	Problem Solving & Programming	ES	3-1-0	4
4.	19A03102	Engineering Graphics Lab	ES	1-0-4	3
5.	19A03101	Engineering Workshop	LC	0-0-2	1
6.	19A51103P	Fundamental Chemistry Lab	BS	0-0-3	1.5
7.	19A05101P	Problem Solving & Programming Lab	ES	0-0-3	1.5
				Total	**18**

Semester - II (Theory - 5, Lab - 5)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A02201T	Basic Electrical & Electronics Engineering	ES	3-0-0	3
2.	19A54202	Probability and Statistics	BS	3-1-0	4
3.	19A56102T	Engineering Physics	BS	3-0-0	3
4.	19A05201T	Data Structures	ES	3-0-0	3
5.	19A52101T	Communicative English 1	HS	2-0-0	2
6.	19A27201	Food Technology Workshop	LC	0-0-2	1
7.	19A52101P	Communicative English 1 Lab	HS	0-0-2	1
8.	19A02201P	Basic Electrical & Electronics Engineering Lab	ES	0-0-3	1.5
9.	19A56102P	Engineering Physics Lab	BS	0-0-3	1.5
10.	19A05201P	Data Structures Lab	ES	0-0-3	1.5
				Total	**21.5**

Semester – III (Theory - 6, Lab – 3, MC-1)					
S.No	Course No	Course Name	Category	L-T-P	Credits
1.	19A54304	Numerical Methods & Probability Theory	BS	2-1-0	3
2.	19A27301T	Food Chemistry	PC	3-0-0	3
3.	19A27302T	Processing Of Cereals, Pulses & Oilseeds	PC	3-0-0	3
4.	19A27303T	Fluid Mechanics for Food Processing	PC	2-1-0	3
5.	19A57301	Basic Microbiology	BS	3-0-0	3
6.	19A27304	Principles Of Food Preservation	PC	2-0-0	2
7.	19A27301P	Food Chemistry Lab	PC	0-0-3	1.5
8.	19A27302P	Processing Of Cereals, Pulses And Oil Seeds Lab	PC	0-0-3	1.5
9.	19A27303P	Fluid Mechanics for Food Processing Lab	PC	0-0-3	1.5
10.	19A99302	Biology For Engineers	MC	3-0-0	0
				Total :	**21.5**

Semester - IV (Theory - 7, Lab – 2, MC-1)					
S.No	Course No	Course Name	Category	L-T-P	Credits
1.	19A27401T	Processing Of Fruit And Vegetables	PC	3-0-0	3
2.	19A27402T	Mechanical Operations And Material Handling	PC	2-1-0	3
3.	19A27403	Principles Of Food Engineering	PC	2-1-0	3
4.	19A27404	Processing Of Fish And Marine Products	PC	3-0-0	3
5.	19A05304T	Python Programming	ES	2-1-0	3
6.	19A27405	Processing Of Spices And Plantation Crops And Medicinal Herbs	PC	3-0-0	3
7.	19A52301	Universal Human Values	HS	2-0-0	2
8.	19A27401P	Processing of Fruit and Vegetables Lab	PC	0-0-3	1.5
9.	19A27402P	Mechanical operations and Material Handling Lab	PC	0-0-3	1.5
10.	19A99301	Environmental Sciences	MC	3-0-0	0
				Total:	**23**

Semester – V (Theory - 6, Lab – 3)					
S.No.	Course No	Course Name	Category	L-T-P	Credits
1.	19A27501T	Heat Transfer	PC	2-1-0	3
2.	19A27502T	Processing of Milk of Milk Products	PC	3-0-0	3
3.	19A52601T	English Language Skills	HS	3-0-0	3
4.	19A27503	Food Biochemistry & Nutrition	PCC	2-0-0	2
5.		Professional Elective-II	PEC	3-0-0	3
	19A27504a	Food Nano Technology			
	19A27504b	Food Refrigeration and Cold Chain			
	19A27504c	Food Safety Management System			
	19A27504d	Marketing Management & International Trade			
	19A27504e	Energy Audit & Conservation			
6.		Open Elective-I	OEC	3-0-0	3
	19A01506a	Experimental stress analysis.			
	19A01506b	Building Technology			
	19A02506a	Electrical Engineering Materials			
	19A03506a	Introduction to Hybrid and Electric Vehicles			
		Rapid Prototyping			
	19A03506b	Analog Electronics			
	19A04506a	Digital Electronics			
	19A04506b	Free and Open Sources Systems			
	19A05506a	Computer Graphics and Multimedia			
	19A05506b	Animation			
	19A54506a	Optimization Techniques			
		Technical Communication and Presentation			
	19A52506a	Skills			
	19A51506a	Chemistry of Energy Materials			
7.	19A27501P	Heat Transfer Lab	PCC	0-0-3	1.5
8.	19A27502P	Processing of Milk of Milk Products Lab	PCC	0-0-1	1.0
9.	19A52601P	English Language Skills Lab	HS	0-0-3	1.5
10.	19A27505	Socially Relevant Project	PR	------	0.5
11.	19A99601	Mandatory Course: Research Methodology	MC	3-0-0	0
				Total :	**21.5**

Semester - VI (Theory - 6, Lab - 2)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A27601T	Food and Industrial Microbiology	PCC	3-0-0	3
2.	19A27602	Plant Design & Process Economics	PCC	2-1-0	3
3.	19A27603T	Processing of Meat and Poultry Products	HSMC	3-0-0	3
4.		Professional Elective-II (MOOC)	PE	3-0-0	3
	19A27605a	Thermal Operations in Food Process Engineering			
	19A27605b	Thermal Processing of Foods			
	19A27605c	Food Engineering			
	19A27605d	Novel Technologies for Food Processing and Shelf Life Extension			
	19A27605e	Dairy and Food process and Products Technology			
5.		Open Elective-II	OE	3-0-0	3
	19A01604a	Industrial waste and waste water management.			
	19A01604b	Building Services & Maintenance			
	19A02604a	Industrial Automation			
	19A02604b	System Reliability Concepts			
	19A03604a	Introduction to Mechatronics			
	19A03604b	Optimization techniques through MATLAB			
	19A04604a	Basics of VLSI			
	19A04604b	Principles of Communication Systems			
	19A05604a	Fundamentals of VR/AR/MR			
	19A05604b	Data Science			
	19A54604a	Wavelet Transforms & its applications			
	19A52604a	Soft Skills			
	19A51604a	Chemistry of Polymers and Its Applications			
6.		Humanities Elective-I	HE	3-0-0	3
	19A52602a	Entrepreneurship & Incubation			
	19A52602b	Managerial Economics and Financial Analysis			
	19A52602c				
	19A52602d	Business Ethics and Corporate Governance			
	19A52602e	Enterprise Resource Planning			
		Supply Chain Management			
7.	19A27601T	Food and Industrial Microbiology Lab	PCC	0-0-3	1.5
8.	19A27603P	Processing of Meat and Poultry Products	HSMC	0-0-3	1.5
9.	19A27606	Socially Relevant Project	PR	------	0.5
10.	19A99501	Mandatory course: Constitution of India	MC	3-0-0	0
11.	19A27607	Comprehensive online examination		-	0
				Total	**21.5**

Semester – VII (Theory - 5, Labs -2)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	19A27701T	Mass Transfer	PCC	2-1-0	3
2.	19A27702T	Food Packaging	PCC	3-0-0	3
3.	 19A27703a 19A27703b 19A27703c 19A27703d 19A27703e	Professional Elective-III Extrusion Technology Instrumentation and Process Controls in Food Industry Emerging Technologies in Food Safety and Quality Financial Management Waste and Effluent Management	PE	3-0-0	3
4.	 19A01704a 19A01704b 19A02704a 19A02704b 19A03704a 19A03704b 19A04704a 19A04704b 19A05704a 19A05704b 19A54704a 19A51704a	Open Elective-III Air pollution and control. Basics of civil Engineering Renewable Energy Systems Electric Vehicle Engineering Finite element methods Product Marketing Introduction to Microcontrollers & Applications Principles of Digital Signal Processing Fundamentals of Game Development Cyber Security Numerical Methods for Engineers (ECE , CSE, IT &CE) Chemistry of Nanomaterials and Applications	OE	3-0-0	3
5.	 19A52701a 19A52701b 19A52701c 19A52701d 19A52701e	Humanities Elective-II Organizational Behavior Management Science Business Environment Strategic Management E-Business	HS	3-0-0	3
6.	19A27701P	Mass Transfer Lab	PCC	0-0-3	1.5
7.	19A27702P	Food Packaging Lab	PCC	0-0-3	1.5
9.	19A27705	Industrial Training/Skill Development/Research Project*	PR	------	2
				Total	**20**

Semester – VIII (Theory - 2)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Professional Elective-IV	PE	3-0-0	3
	19A27801a	Confectionery Technology			
	19A27801b	Non-Thermal Technologies in Food Processing			
	19A27801c	Food Safety and Standards Act & Regulations in India			
	19A27801d	Food Supply chain management			
	19A27801e	Food Plant Sanitation and Hygiene			
2.		Open Elective-IV	OE	3-0-0	3
	19A01802a	Disaster Management.			
	19A01802b	Global Warming and climate changes			
	19A02802a	IoT Applications in Electrical Engineering			
	19A02802b	Smart Electric Grid			
	19A03802a	Energy conservation and management			
	19A03802b	Non - destructive testing			
	19A04802a	Introduction to Image Processing			
	19A04802b	Principles of Cellular and Mobile Communications			
	19A04802c	Industrial Electronics			
	19A04802d	Electronic Instrumentation			
	19A05802a	Block Chain Technology and Applications			
	19A05802b	MEAN Stack Technology			
	19A54802a	Mathematical Modeling & Simulation			
	19A51802a	Green Chemistry and Catalysis for Sustainable Environment			
3.	19A01803	Project	PR	------	7
				Total	**13**

HONOURS DEGREE IN FOOD TECHNOLOGY

S.No.	Course No.	Course Name	L	T	P	Credits
1.	19A27H01	Novel Technologies in Food Processing	3	1	0	4
2.	19A27H02	Food Storage Engineering	3	1	0	4
3.	19A27H03	TQM in Food Industry	3	1	0	4
4.	19A27H04	Entrepreneurship Development for Food Technologists	3	0	0	4
5.	19A27H05	Computer Applications in Food Technology	3	1	0	4
				Total		**20**

MINOR DEGREE IN FOOD TECHNOLOGY

S.No.	Course No.	Course Name	L	T	P	Credits
1.	19A27403	Principles of Food Engineering	2	1	0	3
2.	19A27802a	Food Plant Utilities & Services	2	1	0	3
3.	19A27601T	Food and Industrial Microbiology	2	1	0	3
4.	19A27503	Food Biochemistry & Nutrition	3	0	0	3
5.	19A27504c	Food Safety Management System	2	1	0	3
6.		Mini Project	-	-	-	5
				Total		**20**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– I-I Sem

L	T	P	C
3	1	0	4

(19A54101) ALGEBRA & CALCULUS

(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, 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: Mean Value Theorems **6 hrs**

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)
- analyze the behaviour of functions by using mean value theorems (L3)

Unit 3: Multivariable calculus **8 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, 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 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:Special 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. 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, 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. 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 special functions

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)–I- I Sem

L	T	P	C
3	0	0	3

(19A51103T) FUNDAMENTAL CHEMISTRY
(Food Technology)

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

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, 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 Crystal field splitting in octahedral and tetrahedral geometry, magnetic properties and colour, band theory of solids – band diagrams for conductors, semiconductors and insulators, Effect of doping on band structures.

Learning Outcomes:

At the end of this unit, the students will be able to

- **apply** Schrodinger wave equation to hydrogen and particle in a box (L3)
- **illustrate** the molecular orbital energy level diagram of different molecular species (L2)
- **explain** the band theory of solids for conductors, semiconductors and insulators (L2)
- **discuss** the magnetic behaviour and colour of complexes (L3)

Unit 2: Electrochemistry and Applications: (10 hrs)

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems, concept of pH, pH meter and applications of pH metry (acid-base titrations), 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-air battery, alkali metal sulphide batteries, Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

Secondary cells – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions, button 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 3: 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 - Thermoplastics and Thermosettings, Preparation, properties and applications of – Bakelite, urea-formaldehyde, Nylon-66, 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-66, 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 4: Instrumental Methods and Applications (10 hrs)

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. Principle and applications of pH metry, potentiometry, conductometry, UV-Visible, IR and NMR spectroscopies. Principles of Gas Chromatography (GC) and High Performance Liquid Chromatography (HPLC), separation of gaseous mixtures and liquid mixtures

Learning outcomes:

After completion of Module 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)

Unit 5: Surface Chemistry and Applications: (10 hrs)

Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (any two methods with examples), chemical and electrochemical methods (not more than two methods) of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, characterization of surface by physicochemical methods (SEM, TEM, X-ray diffraction), solid-gas interface, solid-liquid interface, adsorption isotherm, BET equation (no derivation), calculation of specific surface area of solids, numerical problems, functionalization of surface of nanomaterials– applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

Learning Outcomes:

At the end of this unit, the students will be able to

- **summarize** the applications of SEM, TEM and X-ray diffraction in surface characterization (L2)
- **explain** the synthesis of colloids with examples (L2)
- **outline** the preparationof nanomaterials and metal oxides (L2)
- **identify** the application of colloids and nanomaterials in medicine, sensors and catalysis (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. J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman,1992

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 &thermosettings, elastomers & conducting polymers. (L2)
- **explain** the principles of spectrometry, GC and HPLC in separation of gaseous and liquid mixtures (L2)
- **apply** the principle of supramolecular chemistry in application of molecular machines and switches (L3)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) I– I Sem

L	T	P	C
3	1	0	4

(19A05101T) PROBLEM SOLVING AND PROGRAMMING
(Common to All Branches of Engineering)

Course Objectives:

1. Introduce the internal parts of a computer, and peripherals.
2. Introduce the Concept of Algorithm and use 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.

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:

Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, the analysis of algorithms.

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.

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:

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.

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. RS Bichkar "Programming with C", 2012, Universities Press.
2. Pelin Aksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage Learning.
3. Byron Gottfried and Jitender Kumar Chhabra, "Programming with C", 4th Edition, 2019, McGraw Hill Education.

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

B.Tech (FT)– I-II Sem **L T P C**

1 0 4 3

(19A03102) ENGINEERING GRAPHICS LAB
(Common to All Branches of Engineering)

Course Objectives:

- Bring awareness that Engineering Drawing is the Language of Engineers.
- Familiarize how industry communicates technical information.
- Teach the practices for accuracy and clarity in presenting the technical information.
- Develop the engineering imagination essential for successful design.
- Instruct the utility of drafting & modeling packages in orthographic and isometric drawings.
- Train the usage of 2D and 3D modeling.
- Instruct graphical representation of machine components.

Part A: Manual Drawing: (7 Classes)

Introduction to Engineering graphics: Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions.

a) Conic sections including the rectangular hyperbola- general method only,
b) Cycloid, epicycloids and hypocycloid
c) Involutes **(2L + 6P hrs)**

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. **(2L + 6P hrs)**

Projections of solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method. **(1L + 3P hrs)**

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections. **(1L + 3P hrs)**

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts. **(1L + 6P hrs)**

Part B: Computer Aided Drafting: (6 Classes)

Introduction to AutoCAD: 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. **(1L + 3P hrs)**

Dimensioning principles and conventional representations.

Orthographic Projections: Systems of projections, conventions and application to orthographic projections. **(3L + 9P hrs)**

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, simple solids. **(2L + 6P hrs)**

Text Books:

1. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000

Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.
3. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
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

- draw various curves applied in engineering. (L2)
- show projections of solids and sections graphically. (L2)
- draw the development of surfaces of solids. (L3)
- use computers as a drafting tool. (L2)
- draw isometric and orthographic drawings using CAD packages. (L3)

Note:

1. Manual (part A) and Computer Aided Drafting (part B) classes can be held in alternative weeks for optimal utilization of computer facilities.
2. External examinations to be conducted both manual and computer mode with equal weight of marks.

Additional Sources

1. Youtube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– I-I Sem **L T P C**

0 0 2 1

(19A03101) ENGINEERING WORKSHOP
(Common to all branches)

C**ourse 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) Bicycle tire puncture and change of two wheeler tyre

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

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 parts 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. Demonstrate soldering and brazing. (l2)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)–I- I Sem

L	T	P	C
0	0	3	1.5

(19A51103P) FUNDAMENTAL CHEMISTRY LAB
(Food Technology)

Course Objectives:

- Verify the fundamental concepts with experiments

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method
2. Models of potential energy surfaces
3. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base
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 polymer
8. Determination of viscosity of polymer solution using survismeter
9. Verify Lambert-Beer's law
10. Thin layer chromatography
11. Identification of simple organic compounds by IR and NMR
12. HPLC method in separation of gaseous and liquid mixtures
13. Preparation of nanomaterials
14. Adsorption of acetic acid by charcoal

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 materials (L2)
- **measure** the strength of an acid present in secondary batteries (L3)
- **analyse** the IR and NMR of some organic compounds (L3)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– I–I Sem

L	T	P	C
0	0	3	1.5

(19A05101P) PROBLEM SOLVING AND PROGRAMMING LAB
(Common to All Branches of Engineering)

Laboratory Experiments #

1. Assemble and disassemble parts of a Computer
2. Design a C program which reverses the number
3. Design a C program which finds the second maximum number among the given list of numbers.
4. Construct a program which finds the kth smallest number among the given list of numbers.
5. 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. Design algorithm 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.

The above list is not exhaustive. Instructors may add some experiments to the above list. Moreover, 50% of the experiments are to be changed every academic year. Instructors can choose the experiments, provided those experiments are not repetitions.

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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) –I- II Sem **L T P C**

3 0 0 3

(19A02201T) BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Part A: Basic Electrical Engineering
(Civil, Mechanical, CSE, CSSE, IT and Food Technology)

Course Objectives:

1. To introduce basics of electric circuits.
2. To teach DC and AC electrical circuit analysis.
3. To explain working principles of transformers and electrical machines.
4. To impart knowledge on low voltage electrical installations

Unit 1 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.

Unit Outcomes: Able to

- Recall Kirchoff laws (L1)
- Analyze simple electric circuits with DC excitation (L4)
- Apply network theorems to simple circuits (L3)
- Analyze single phase AC circuits consisting of series RL - RC - RLC combinations (L4)

Unit 2 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 test on transformer - principle and operation of Induction Motor [Elementary treatment only]

Unit Outcomes: Able to

- Explain principle and operation of DC Generator & Motor.
- Perform speed control of DC Motor (L2)
- Explain operation of transformer and induction motor. (L2)
- Explain construction & working of induction motor - DC motor

Unit 3 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.

Unit Outcomes: Able to

- Understand working operation of various generating stations (L2)
- Explain the types of 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.

Course Outcomes:

- Apply concepts of KVL/KCL in solving DC circuits (L3)
- Choose correct rating of a transformer for a specific application (L5)
- Illustrate working principles of induction motor - DC Motor (L3)
- Identify type of electrical machine based on their operation.(L1)
- Describe working principles of protection devices used in electrical circuits. (L2)

Part B: Basic Electronics Engineering

Course Objectives:

- To provide comprehensive idea about working principle, operation and applications of PN junction & zener diodes, BJT, FET, MOSFET and operational amplifier
- To introduce fundamentals of digital electronics
- To educate on principles of various communication systems
- To teach efficacy of electronic principles which are pervasive in engineering applications

Unit I Analog Electronics

Overview of Semiconductors, PN junction diode, Zener diode, Applications of diode as switch and rectifier, Zener diode as regulator, special purpose diodes: schottky diode, tunnel diode, varactor diode, photodiode, phototransistor and LED.

BJT construction, operation, configuration and characteristics, JFET and MOSFET construction, operation, characteristics (CS configuration), applications

Operational Amplifiers: Introduction, block diagram, basic op-amp circuits: Inverting, Non Inverting, summer, subtractor, voltage follower.

Unit Outcomes:

- Describe operation and characteristics of diodes and transistors (L2)
- Make use of diodes and transistors in simple, typical circuit applications (L3)
- Understand operation of basic op-amp circuits (L2)

Unit II Digital Electronics

Introduction, Switching and Logic Levels, Digital Waveform, characteristics of digital ICs, logic gates, number systems, combinational circuits - adders, multiplexers, decoders; introduction to sequential circuits, flip flops, shift register, binary counter.

Unit Outcomes:

- Explain different logic gates using truth table (L2)
- Distinguish combinational and sequential circuits (L2)
- Analyze various combinational circuits such as adders, multiplexers and decoders (L4)
- Understand functionality of flip-flops, shift registers and counters (L2)

Unit III Communication Systems

Introduction, Elements of Communication Systems, EM spectrum, basics of electronic communication, Amplitude and Frequency modulation, Pulse modulation, Communication receivers, Examples of communication systems: Microwave & Satellite, Fibre optic, Television, mobile communication (block diagram approach).

Unit Outcomes:

- Describe basic elements of a communication system (L2)
- Explain need for modulation and different modulation techniques (L2)
- Understand functioning of various communication systems (L2)

Text Books:

1. D.P. Kothari, I.J.Nagrath, Basic Electronics, 2nd edition, McGraw Hill Education(India)Private Limited
2. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, 2nd edition, Pearson India Private Limited.

Reference Books:

1. R. Muthusubramanian, S. Salivahanan, “Basic Electrical and Electronics Engineering”, Tata McGraw-Hill Education, Reprint 2012.
2. David Bell, Electronic Devices and Circuits: Oxford University Press, 5th EDn., 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)–I- II Sem **L T P C**

3 1 0 4

(19A54202) PROBABILITY AND STATISTICS

(Common to CSE, IT and Food Technology)

Course Objectives:

1) To familiarize the students with the foundations of probability and statistical methods
2) To impart probability concepts and statistical methods in various applications Engineering

Unit 1: Descriptive statistics and methods for data science **10 hrs**

Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variable: dependent and independent Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, regression lines.

Learning Outcomes:

At the end of this unit, the student will be able to

- summarize the basic concepts of data science and its importance in engineering (L2)
- analyze the data quantitatively or categorically , measure of averages, variability (L4)
- adopt correlation methods and principle of least squares, regression analysis (L5)

UNIT 2: Probability **8 hrs**

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

Learning Outcomes:

At the end of this unit, the student will be able to

- define the terms trial, events, sample space, probability, and laws of probability (L1)
- make use of probabilities of events in finite sample spaces from experiments (L3)
- apply Baye's theorem to real time problems (L3)
- explain the notion of random variable, distribution functions and expected value(L2)

UNIT 3: Probability distributions **6 hrs**

Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply Binomial and Poisson distributions for real data to compute probabilities, theoretical frequencies (L3)
- interpret the properties of normal distribution and its applications (L2)

Unit4: Estimation and Testing of hypothesis, large sample tests **8 hrs**

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two

types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

Learning Outcomes:

At the end of this unit, the student will be able to

- explain the concept of estimation, interval estimation and confidence intervals (L2)
- apply the concept of hypothesis testing for large samples (L4)

Unit 5: Small sample tests **8 hrs**

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply the concept of testing hypothesis for small samples to draw the inferences (L3)
- estimate the goodness of fit (L5)

Text Books:

1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.

Course Learning Outcomes:

Upon successful completion of this course, the student should be able to

- make use of the concepts of probability and their applications (L3)
- apply discrete and continuous probability distributions (L3)
- classify the concepts of data science and its importance (L4)
- interpret the association of characteristics and through correlation and regression tools (L4)
- design the components of a classical hypothesis test (L6)
- infer the statistical inferential methods based on small and large sampling tests (L6)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– I-II Sem

L	T	P	C
3	0	0	3

(19A56102T) ENGINEERING PHYSICS
(Civil, Mechanical and Food Technology)

Course Objectives:

- To impart knowledge in basic concepts of mechanics.
- To familiarize the basic concepts of acoustics and ultrasonics with their Engineering applications.
- To explain the significant concepts of dielectric and magnetic materials this leads to potential applications in the emerging micro devices.
- To impart knowledge in basic concepts of optical fibers and LASERs along with its Engineering applications.
- Familiarize types of sensors for various engineering applications

Unit-1: MECHANICS (10 hrs)

Basic laws of vectors and scalars-rotational frames-conservative forces- F = - grad V, torque and angular momentum - Newton's laws in inertial and linear accelerating non-inertial frames of reference-rotating frame of reference with constant angular velocity-qualitative explanation of Foucault's pendulum-rigid body-angular velocity vector -center of mass- gravitation and Keplar's Law (Qualitative).

Learning Outcomes:

The students will be able to

- **Identify** forces and moments in mechanical systems using scalar and vector techniques (L3)
- **interpret** the equation of motion of a rigid rotating body (torque on a rigid body) (L3)
- **extend** Newton's second law for inertial and non-inertial frame of reference (L2)
- **explain** consideration of Earth's rotation in designing and launching missiles (L2)

Unit-2: ACOUSTICS AND ULTRASONICS (9 hrs)

Acoustics Introduction – Reverberation – Reverberation time– Sabine's formula- derivation using growth and decay method – Absorption coefficient and its determination –factors affecting acoustics of buildings and their remedies.

Ultrasonics – Introduction, Properties and Production by magnetostriction& piezoelectric methods - acoustic grating -Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Medical applications.

Learning Outcomes:

The students will be able to

- **explain** how sound is propagatedin buildings (L2)

- **analyze** acoustic properties of typically used materials in buildings (L4)
- **recognize** sound level disruptors and their use in architectural acoustics (L2)
- **identify** the use of ultrasonics in different fields (L3)

Unit-3 : Dielectric and Magnetic Materials
(8hrs)

Introduction--Dielectric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations: Electronic, Ionic, Orientation Polarizations (Qualitative) - Frequency dependence of polarization-Lorentz (internal) field-Claussius -Mosotti equation-Applications of Dielectrics.

Introduction-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials-Domain Concepts of ferromagentism-Hysteresis-soft and hard magnetic materials-Magnetic device applications.

Unit Outcomes:

The students will be able to

- **explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **summarize** Gauss's law in the presence of dielectrics (L2)
- **interpret** dielectric loss, Lorentz field and Claussius- Mosotti relation (L2)
- **classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **explain** the applications of dielectric and magnetic materials (L2)

Unit – IV: Lasers and Fiber Optics (10hrs)

Introduction - Characteristics of Laser - Spontaneous and Stimulated emission of radiation - Einstein's coefficients - Population inversion - Pumping Mechanisms - He-Ne laser, Nd-YAG laser - Semiconductor laser - Applications of laser.

Introduction to Optical Fibers-Total Internal Reflection-Construction of optical fibers, Critical angle of propagation-Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile& modes –Propagation of electromagnetic wave through optical fiber-importance of V number- Block Diagram of Fiber optic Communication system -Medical 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 medical, communication and other fields (L2)

Unit – V: Sensors (8 hrs)

Sensors:(qualitative description only): Different types of sensors and applications; Strain and Pressure sensors- Piezoelectric, magnetostrictive sensors, Fibre optic methods of pressure sensing; Temperature sensors - bimetallic strip, pyroelectric detectors, Hall-effect sensor, smoke and fire detectors.

Learning Outcomes:

The students will be able to

- **identify** different types of sensors and applications (L3)
- **explain** physics behind theworking principles of sensors (L2)
- **select** sensors for different type of applications (L3)

Text Books :

1. M.N.Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy" A Text book of Engineering Physics"-S.Chand Publications, 11th Edition 2019
2. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics",Pearson Education,2018

Reference Books:

1. M K Varma "Introduction to Mechanics"-Universities Press-2015.
2. D.K. Bhattacharya and A. Bhaskaran, "Engineering Physics"- Oxford Publications-2015
3. Ian R Sinclair, Sensor and Transducers, 3rd eds, 2001, Elsevier (Newnes)

Course Outcomes:

After completing this course students will be able to

- **explain** physics applied to solve engineering problems (L2)
- **apply** the principles of acoustics in designing of buildings (L3)
- **explains** the applications of ultrasonics in various engineering fields (L2)
- **apply** electromagnetic wave propagation in different Optical Fibers (L2)
- **Apply** the lasers concepts in various applications (L3)
- **Explains** the concepts of dielectric and magnetic materials (L2)
- **identify** the sensors for various engineering applications (L3)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– I-II Sem **L T P C**

3 0 0 3

(19A05201T) DATA STRUCTURES
(Common to All Branches of Engineering)

Course Objectives:

1. To teach the representation of solution to the problem using algorithm
2. To explain the approach to algorithm analysis
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. Design a 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, Optimal Binary search Trees, AVL Trees. B-Trees: B-Trees, B + 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, Sartaj Sahni and Susan Anderson Freed "Fundamentals of Data Structures in C", 2nd Edition, University Press, 2007.
2. Alan L. Tharp, "File Organization and Processing", Wiley and Sons, 1988.

Reference Books:

1. D. Samanta, "Classic Data Structures", 2nd 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

B.Tech (FT)- I-I Sem **L T P C**

2 0 0 2

(19A52101T) COMMUNICATIVE ENGLISH I
(Common to All Branches of Engineering)

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

Listening: Identifyingthe 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: countables and uncountables; 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

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

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

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:** Information transfer; describe, compare, contrast, identify significance/trendsbased 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

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

Text Book

- **English all round: Communication Skills for Undegurdation Learners** Vol. I, Orient BlackSwan Publisers, First Edition 2019.

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.

Sample Web Resources

Grammar/Listening/Writing

1-language.com
http://www.5minuteenglish.com/
https://www.englishpractice.com/

Grammar/Vocabulary

English Language Learning Online
http://www.bbc.co.uk/learningenglish/
http://www.better-english.com/
http://www.nonstopenglish.com/
https://www.vocabulary.com/
BBC Vocabulary Games
Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/
https://www.englishclub.com/reading/short-stories.htm
https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613
http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/
BBC Learning English – Pronunciation tips
Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/
http://www.world-english.org/
http://learnenglish.britishcouncil.org/

Online Dictionaries

Cambridge dictionary online
MacMillan dictionary
Oxford learner's dictionaries

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

B.Tech (FT)–I- II Sem

L	T	P	C
0	0	2	1

(19A27201) FOOD TECHNOLOGY WORKSHOP

Course Objectives:

1. To create basic awareness on traditional processing methods and their importance in processing of foods.
2. To know physico-chemical changes during these processing methods.

List of Exercises / Experiments:

1. Soaking
2. Boiling
3. Smoking
4. Curing
5. Grilling
6. Drying
7. Steaming
8. Roasting
9. Simmering
10. Stewing
11. Frying

Learning Outcomes:

- Gain knowledge on primary processing methods
- Learn the changes occurred during processing

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– I-II Sem

L	T	P	C
0	0	2	1

(19A52101P) COMMUNICATIVE ENGLISH I LAB
(Common to All Branches of Engineering)

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

- ➢ To expose the students to variety of self instructional, learner friendly modes of language learning
- ➢ To help the students 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.
- ➢ To enable them to learn better pronunciation through stress, intonation and rhythm
- ➢ To train them to use language effectively to face interviews, group discussions, public speaking
- ➢ To initiate them into greater use of the computer in resume preparation, report writing, format making etc

Course Outcomes

- ➢ CO1: To remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
- ➢ CO2: To apply communication skills through various language learning activities
- ➢ CO3: To analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- ➢ CO4: To evaluate and exhibit acceptable etiquette essential in social and professional settings
- ➢ CO5: To 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 and Note 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

Reference Books

- English in Action, I st Edition, 2019, Maruthi Publications.
- 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.

Sample Web Resources

Grammar/Listening/Writing
1-language.com
http://www.5minuteenglish.com/
https://www.englishpractice.com/

Grammar/Vocabulary
English Language Learning Online
http://www.bbc.co.uk/learningenglish/
http://www.better-english.com/
http://www.nonstopenglish.com/
https://www.vocabulary.com/
BBC Vocabulary Games
Free Rice Vocabulary Game

Reading
https://www.usingenglish.com/comprehension/
https://www.englishclub.com/reading/short-stories.htm
https://www.english-online.at/

Listening
https://learningenglish.voanews.com/z/3613
http://www.englishmedialab.com/listening.html

Speaking
https://www.talkenglish.com/
BBC Learning English – Pronunciation tips

Merriam-Webster – Perfect pronunciation Exercises

All Skills
https://www.englishclub.com/
http://www.world-english.org/
http://learnenglish.britishcouncil.org/

Online Dictionaries
Cambridge dictionary online
MacMillan dictionary
Oxford learner's dictionaries

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)–I- II Sem

L	T	P	C
0	0	3	1.5

(19A02201P) BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

(Civil, Mechanical, CSE, CSSE, IT and Food Technology)

Part A: Electrical Engineering Lab

Course Objectives:

1. To Verify Kirchoff's laws
2. To verify Superposition theorem.
3. To learn performance characteristics of DC Machines.
4. To perform open circuit & Short Circuit test on 1- Phase Transformer.
5. To Study the I – V Characteristics of Solar PV Cell

List of experiments: -

1. Verification of Kirchhoff laws.
2. Verification of Superposition Theorem.
3. Open circuit characteristics of a DC Shunt Generator.
4. Speed control of DC Shunt Motor.
5. OC & SC test of 1 – Phase Transformer.
6. Brake test on 3 - Phase Induction Motor.
7. I – V Characteristics of Solar PV cell
8. Brake test on DC Shunt Motor.

Course Outcomes: Able to

1. Verify Kirchoff's Laws & Superposition theorem.
2. Perform testing on AC and DC Machines.
3. Study I – V Characteristics of PV Cell

Part B: Electronics Engineering Lab

Course outcomes:

- Describe construction, working and characteristics of diodes, transistors and operational amplifiers (L2)
- Demonstrate how electronic devices are used for applications such as rectification, switching and amplification (L2)
- Build different building blocks in digital electronics using logic gates (L3)
- Explain functionality of flip-flops, shift registers and counters for data processing applications (L2)
- Explain functioning of various communication systems (L2)

List of Experiments:

1. Draw and study the characteristics of Semi-conductor diode and Zener Diode
2. Draw and study the input and output characteristics of Transistor in Common Emitter configuration
3. Draw and study the static and transfer characteristics of FET in Common Source Configuration

4. Construct half wave and full wave rectifier circuits. Find ripple factor and plot their output waveforms with and without filters
5. Study the application of Op-amp as an Inverting amplifier, Non-inverting amplifier, Voltage follower, Summer and Subtractor
6. Realization of logic gates, AND, OR, NOT, NAND, NOR, XOR
7. Realization of Adders, Multiplexers and Decoders using logic gates.
8. Realization of flip-flops using logic gates.
9. Conduct an experiment on AM & FM modulation & demodulation, Plot the corresponding modulated and demodulated signals

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech(FT) – I-II Sem

L	T	P	C
0	0	3	1.5

(19A56102P) ENGINEERING PHYSICS LAB
(Civil, Mechanical and Food Technology)

Course Objectives:

- Understand the role of Optical fiber parameters in engineering applications.
- Recognize the significance of laser by studying its characteristics and its application in finding the particle size.
- Illustrates the magnetic and dielectric materials applications.
- Identifies the various sensor applications.

Note: - In the following list of experiments, out of 15 experiments any 12 experiments must be performed in a semester.

List of Physics Experiments:

1. Determination of wavelength of LASER light 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)

2. 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)

3. Determination of spring constant of springs using Coupled Oscillator

   Experimental outcomes:
   operatesvarious instrument. (L2)
   estimate thespring constant (L2)
   Identifies the principle of coupled oscillations. (L2)

4. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.

   operatesvarious instruments and connect them as per the circuit. (L2)
   estimate thecharge carrier concentration and mobility in a semiconductor. (L2)
   Illustrates the applications of hall effect. (L3)
   plotsthe voltage with current and voltage with magnetic field (L3)

5. Determination of Dielectric constant of dielectric material using charging and discharging of capacitor.

   Experimental outcomes:
   operatesvarious instruments and connect them as per the circuit. (L2)
   estimate the dielectric constant of the given substance. (L2)
   Identifies the significance of dielectric constant in various devices. (L2)

6. Magnetic field along the axis of a circular coil carrying current.

   Experimental outcomes:

operatesvarious instruments and connect them as per the circuit. (L2)
estimate the magnetic field along the axis of a circular coil carrying current. (L2)
plotsthe intensity of the magnetic field of circular coil carrying current with distance (L3)

7. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum)

Experimental outcomes:
operatesvarious instruments. (L2)
estimate therigidity modules of a given wire (L2)
plotslength of the pendulum (l) with time period T^2 (L3)

8. Determination of hysteresis loss by tracing B-H Curve of ferromagnetic material.

Experimental outcomes:
operatesvarious instruments and connect them as per the circuit. (L2)
estimate thehysteresis loss, coercivity and retentivity of the ferromagnetic material.. (L2)
classifies the soft and hard magnetic material based on B-H curve. (L2)
plotsthe magnetic field H and flux density B (L3)

9. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle

Experimental outcomes:
operatesvarious instruments and connect them as per the circuit. (L2)
estimate thenumerical aperture and acceptance angle of a given optical fiber. (L2)
Identifies the significance of numerical aperture and acceptance angle of a optical fiber in various engineering applications. (L2)

10. Measurement of magnetic susceptibility by Gouy's method

Experimental outcomes:
operatesvarious instruments and connect them as per the circuit. (L2)
estimate themagnetic susceptibility of the given material. (L2)
Identifies the significance of magnetic susceptibilityin various engineering applications. (L2)

11. Determination of ultrasonic velocity in liquid (Acoustic grating)

Experimental outcomes:
operatesvarious instruments. (L2)
estimatethe velocity of ultrasonic waves in liquids. (L2)
Illustrates the basic applications of ultrasonics. (L3)

12. Determination of pressure variation using Strain Guage sensor.

Experimental outcomes:
operatesvarious instruments. (L2)
estimatethe pressure variation using strain guage sensor. (L2)
Illustrates the applications of strain gauge sensors. (L3)

13. Determination of temperature change using Strain Guage sensor.

Experimental outcomes:
operatesvarious instruments. (L2)
estimatethe temperature variation using strain guage sensor. (L2)
Illustrates the applications of strain gauge sensors. (L3)

14. Determination of pressure variations using optical fiber sensors.

Experimental outcomes:
operatesvarious instruments. (L2)

estimatethe pressure variation using Optical fiber sensor. (L2)
Illustrates the applications of Optical fiber sensors. (L3)

15. Determination of temperature changes using optical fiber sensors.
    Experimental outcomes:
    operatesvarious instruments. (L2)
    estimatethe temperature variation using Optical fiber sensor. (L2)
    Illustrates the applications of Optical fiber sensors. (L3)

Course Outcomes:

The students will be able to

- **Operate** various optical instruments (L2)
- **Estimate** wavelength of laser and particles size using laser(L2)
- **estimate** the susceptibility and related magnetic parameters of magnetic materials (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** magnetic susceptibility of the material and its losses by B-H curve (L3)
- **identify** the type of semiconductor i.e., n-type or p-type using hall effect (L3)
- **Apply** the concepts of sensors for various applications (L2)

Reference Books:

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

B.Tech (FT) – I-II Sem

L	T	P	C
0	0	3	1.5

(19A05201P) DATA STRUCTURES LAB
(Common to All Branches of Engineering)

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.

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, and traversal.
10. Breadth first search
11. Depth first search
12. Travelling sales man 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 datatype and support different operations on it.

Course Outcomes:

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)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
2	1	0	3

(19A54304) NUMERICAL METHODS AND PROBABILITY THEORY

Course Objective:

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.
- The theory of Probability and random variables.

Unit-I: Solution of Algebraic & Transcendental Equations:

Introduction-Bisection method-Iterative method-Regula falsi method-Newton Raphson method
System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.

Unit Outcomes:

Students will be able to

- Calculate the roots of equation using Bisection method and Iterative method.
- Calculate the roots of equation using Regula falsi method and Newton Raphson method.
- Solve the system of algebraic equations using Gauss Jordan method and Gauss Siedal method.

Unit-II: Interpolation

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

Unit Outcomes:

Students will be able to

- Understand the concept of interpolation.
- Derive interpolating polynomial using Newton's forward and backward formulae.
- Derive interpolating polynomial using Lagrange's formulae.
- Derive interpolating polynomial using Gauss forward and backward formulae.

Unit-III: Numerical Integration & Solution of Initial value problems to Ordinary differential equations

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

Unit Outcomes:

Students will be able to

- Solve integral equations using Simson's 1/3 and Simson's 3/8 rule.
- Solve integral equations using Trapezoidal rule.
- Solve initial value problems to ordinary differential equations using Taylor's method.
- Solve initial value problems to ordinary differential equations using Euler's method and Runge Kutta methods.

Unit-IV: Probability theory:

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

Unit Outcomes:

Students will be able to

- Understand the concept of Probability.
- Solve problems on probability using addition law and multiplication law.
- Understand Random variables and probability mass and density functions.
- Understand stastical constants of random variables.

Unit-V: Random variables & Distributions:

Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties-Uniform distribution-exponential distribution

Unit Outcomes:

Students will be able to

- Understand Probability distribution function.
- Solve problems on Binomial distribution.
- Solve problems on Poisson distribution.
- Solve problems on Normal distribution.

Course Outcomes:

After the completion of course, students will be able to

- Apply numerical methods to solve algebraic and transcendental equations
- Derive interpolating polynomials using interpolation formulae
- Solve differential and integral equations numerically
- Apply Probability theory to find the chances of happening of events.

- Understand various probability distributions and calculate their statistical constants.

TEXT BOOKS:

1. B.S. Grewal, “Higher Engineering Mathematics”, Khanna publishers.
2. Ronald E. Walpole, “Probability and Statistics for Engineers and Scientists”, PNIE.
3. Erwin Kreyszig, “Advanced Engineering Mathematics”, Wiley India

REFERENCE BOOKS:

1. B.V.Ramana, “ Higher Engineering Mathematics”, Mc Graw Hill publishers.
2. Alan Jeffrey, “Advanced Engineering Mathematics”, Elsevier.Publishers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
3	0	0	3

(19A27301T) FOOD CHEMISTRY

PREAMBLE

The subject deals with the basic concepts of food analysis, principles of analytical techniques, separation techniques and rapid result methods.

Course Objectives

- To impart knowledge to the students on the Techniques in food analysis
- To read them with the Analytical techniques in Quality control laboratory.

UNIT – I

Sampling and sampling techniques. Proximate analysis- Moisture, ash, crude fat, crude fibre, crude protein and carbohydrates by difference. Principles and methods of food analysis.

Unit Outcomes:

At the end of unit, students will be able to

- Understand the concept of sampling and techniques and its importance
- Know the proximate analysis and its significance

UNIT – II

Basic principles: Refractometry, polarimetry, densitometry, HPLC, GLC, spectrophotometry, electrophoresis, automatic amino acid analyzer.

Unit Outcomes:

At the end of unit, students will be able to

- Illustrate the principles of refractometry, polarimetry and densitometry, automatic amino acid analyzer
- Explain the theory of HPLC, GLC, spectrophotometry, electrophoresis

UNIT – III

Determination of starch. Test for unsaturation of fats, rancidity of fats. Quantitative analysis of protein by Biuret method, Ninhydrin method, Lowry’s method and Dye-binding method Bioassays for protein quality of grains.

Unit Outcomes:

At the end of unit, students will be able to

- Understand the various quality tests like starch determination, test for unsaturation of fats
- Describe the quantitative analysis of protein by biuret and ninhydrin methods

UNIT – IV

Chemical, microbiological, flurometric and colorimetric methods of analysis of fat soluble and water soluble vitamins.

Unit Outcomes:

At the end of unit, students will be able to

- Explain the chemical, microbiological methods of analysis of fat and water soluble vitamins
- Know the flurometric and colorimetric methods of analysis of fat and water soluble vitamins

UNIT – V

Principles and methods for estimation of minerals: Atomic absorption spectroscopy, colorimetric, titrimetric and gravimetric methods Methods for determining physical and rheological properties of food.

Unit Outcomes:

At the end of unit, students will be able to

- Describe the principles and methods for estimation of minerals by atomic absorption spectroscopy, colorimetric, titrimetric and gravimetric methods
- Estimate the methods for physical and rheological properties of food.

Course Outcomes

- Understand the concepts of Techniques in food analysis,
- Understand proximate analysis of foods
- Understand Biochemical methods and approaches used in Food analysis

TEXT BOOKS

1. Suzanne Nielsen, “Food Analysis”, Springer Publishers.
2. Y. Pomeranz and C.E. Meloan, “Food Analysis”, A.V.I Publishing Company, INC West Port, Connecticut, U.S.A.

REFERENCES

1. Plummer, D.T. “An Introduction to Practical Biochemistry”, Tata Mc Graw-Hill Publishing Co., New Delhi. 1979.
2. Sadasivam, S. and Manickam, A. “Biochemical methods for Agricultural Sciences”, New Age International Publisher, New Delhi, 1996.
3. ManoRanjanKalia “Food Analysis and Quality Control”, 1st Edition Kalyani Publishers, New Delhi, 2002.
4. Jayaraman, J. “Laboratory Manual in Biochemistry”, Wiley Eastern Publishers, New Delhi, 1980.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) – II-I Sem **L T P C**

3 0 0 3

(19A27302T) PROCESSING OF CEREALS, PULSES & OILSEEDS

PREAMBLE

This course covers fundamentals of cereals and pulses processing, equipments, products and storage requirements.

Course Objectives

- To learn about the processing of major cereals and pulses.
- To gain knowledge about grain storage structure and handling devices.

UNIT – I

Importance of Cereals Pulses and Oilseeds, Composition, Structure and processing characteristics of Cereal grains, Legumes and Oilseeds, Post-harvest technology, Post processing practices for safe storage. Rice: Structure, types, composition, quality characteristics and physicochemical properties of Rice. Milling and parboiling of paddy, Curing and ageing of paddy and rice. Criteria and assessment of milling, cooking, nutritional and storage qualities of raw & parboiled rice. Processed rice products (flaked, expanded and puffed rice), By-products.

Unit Outcomes:

At the end of unit, students will be able to

- Learn composition, structure and processing of cereals, legumes & oilseeds
- Know the post processing operations for storage and further processing
- Knowledge of milling and parboiling of paddy and other processing methods
- Importance of quality assessment related to rice and rice products
- Knowledge on value added products and by products of rice.

UNIT – II

Wheat-Structure, Composition, Types, quality characteristics for milling into flour and Semolina. Flour milling, Turbo grinding and air classification, Blending of flours, Flour grades and their suitability for baking purposes, Milling equipment and milled products (Dalia, Atta, Semolina and flour). Assessment of flour quality and characteristics, Macaroni products. Dough rheology- influence of flour constituents in dough rheology.

Baked products-Ingredients Technology and quality parameters: Bread, Biscuits, Cakes and Crackers.

Unit Outcomes:

At the end of unit, students will be able to

- Acquired knowledge on fundamentals of wheat and its milling
- Detailed description of quality parameters and value added products from wheat

UNIT – III

Other Cereals: Corn- Structure, types and composition. Dry and wet milling of Corn. Starch and conversion products. Processed corn products (popped corn, corn flakes etc.) Structure and composition of Barley, Malting of barley, Bajra, Jowar and other cereal grains and millets. Pearling of millets. Parched and snack products. Breakfast cereals – types and manufacturing methods.

Unit Outcomes:

At the end of unit, students will be able to

- Variations in processes of dry and wet milling of corn
- Advantages of value added products from corn
- Knowledge of millets and malting process

UNIT – IV

Pulses: Pulses production, types, chemical composition, anti-nutritional factors, milling of pulses, milling equipment, factors affecting quality, secondary processing of pulses, processed products, fermented products, traditional products, Value addition; effect of processing on nutritive value.

Unit Outcomes:

At the end of unit, students will be able to

- Description of pulses and their importance
- Impact of anti-nutritional factors in pulses on processing
- Knowledge on milling of pulses and value added products

UNIT – V

Processing of oil seeds for direct use and consumption, Oil extraction methods- mechanical (Ghani and Expellers) and chemical methods (solvent extraction), Processing of extracted oil: Refining, Hydrogenation, Interesterification. Processing of deoiled cake into protein concentrates and isolates, Texturized vegetable protein, Functional protein preparations. Peanut butter, Margarine and Spread.

Unit Outcomes:

At the end of unit, students will be able to

- Explanation of oil extraction methods
- Need of refining and other processes like hydrogenation etc.
- Importance of protein derivatives from oilseeds

Course Outcomes

- Students will get information about the classification of various grains
- Students also exposed to various processing methods and machinery used
- Students will learn value added products from all grains

TEXT BOOKS

- K. Kulp and J. G. Ponte. Jr., "Hand Book of Cereal Science and Technology", 2nd Edition, CRC, 2000.
- G. Owens, "Cereals Processing Technology", 2nd Edition, Wood head Publishing, 2001.

REFERENCES

1. D.A.V. Dendy and B.J. Dobraszczyk, "Cereals and Cereal products: Chemistry and Technology", Vol. 4, Springer, 1st Edition, 2001.
2. B.O.Juliano, "Rice: Chemistry and Technology", 2nd Edition, AACC,1985.
3. Y.Pomeranz, "Wheat: Chemistry and Technology", 3rd Edition, AACC,1988.
4. A. Karleskind, "Oils and Fats manual", 1st Edition, Lavoisier Publisher, Paris, 1996.
5. R.H. Mathews, Marcel Dekker, "Legumes: Chemistry, Technology and Human Nutrition", 1st Edition, 1989.
6. D. Swer, "Bailey's Industrial Oil & Fat Products", 5th Edition, John Wiley & Sons, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
2	1	0	3

(19A27303T) FLUID MECHANICS FOR FOOD PROCESSING

PREAMBLE

The subject covers properties of fluids and its flow characteristics, flow through pipes. Importance of dimensional analysis and its applicability. Types and Selection of pumps.

Course Objectives

- The basic concepts and fluid-flow phenomena and the kinematics of flow
- To enable the students to design efficient water conveyance systems like canals, channels and pipes from places of origin to delivery points by acquiring knowledge on the principles of mechanics of fluids, water measurement and regulation

UNIT – I

Introduction and Properties of Fluids: Concept of fluid mechanics, definition of fluid, density, specific weight, Viscosity: Newtonian and Non-Newtonian fluids, kinematic viscosity, dynamic viscosity, variation of temperature with viscosity, Surface tension, vapour pressure, incompressible and compressible fluids, ideal and real fluids

Unit Outcomes:

At the end of unit, students will be able to

- Explain the properties of fluids and concept of fluid mechanics
- Differentiate Newtonian and non-Newtonian fluids
- Concept of viscosity and types and their effect on temperature
- Description of basics of classification of fluids

UNIT – II

Fluid Mechanics Pressure Measurement: Static pressure of liquids, absolute and gauge pressures, pressure measurement devices: mechanical instruments, electro-mechanical instruments electronic instruments. Dynamics of Fluid Flow, Euler's equation of motion, Bernoulli's equation, applications of Bernoulli's equation, cavitation.

Unit Outcomes:

At the end of unit, students will be able to

- Measure the fluids by various instruments.
- Explain the different forces acting on fluids.
- Importance of dynamic flow and their applications.

UNIT – III

Kinematics of Fluid Motion and Classification of Flow: Method of describing fluid motion, classification of flow: steady and unsteady; uniform and non-uniform; one, two and three dimensional flow Laminar and turbulent flows, streamline, pathline and streakline Acceleration equations, continuity equations.

Unit Outcomes:

- Description of kinematics of flow.
- Classify the fluid flow.
- Derive the continuity equation and its importance.

UNIT – IV

Analysis of flow through pipes, energy losses in pipe lines, minor losses in pipe lines due to enlargement, contraction, bends and pipe fitting, concept of equivalent length. Problems in Pipe flow: determination of pipe diameter, discharge and head loss. Flow measurements: Measurement of flow in pipes: venturimeter, flow nozzle, sharp edged concentric orifice meter, bend meter, rotameter. Measurement of velocity: pitot tube, hot wire anemometer, current meter.

Unit Outcomes:

At the end of unit, students will be able to

- Calculate the energy losses in pipe & fittings.
- Role of equivalent length in fluid flow.
- Knowledge on various flow measurements.

UNIT – V

Fluid Machines: Pumps – classification, centrifugal pumps, submersible pumps, reciprocating pumps, positive displacement pump. Centrifugal pumps: Pumps in series and parallel, basic equations applied to centrifugal pump, operating characteristics of centrifugal pumps. Submersible pumps: Reciprocating pumps: working of reciprocating pump, double acting pump, gear pump.

Unit Outcomes:

At the end of unit, students will be able to

- Basis for selection of pumps, types of pumps
- Applications of pumps and efficiency of pumps.

Course Outcomes

By the end of the course the students will be able to

- Gain knowledge on Bernoullies theory, Buckingham's Pi theorem, Hagen-Poiseuille equation
- Gain the knowledge on mechanical gauges, flow of fluids in the pumps, and Archimedies principles and theory
- Understand flow through mouth pieces, flow through orifices and pumps

TEXT BOOKS

1. P.G. Smith, "Introduction to Food Process Engineering", 2nd Edition, Lincoln, UK, 2010.
2. R. Paul Singh and Dennis R. Heldman, "Introduction to Food Engineering", 4th Edition, Academic Press, 2009.

REFERENCES

1. Modi, P. M. and Seth, S.M. "Hydraulics and Fluid Mechanics". Standard Book House, Delhi, 1973,
2. Jagdish Lal, "Fluid Mechanics and Hydraulics", Metropolitan Book Co. Private Limited., New Delhi, 1985.
3. Christie John Geankoplis. "Transport Processes and Separation Process Principles" (Includes Unit Operations). 4th Ed. Prentice-Hall, NY, USA., 2003,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
3	0	0	3

(19A57301) BASIC MICROBIOLOGY

PREAMBLE

This subject includes the basic concepts of microbiology, classification of micro-organisms, growth factors, types of culture media etc.

Course Objectives

- To learn the basic microbiological classification and microbial techniques.
- To enable students to gain knowledge on various microbial cultures and their growth factors.

UNIT – I

Evolution and scope of microbiology; History of microbiology; Classification of microorganisms, Applied areas of microbiology; Microscopy – Optical & Electron- Optical: Bright field, dark field, ultraviolet, phase contrast, fluorescent; Electron- Scanning electron microscopy, Transmission electron microscopy; Morphology, general characteristics & Reproduction of algae; Morphology general characteristics and reproduction of fungi and molds.

Unit Outcomes:

At the end of unit, students will be able to

- Importance of field of microbiology in different areas
- Awareness on microscopy and its types
- Basic information on Morphology, reproduction of algae, fungi

UNIT – II

Morphology general, characteristics, structure, classification, identification, reproduction, nutrition and growth of bacteria, bacteria genetics; bacteria recombination; Bacterial conjugation, transduction; Bacterial transformation

Unit Outcomes:

At the end of unit, students will be able to

- Explain the morphology, reproduction of bacteria
- Know about cell structure, classification and identification of bacteria
- Acquires knowledge on bacterial recombination and their types
- Basics of bacteria genetics

UNIT – III

Mutations: Types of mutations, mutagenesis; Mutation rate, repair of mutations; Phenotypes of bacterial mutants; Designation of bacterial mutants.

Unit Outcomes:

At the end of unit, students will be able to

- Know about the importance of mutation and its types
- Occurrence of mutations and adverse effect and repair of mutations
- Explain the phenotypes of bacterial mutants and their designation

UNIT – IV

Viruses – Structure, shape classification based on nucleic acid; replication and multiplication; food borne viruses

Unit Outcomes:

At the end of unit, students will be able to

- Explain the study of virus structure
- Know the classification of nucleic acid
- Basic concepts of replication and multiplication

UNIT – V

Factors affecting growth of microorganism, Intrinsic factors and Extrinsic factors; Identification of bacteria- bacteria straining, estimating members cell counts, viable , plate counts; Pure culture: Definition, methods of isolation, preservation techniques; control of microorganisms by physical, chemical, antibiotic and other chemotherapeutic agents.

Unit Outcomes:

At the end of unit, students will be able to

- Know the factors affecting growth of microorganisms both internal and external
- Identify the bacteria and enumeration
- Acquires knowledge on pure cultures, isolation methods, preservation techniques
- Various methods of controlling microorganisms

Course Outcomes

By the end of the course, students will learn

- Significance and importance of microbiology
- Morphology of various microorganisms
- Control of microorganisms and preservation of pure cultures

TEXT BOOKS

1. M.J., Pelczar, E.C.S. Chan and N.R. Krieg. “Microbiology”. McGraw-Hill New York 1993.
2. W.C Frazier,. and D.C Westhoff,. “Food Microbiology”. 4th Edition. Tata McGraw Hill Publishing Co. Ltd., New Delhi 2008.

REFERENCES

1. RY Stainier, JL ML Ingraham, Wheelis & PR.Painter “General Microbiology”. MacMillan, 2003.
2. George J Banwart, “Basic Food Microbiology”
3. S S Purohit “Microbiology Fundamentals and Applications”
4. M R Adams & M O Moss “Food Microbiology”
5. James M Jay “Modern Food Microbiology”

B.Tech (FT)– II-I Sem

L	T	P	C
2	0	0	2

(19A27304) PRINCIPLES OF FOOD PRESERVATION

PREAMBLE

This course helps the students to apply basic food science knowledge and get to know biochemical changes occurring during various processing and preservation techniques.

Course Objectives

- Emphasis on importance of food technology into reduce the spoilage and improve the quality
- To explore the various preservation methods

UNIT – I

Definition and scope of Food Science and Technology, Historical development of food processing and preservation, general principles of food preservation. Degree of perishability of unmodified foods, Causes of quality deterioration and spoilage of perishable foods, intermediate moisture foods, wastage of foods.

Unit Outcomes:

At the end of unit, students will be able to

- Understand the scope and importance of Food Science and Technology
- Know the developments in food processing
- Have idea on principles of preservation and its methods

UNIT – II

Preservation of foods by low temperatures: (A) Chilling temperatures: Consideration relating to storage of foods at chilling temperatures, Chilling injury, Applications and procedures, Controlled and Modified atmospheric storage of foods, Post storage Handling of foods.
(B) Freezing temperatures: Freezing process, Slow and quick freezing of foods; effect on foods, other occurrences associated with freezing of foods. Technological aspects of pre freezing, Actual freezing, Frozen storage and thawing of foods, Individual Quick Freezing.

Unit Outcomes:

At the end of unit, students will be able to

- Gain knowledge on preservation of foods by chilling and its applications
- Understand the concepts of freezing and its types

UNIT – III

Preservation of foods by high temperatures: Basic concepts in thermal destruction of microorganisms D, Z and F values. Heat resistance and thermophilic microorganisms. Cooking, blanching, pasteurization and sterilization of foods. Extrusion, baking, roasting, frying, dielectric heating, ohmic, microwave and infrared heating. Assessing efficacy of thermal processing of foods, General process of canning of foods.

Unit Outcomes:

At the end of unit, students will be able to

- Acquire knowledge on cooking, blanching, pasteurization and sterilization and other high temperature preservation techniques
- Know the concepts on thermal destruction of foods

Unit – IV

Preservation by water removal: (a) Principles, Technological aspects and application of evaporative concentration process; Freeze concentration and membrane process for food concentrations. (b) Principles, Technological aspects and application of drying and dehydration of foods, Cabinet, tunnel, belt, bin, drum, spray, vacuum, foam mat, fluidized-bed and freeze drying of foods.

Unit Outcomes:

At the end of unit, students will be able to

- Understand the importance of concentration and evaporation in food processing
- Know the dehydration and its applications

UNIT – V

Chemical & Natural Preservatives: Classification, Principles, Radiations: Sources of radiations, units and dosages, effect on microorganisms and different nutrients; dose requirements for radiation preservation of foods., safe limits, irradiation mechanism and survival curve, technological aspects; applications of sugar and salt, antimicrobial agents, biological agents, Hurdle technology. Effects of various food processing operations on the nutritive value of foods.

Unit Outcomes:

At the end of unit, students will be able to

- Have knowledge on role of chemical as a preservatives
- Acquires understanding of radiation and its effects on foods
- Know the concept of hurdle technology

Course Outcomes

Upon completion of this course students should be able to understand

- The changes occurring during various food processing techniques
- The changes during storage and preservation
- The effect of enzymes on spoilage reactions of foods

TEXT BOOKS

1. Norman N. Potter and J.H. Hotchkiss, Chapman and Hall, "Food Science", 5th Edition, 1998.
2. P. J. Fellows, "Food processing technology: Principles and Practice", 3rd Edition, Taylor and Francis, 2009.

REFERENCES

1. M. Karel, O.R. Fennema and D.B. Lund, "Principles of Food Science-Part-II: Physical Method of Food Preservation", 2nd Edition, Marcel Dekkar Inc., 2001.
2. V. Kyzlink, "Principles of Food Preservation", 2nd Edition, Elsevier Press, 2003.
3. J. M. Jay, D. Van Nostrand, "Modern Food Microbiology", 7th Edition, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
0	0	3	1.5

(19A27301P) FOOD CHEMISTRY LAB

Course Objectives

- To expertise the students to analyze the proximate composition and other important constituents present in the food.

EXPERIMENTS

1. Sampling plan; Sampling requirements, Sample collection and preparation for analysis procedures and methods
2. Determination of pH
3. Determination of moisture content of foods by oven drying and distillation methods
4. Determination of Total and Acid insoluble ash content in foods
5. Determination of crude fat content by solvent extraction methods in foods
6. Determination of crude Protein by Kjeldhal Lowry method & other methods
7. Determination of reducing and total sugar content in foods
8. Determination of crude fibre content in foods
9. Determination of specific mineral contents in foods such as Calcium, Iron, Phosphorus, Chloride etc.
10. Determination of specific vitamin content of food such as ascorbic acid, carotenes etc.
11. Determination of specific Natural and/ or added Colouring Matters in foods
12. Determination of specific added food Preservatives in foods

Course Outcomes

By the end of the practical exercises, the students will be able to

- Adapt suitable method for food analysis
- Apply the knowledge of Techniques in Food Analysis,
- Differentiate between Qualitative identification and Quantitative estimations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
0	0	3	1.5

(19A27302P) PROCESSING OF CEREALS, PULSES AND OIL SEEDS LAB

Course Objectives

- Determination of parameters by qualitative and quantitative methods
- Study on some important unit operations used for some grains
- Preparation of standard food products

EXPERIMENTS

1. Determination of physical properties (Bulk Density, Porosity, Sphericity, Angle of repose, Test weight, Particle size, Sieve analysis) of different grains.
2. Determination of Gluten content, sedimentation value, alcoholic acidity, water absorption capacity and Polenske value of wheat flour.
3. Determination of adulterant ($NaHCO_3$) in wheat flour/ Maida.
4. Determination of alkali score and gelatinization temperature of rice.
5. Traditional and improved pre-treatments and their effect on dehusking of some legumes.
6. Removal of anti-nutritional compounds from selected pulses and oilseeds.
7. Study of cooking quality of Dhal.
8. Pearling of millets.
9. Determination of yeast activity.
10. Determination of different quality parameters of oils.
11. Determination of efficiency of oil extraction techniques (mechanical expelling and solvent extraction).
12. Preparation of Bread.
13. Preparation of Biscuits.
14. Preparation of Cookies.
15. Preparation of Cake.
16. Preparation of Rusk.
17. Preparation of Crackers.
18. Visit to a Bakery, Confectionery Unit
19. Visit to a working modern roller flour mill and FCI godowns.
20. Visit to working rice mill.

Course Outcomes

- Students are exposed to learn various parameters determination and quantification
- Students will able to prepare and understand the technology involved in foods from grains
- Students will acquire more knowledge by visiting industries

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
0	0	3	1.5

(19A27303P) FLUID MECHANICS FOR FOOD PROCESSING LAB

Course Objectives

- To impart knowledge on coefficient of discharge, friction factor, pressure drop on different fluids.
- Importance of pipe fittings and application of various pumps in food industry.

EXPERIMENTS

1. To determine the coefficient of discharge of an orifice (or a mouth piece) of a given shape.
2. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number.
3. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
4. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
5. To study the variation of friction factor, 'f' for turbulent flow in smooth and rough commercial pipes.
6. To determine the loss coefficients for the pipe fittings.
7. To verify Bernoulli's equation experimentally.
8. To determine the flow rate and coefficient of discharge using Venturimeter.
9. To measure discharge through Rotameter.
10. To determine the Reynolds number and types of flow (Laminar or Turbulent), the flow rate and coefficient of discharge using Orifice meter.
11. To determine losses due to pipe fitting, sudden enlargement and contraction.
12. Measurement of viscosity and surface tension of liquids.
13. To determine the characteristics of centrifugal pump and to find out total head, pump efficiency and overall efficiency of pump.
14. Study of various types of pipes and pipe fittings.
15. Study of different types of valves.
16. Study of reciprocating pump.
17. Determination of frictional coefficient of given pipe.

Course Outcomes

By the end of the course the students will be able to

- Know the measurement of fluid pressure, measurement of discharge and measurement of time
- Know how to determine the Coefficient of discharge from the pitot tube experiment
- How to measure the water level from 'U' tube manometer.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – II-I Sem

L	T	P	C
3	0	0	3

(19A99302) BIOLOGY FOR ENGINEERS

Course Description: 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.

Course Outcomes:

After studying the course, the student will be able to:

- Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
- Explain about biomolecules, their structure and function and their role in the living organisms. How biomolecules are useful in Industry.
- Briefly about human physiology.
- Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
- Know about application of biological Principles in different technologies for the production of medicines and Pharmaceutical molecules through transgenic microbes, plants and animals.

Unit I: Introduction to Basic Biology (8 hours)

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, Brief introduction to five kingdoms of classification.

Unit Outcomes:

After completing this unit, the student will be able to

- Summarize the basis of life. (L1)
- Understand the difference between lower organisms (prokaryotes) from higher organisms (eukaryotes). (L2)
- Understand how organisms are classified. (L3)

Unit II: Introduction to Biomolecules (8 hours)

Carbohydrates, lipids, proteins, Vitamins and minerals, Nucleic acids (DNA and RNA) and their types. Enzymes, Enzyme application in Industry. Large scale production of enzymes by Fermentation.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what are biomolecules? their role in living cells, their structure, function and how they are produced. (L1)
- Interpret the relationship between the structure and function of nucleic acids. (L2)
- Summarize the applications of enzymes in industry. (L3)
- Understand what is fermentation and its applications of fermentation in industry. (L4)

Unit III: Human Physiology (8 hours)

Nutrition: Nutrients or food substances. Digestive system, Respiratory system, (aerobic and anaerobic Respiration). Respiratory organs, respiratory cycle. Excretory system.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand what nutrients are (L1)
- Understand the mechanism and process of important human functions (L2 & L3)

Unit IV: Introduction to Molecular Biology and recombinant DNA Technology: (8 hours)

Prokaryotic gene and Eukaryotic gene structure. DNA replication, Transcription and Translation. rDNA technology. Introduction to gene cloning.

Unit Outcomes:

After completing this unit, the student will be able to

- Understand and explain about gene structure and replication in prokaryotes and Eukaryotes (L1)
- How genetic material is replicated and also understands how RNA and proteins are synthesized. (L2)
- Understand about recombinant DNA technology and its application in different fields.(L3)
- Explain what is cloning. (L4)

Unit V: Application of Biology (10 hours)

Brief introduction to industrial Production of Enzymes, Pharmaceutical and therapeutic Proteins, Vaccines and antibodies. Basics of biosensors, biochips, Bio fuels, and Bio Engineering. Basics of Production of Transgenic plants and animals.

Unit Outcomes:

After completing this unit, the student will be able to Understand.

- How biology is applied for production of useful products for mankind.(L1)
- What are biosensors, biochips etc. (L2)
- Understand transgenic plants and animals and their production (L3)

TEXT BOOKS:

1. P.K.Gupta, " Cell and Molecular Biology"
2. U. Satyanarayana. "Biotechnology", 2017

REFERENCE BOOKS:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018.
2. T Johnson, "Biology for Engineers", CRC press, 2011 "Molecular Biology and Biotechnology" 2nd ed. J.M. Walker and E.B. Gingold. Panima Publications. PP 434.
3. David Hames, "Instant Notes in Biochemistry", 2016
4. Phil Tunner, A. Mctennan, A. Bates & M. white "Instant Notes – Molecular Biology" 2014

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem **L T P C**

3 0 0 3

(19A27401T) PROCESSING OF FRUIT AND VEGETABLES

PREAMBLE

This course enables the students to gain a sound knowledge about the processing and preservation technologies of fruits and vegetables.

Course Objectives

At the end of this course the students get a detailed background about

- Various methods used for preserving fruits and vegetables.
- Different operations involved in processing fruits and vegetables
- Technology behind intermediate moisture and minimally processed fruit and vegetable.

UNIT – I

Production and processing scenario of fruits and vegetables in India and world; Scope of fruit and vegetable processing industry in India; Overview of principles and preservation methods of fruits and vegetables; Supply chain of fresh fruits and vegetables;

Unit Outcomes:

At the end of unit, students will be able to

- Acquires the present status and production trends in India and world.
- Have brief idea on overall preservation methods and its principles.
- Know the importance of supply chain in fresh fruits and vegetables.

UNIT – II

Primary processing and pack house handling of fruits and vegetables; Peeling, slicing, cubing, cutting and other size reduction operations for fruits and vegetables; Storage of Fresh Fruits and Vegetables: Containers: Tin, glass and other packaging materials used in fruits and vegetables preservations. Canning and bottling, effect of canning and bottling on nutritive value, spoilage of canned foods, spoilage organisms, detection and control.

Unit Outcomes:

At the end of unit, students will be able to

- Understand the primary processing methods
- Know the storage of fruits and vegetables

- Assess the spoilage factors in canned foods and responsible microorganisms and their control

UNIT – III

Preparation and preservation of Juice, Squash, Syrup, Sherbet, Nectar, Cordial, Crush etc.; FSSAI specifications, Processing and equipment for above products; Preparation, preservation and equipment for manufacture of crystallized fruits and preserves, Jam, Jelly and Marmalades, defects in making, Candies; FSSAI specifications.

Unit Outcomes:

At the end of unit, students will be able to

- Know the preservation of various fruit products like squash, syrup and cordial etc.
- Understand the process equipment used for crystallized fruits and preserves, jam, jelly etc.
- Explain standards given by FSSAI.

UNIT – IV

Preparation, preservation and equipment for manufacture of Chutney, Pickles, Sauce, Puree, Paste, Ketchup; Toffee, Cheese, Lather. Production of Pectin and Vinegar; Commercial processing technology of selected fruits and vegetables for production of various value added processed products; FSSAI specifications.

Unit Outcomes:

At the end of unit, students will be able to

- Gain knowledge on equipment, process for various fruit and vegetable products
- Know the importance of Specifications given by FSSAI

UNIT – V

Minimally processed Fruits and Vegetables: Factors affecting shelf life and the quality of minimally processed fruits and vegetables, physiology and biochemistry of fresh cut fruits. Dehydration of Fruits and Vegetables: Methods; packaging, storage, quality control. Products: Dehydrated, Wafers and Papads, Soup powders; Food additives: Use in fruit and vegetable preservation; Restructured fruits & Vegetables; FSSAI specifications.

Unit Outcomes:

At the end of unit, students will be able to

- Have broad idea on minimally processed fruits and vegetables
- Understand the factors affecting shelf life and their quality of minimally processed fruits and vegetables
- Know the process technology of different value added products from fruits and vegetables

Course Outcomes

By the end of the course, the students will be able to

- Train the students in the field of Fruit and Vegetable Processing.
- Enable the students learn different preservation techniques to curb post-harvest losses in the field of agriculture.
- Learn processing of fruits & vegetables - different preservation techniques to improve the shelf life of seasonal fruits.
- Understand the importance of FSSAI Specifications

TEXT BOOKS

1. Giridharlal, Siddappa and Tandon. ICAR, "Preservation of Fruits and Vegetables", New Delhi.
2. Srivastava. P.R. and Sanjeev Kumar. "Fruit and Vegetable Preservation". 3rd Edition, International Publishers, Delhi.

REFERENCES

1. Norman Potter. "Food Science", CBS publishers and Distributors, New Delhi.
2. Joshi and Pandey, "Biotechnology: Food Fermentation". Volume-II. Educational Publishing and Distributing Co
3. Namkeen, "Manufacture of Snacks", Papads and Potato products-EIRI. EIRI Board of Consultants and Engineers.
4. Sudhir Gupta (Compiled). "Fruits and Vegetables Processing", Hand Book EIRI, Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

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(19A27402T) MECHANICAL OPERATIONS AND MATERIAL HANDLING

PREAMBLE

The broad idea of this subject mentions about each individual operation and its applicability in food processing.

Course Objectives

- To impart knowledge to the students on principles, operation and maintenance of various food processing equipment namely mixing, forming, size reduction, cutting and grinding equipment. centrifugation, filtration material handling equipment like belt, screw and pneumatic conveyors, bucket elevator.

UNIT – I

Geometrical, physical and mechanical properties of foods. Cleaning, sorting and grading of foods. Peeling, decortications, deseeding of fruits, dehulling of grains, blanching of vegetables. Size Reduction: Principles and types of size reduction equipment, Crushers, Grinders, mills, disintegration of fibrous materials. Energy and power requirement, Mechanical expression of edible oil.

Unit Outcomes:

At the end of unit, students will be able to

- Know the various properties of foods
- Explain the primary processing operations
- Describe the size reduction and principles, equipment

UNIT – II

Sedimentation: Theory and principles of sedimentation, minimum area for continuous sedimentation, applications in food industry. Filtration: Principle of Constant pressure and constant rate filtration and types of filtration equipment, Settling classifiers and Flotation Screening, types of screen. Centrifugation: Principle of settling and centrifugation, devices for centrifugal separation. Membrane separation processes: Reverse osmosis, Nano-filtration, ultra-filtration, microfiltration, dialysis and pervaporation.

Unit Outcomes:

At the end of unit, students will be able to

- Acquire basic knowledge on sedimentation, filtration and their equipment
- Explain the principles of centrifugation and membrane separation and its applications

UNIT – III

Mixing: Mixing of liquids and solids (powder), mixing equipment, mixing index and mixing time, Agitation and blending, types of agitators, power consumption in mixing. Scope and importance of material handling devices; Study of different material handling systems: Classification, principles of operation, conveyor system selection/design; Separation/Grading: Theory and principles: Types of separators – Disk, Indent cylinder, spiral and specific gravity, stone, inclined belt, pneumatic and aspirator separators- separation based on fluidization techniques – magnetic, cyclone and color separator.

Unit Outcomes:

At the end of unit, students will be able to

- Know the importance of mixing in solid and liquid foods and their equipment
- Applications of material handling equipment
- Various types of separators and its applications

UNIT – IV

Belt conveyor: Principle, characteristics, design, relationship between belt speed and width, capacity, inclined belt conveyors, idler spacing, belt tension, drive tension, belt tripper; Chain conveyor: Principle of operation, advantages, disadvantages, capacity and speed, conveying chain; Screw conveyor: Principle of operation, capacity, power, troughs, loading and discharge, inclined and vertical screw conveyors;

Unit Outcomes:

At the end of unit, students will be able to

- Explain the operation of belt conveyor and its practical applications
- Know the principle of screw conveyor and its types

UNIT – V

Bucket elevator: Principle, classification, operation, advantages, disadvantages, capacity, speed, bucket pickup, bucket discharge, relationship between belt speed, pickup and bucket discharge, buckets types; Pneumatic conveying system: Capacity and power requirement, types, air/product separators; Gravity conveyor design considerations, capacity and power requirement. Storage: Methods of storage, silos and bins, hoppers.

Unit Outcomes:

At the end of unit, students will be able to

- Know the detailed working mechanism of bucket elevator and its parts
- Pros and Cons of using bucket elevator

- Acquires knowledge on pneumatic conveyors and its application
- Explain the various methods of storage and their equipment

TEXT BOOKS

1. R.L Earle. “Unit operations in Food Engineering”.
2. K.M Sahay and Singh “Unit operations of Agricultural Processing”. K.K. Vikas Publishing House Pvt. Ltd. New Delhi.

REFERENCES

1. Mc. Cabe, J.C Smith and P. Harriot. “Unit operations of Chemical Engineering”. McGraw Hill Publishers. New Delhi.
2. N. N. Mohesinin “Physical properties of Plant and Animal materials”.
3. A. Chakraverty, Pulses and Oilseeds. “Post-Harvest Technology of Cereals”, Oxford & IBH Publishers. New Delhi.
4. P.J.Fellows “Food Processing Technology, Principles and Practice”, Wood Head Publishing Ltd., Cambridge, England.
5. R. P Singh and D.R Heldman. “Introduction to Food Engineering”, 3rdEdition.
6. P.G Smith “Introduction to Food Process Engineering”.

Course Outcomes

By the end of the course, the students will be able to

- Understand different food processing equipment that are being used in food industries
- Study about the principles, operation and maintenance of food processing equipment viz., material handling, cleaning, grading, mixing, forming, size reduction, cutting, grinding, centrifugation, filtration, evaporation and drying

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B.Tech (FT)– II-II Sem **L T P C**

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(19A27403) PRINCIPLES OF FOOD ENGINEERING

PREAMBLE

The text prescribed for detailed study focuses on basic concepts like units and its conversion, fundamental laws and principles are useful to understand the subject.

Course Objectives

- To familiarize the importance and usage of units.
- To understand the fundamental laws and principles and its application

UNIT – I

Introduction to Food Engineering: Definition of terms, System of measurements, The S.I System, Conversion of Units. Steam Generation & Utilization: Concept of normal boiling point, Properties of Steam, Forms of Steam. Pressure-Enthalpy diagram, Problems; Boilers: Classification, Types, Criteria for selection, Maintenance & Applications.

Unit Outcomes:

At the end of unit, students will be able to

- Basic terminology related to Food Engineering
- Importance of conversion of units
- Basic knowledge on steam properties
- Classify the boilers and their selection

UNIT – II

Basic principles of Physics & Chemistry: Ideal Gas law, Vander Waal's equation, Amagat's law, Dalton's law, Problems; Kinetic Theory of gases. Thermodynamics: Basic concepts, First law of thermodynamics, Second law of thermodynamics, Zero law of thermodynamics Refrigeration: Basic concepts, Joule-Thomson effect, Refrigerants, Problems, Refrigeration types (VCC, VAC), Applications.

Unit Outcomes:

At the end of unit, students will be able to

- Importance and applicability of above laws
- Explain the terminology related to thermodynamics
- Applications of laws of thermodynamics
- Acquires knowledge on Refrigeration and its applications

UNIT – III

Humidity: Humidity & Relative Humidity, Saturation Humidity, Percentage Humidity, Psychrometric chart – Utilization, problems; Humidifiers & Dehumidifiers; Applications. Material balance and Energy balance in various unit operations – Problems, significance in food processing

Unit Outcomes:

At the end of unit, students will be able to

- Know about humidifiers and dehumidifiers and its applications
- Importance of material and energy balances in food processing

UNIT – IV

Dimensional Analysis, Fundamental -derived units. Conversion of Dimensional equations – Uses, Methods (Rayleigh's & Buckingham's) Examples: Nusselts Number, Reynolds number, Prandtl's number, Froude's number. Engineering properties of Food Materials: Mass- volume-area related properties of foods, rheological properties of solid foods, thermal properties of frozen & unfrozen foods, electrical conductivity of foods, dielectric properties of foods.

Unit Outcomes:

At the end of unit, students will be able to

- Have knowledge on dimensional analysis and derivations
- Have idea about engineering properties of foods

UNIT – V

Measurement & Control of Process Parameters: Various Process Parameters, On-line & Off-line parameters, Critical & non-critical parameters, Measurement of various parameters, controlling methods (Manual, Automatic & Computer control)

Unit Outcomes:

At the end of unit, students will be able to

- Basic concepts of process parameters
- Knowledge on measurement and control of these parameters
- Various controlling methods.

Course outcomes

- Students will learn the importance of units.
- Students will understand the basic laws and principles and its application in food engineering

TEXT BOOKS

1. R. Paul Singh and Dennis R. Heldman, “Introduction to Food Engineering”, 4th Edition, Academic Press, 2009.
2. P.G. Smith, “ Introduction to Food Process Engineering”, 2nd Edition, Lincoln, UK, 2010

REFERENCES

1. J.M. Smith, H.C. Van Ness and M.M. Abbott “Introduction to Chemical Engineering Thermodynamics”, 7th Edition, McGraw-Hill, Inc., NY, USA. 2005.
2. Z. Berk, “Food Process Engineering and Technology, Food Science and Technology”, 1st Edition, International Series, Elsevier, 2009.
3. D. G. Rao, “Fundamentals of food engineering”, Prentice-Hall of India, New Delhi, 2010.
4. R.K. Rajput. “Engineering Thermodynamics”, 3rd Edition, Laxmi Publications (P) Ltd., Bangalore, 2007.
5. Warren L. McCabe, “Unit Operations of Chemical Engineering”, 7th Edition, Julian Smith, Peter Harriott, McGraw-Hill, Inc., NY, USA, 2004.
6. Christie John Geankoplis “Transport Processes and Separation Process Principles” (Includes Unit Operations), 4th Edition, Prentice-Hall, NY, USA. 2003

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B.Tech (FT)– II-II Sem

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(19A27404) PROCESSING OF FISH AND MARINE PRODUCTS

PREAMBLE

This subject focus on scope and status of marine industry, various processed products with different preservation techniques, novel methods.

Course Objectives

- To impart knowledge on fisheries and other marine foods, their nutritional composition and processing technologies

UNIT – I

Fisheries resources, global and Indian scenario; Types of fish and other marine products; Classification of fish (fresh water and marine), composition of fish, characteristics of fresh fish and quality assessment, spoilage of fish- microbiological, physiological, biochemical; Relationship between chilling and storage life.

Unit Outcomes:

At the end of unit, students will be able to

- Gain knowledge on present scenario of fisheries in India
- Know the different types of fish and marine products
- Describe the fish composition and characteristics, quality assessment
- Understand the different spoilage parameters
- Know the importance of relation between chilling and storage life.

UNIT – II

Methods of Preservation of fish: Drying, Salting, Smoking and Curing. General aspects of fish freezing, changes in quality during chilled and frozen storage; Principles of canning, effect of heat processing on fish, storage of canned fish, preprocess operations, post-process operations, cannery operations for specific canned products;

Unit Outcomes:

At the end of unit, students will be able to

- Describe the methods of preservation techniques
- Identify the changes in quality during the storage
- Have detailed idea on canning process and its products

UNIT – III

Fish products: Introduction, fish muscle proteins, surimi process, traditional and modern surimi production lines, quality of surimi products, comparison of surimi and fish mince products; Preparation protocols of indigenous products: Fish sauce and paste.

Unit Outcomes:

At the end of unit, students will be able to

- Explain the various products prepared from fish mainly surmi
- Understand the quality of surmi products and comparison with minced products
- Get to know about fish sauce and paste

UNIT – IV

Novel methods; Low dose irradiation; High pressure treatment, MAP, vacuum packaging, gas packaging; Oxygen absorbents and CO_2 generators, ethanol vapour generation, hurdle barrier concept, value added fish products, packaging; Sea food quality assurance, HACCP, EU hygienic regulations and ISO 9000 standards; New kinds of quality and safety problems emerging in sea food processing and preservation.

Unit Outcomes:

At the end of unit, students will be able to

- Know the importance of novel methods like irradiation, high pressure processing, oxygen absorbents and etc.
- Understand the value addition of fish products
- Acquire knowledge on quality assurance and standards for fish processing

UNIT – V

Fish by products - production of fish meal, fish protein extracts, fish protein hydrolysates, fish protein concentrate, fish liver oil and fish sauce and other important byproducts; Quality control of processed fish; Fish processing industries in India.

Unit Outcomes:

At the end of unit, students will be able to

- Understand the byproducts from fish and their processing
- Know the quality control of processed fish
- Get knowledge on fish processing industries in India

Course Outcomes

By the end of the course, the students will be able to

- Gain knowledge in the areas of fish and other marine food preservation and processing technology.

TEXT BOOKS

1. D.P. Sen. “Advances in Fish Processing Technology”. 2005. Allied Publishers Pvt. Ltd., Delhi.
2. “Preservation of Fish and Meat”. Brigitte Maas-van Berkel, Brigiet van den Boogaard and CorlienHeijnen. 2004. Agromisa Foundation, Wageningen.

REFERENCES

1. C.O. Chichester and H.D. Graham “Microbial safety of Fishery products”, Academic Press, New York, 1973.
2. George Borstorm. “Fish as Food - Vol. I, II, III and IV”, Academic Press, New York. 1961.
3. K. Gopakumar. “Textbook of Fish Processing Technology”, ICAR, New Delhi. y Charles L. Cutting. Processing and Preservation of Fish. Agro Bios, New Delhi.
4. Brend W. Rautenstrauss and Thomas Liehr. “Fish Technology:, Springer-Verlag, US, 2002.
5. G.M. Hall. “Fish Processing Technology”, 2nd Edition, Chapman & Hall, London, UK, 1997.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem **L T P C**

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(19A05304T) PYTHON PROGRAMMING

Course Objectives:

- To learn the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To get training in the development of solutions using modular concepts
- To introduce the programming constructs of python

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.

Unit Outcomes:

Student should be able to

- List the basic constructs of Python.
- Solve the problems by applying modularity principle.

Unit – II

Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.
onditionals 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,

Unit Outcomes:

Student should be able to

- Apply the conditional execution of the program.
- Apply the principle of recursion to solve the problems.

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.
Case Study: Reading word lists, Search, Looping with indices.
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.

Unit Outcomes:

Student should be able to

- Use the data structure list.
- Design programs for manipulating strings.

Unit – IV

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.
Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.
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:

Unit Outcomes:

Student should be able to

- Apply object orientation concepts.
- Use data structure dictionaries.
- Organize data in the form of files.

Unit – V

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning
Classes and Methods: Object oriented features, Printing objects, The init method, The __str__method, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation
Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.
The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args,

Unit Outcomes:

Student should be able to

- Plan programs using object orientation approach.
- Illustrate the principle of inheritance.

Text books:

1. Allen B. Downey, “Think Python”, 2nd edition, SPD/O’Reilly, 2016.

Reference Books:

1. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, “Fundamentals of Python”, CENGAGE, 2015.
3. R. Nageswara Rao, “Core Python Programming”, 2nd edition, Dreamtech Press, 2019

Course Outcomes:

Student should be able to

- Apply the features of Python language in various real applications.
- Select appropriate data structure of Python for solving a problem.
- Design object oriented programs using Python for solving real-world problems.
- Apply modularity to programs.

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B.Tech (FT)– II-II Sem

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(19A27405) PROCESSING OF SPICES AND PLANTATION CROPS AND MEDICINAL HERBS

PREAMBLE

The subject covers the importance of spices and processing of major and minor spices, plantation crops and medicinal crops and secondary and tertiary processing.

Course Objectives

- To impart knowledge about spice processing and their marketable standards, plantation crops and their importance in Indian economy, post-harvest technology of spices, value added products of spices, packaging of processed spices, food, medicinal and pharmaceutical uses of different spices.

UNIT – I

Importance and Processing of Spices: Classification, chemical composition and principal constituents, History of usage & Spice trade in India and the world.
Spices – production and importance – stage of harvesting and harvesting methods – processing of major spices – Ginger, Chilli, Turmeric and Garlic, Pepper, Cardamom – Unit operations involved – equipment used- value addition of spices.

Unit Outcomes:

At the end of unit, students will be able to

- Get information on history, classification, chemical composition and principal constituents of spices
- Understand the harvesting stages and methods and their processing, utilization of various major spices like ginger, chilli, turmeric etc.
- Know the equipment used and operations involved, valued added products from spices

UNIT – II

Processing of minor Spices: Herbs, leaves and Spartan seasonings and their processing and utilization – All spice, Annie seed, Sweet basil; Caraway seed, Cassia, Cinnamon; Clove, Coriander, Cumin, Dill seed; Fennel seed, Nutmeg, Mace, Mint, Marjoram. Rosemary, saffron, sage; Savory, thyme, ajowan; Asafetida, curry leaves – Unit operations involved – equipment used- value addition of spices.

Unit Outcomes:

At the end of unit, students will be able to

- Understand the harvesting stages and methods and their processing, utilization of various minor spices like herbs, leaves, cinnamon, clove, coriander, nutmeg and etc.
- Know the equipment used and operations involved, valued added products from spices

UNIT – III

Processing of Plantation Crops: Tea Processing Composition and production of tea leaves; processing of tea leaves; CTC tea, black tea, green tea and Oolong tea, grading and packaging; processing of instant tea Coffee Processing Production and processing of coffee cherries by wet and dry method; processing technology for coffee; preparation of brew; processing technology for instant coffee and decaffeinated coffee.

Unit Outcomes:

At the end of unit, students will be able to

- Know about the importance of plantation crops, composition, production and processing of tea leaves, different types of tea, grading and packaging
- Understand the production and processing of coffee by wet and dry method
- Get knowledge on processing technology for instant tea, coffee and decaffeinated coffee, brew.

UNIT – IV

Processing of Plantation Crops: Cocoa processing Cocoa bean- introduction, history and composition; processing of cocoa bean; processed products of cocoa. Coconut, Arecanut, Vanilla and Cashew nut– production and importance – harvesting and stages of harvest – drying, cleaning and grading, processing methods, process and equipment – value added products – grading and types – packaging and storage

Unit Outcomes:

At the end of unit, students will be able to

- Know about the history, importance of cocoa, composition and processing of cocoa beans and processed products
- Understand the harvesting and stages like drying, cleaning and grading and various processing methods for coconut, arecanut, vanilla and cashew nut
- Get knowledge on process and equipment used, value added products from above mentioned plantation crops
- Study of grading, types, packaging and storage for above all plantation crops

UNIT – V

Processing of Medicinal Crops: Importance of medicinal crops – production and export status – processing of medicinal crops – equipment used – principles and operations – active components in various medicinal plants – application and uses – extraction methods

Extraction of Principal Constituents in Spices
Spice Oils & Oleoresins: Flavour extraction from Spices by different methods.

Unit Outcomes:

At the end of unit, students will be able to

- Study about the importance, production and export status of medicinal crops
- Understand the processing and equipment used for medicinal crops
- Know about active components in various medicinal plants and their application, uses
- Get knowledge on extraction methods, Extraction of Principal Constituents in Spices, Oils & Oleoresins: Flavour extraction from Spices by different methods

Course Outcomes

By the end of the course, the students will be able to

- Know history of spices, uses of spices, classification of processed spices according to marketing standards, packaging and different grades
- Learn about flavor development during processing, classification of spices according to economic importance, post-harvest technology and treatments, specifications for marketed products

TEXT BOOKS

1. Pandey, P. H, Saroj Prakasam, "Post-Harvest Engineering of Horticultural Crops through Objectives". Allahabad 2002.
2. Pruthi, J.S, "Major Spices of India – Crop Management and Post-Harvest Technology". Indian Council of Agricultural Research, Krishi Anusandhan Bhavan, Pusa, New Delhi. PP. 514, 1998

REFERENCES

1. Cardamom, "Chemistry". Purseglove, J.W., E.G. Brown, G.L. Green and S.R.J. Robbins, Spices, Vol. I, Tropical Agricultural Series", Longman, London, 1: 605. (1981)
2. J S Pruthi, "Quality Assurance in Spices and Spice Products – Modern Methods of Analysis" Allied Publishers Limited, New Delhi.

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B.Tech (FT)– II-II Sem

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(19A52301) UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY

(Common to all)

Introduction:

This course discusses the role of human values in one's family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course names as"H-102 Universal Human Values 2 : "Understanding Harmony" is designed which may be covered in their III or IV Semester.

In the Induction Program, students would get an initial exposure to human valuesthroughUniversalHumanValues–I.Thisexposureistobeaugmentedby this compulsory full semester foundation course.

Course Objective:

The objective of the course is four fold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

COURSE TOPICS:

The course has 28 lectures and 14 practice sessions in 5 modules:

Unit 1:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Unit 2:

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Unit 3:

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): 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.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit 4:

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment 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.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Unit 5:

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Book

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

MODE OF CONDUCT (L-T-P-C 2-1-0-2)

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.
In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.
Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

OUTCOME OF THECOURSE:

By the end of the course,

- Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability.
- They would also become sensitive to their commitment towards what they have

understood (human values, human relationship and human society).

- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

L	T	P	C
0	0	3	1.5

(19A27401P) PROCESSING OF FRUIT AND VEGETABLES LAB

Course Objectives

- Estimation of preservatives like benzoic acid and SO_2, different processed products from fruit and vegetables and each operation importance.

LABORATORY EXPERIMENTS

1. Estimation of benzoic acid & SO_2
2. Pectin determination in fruits and vegetable products.
3. Preparation fruit juices e.g. carambola, orange, pineapple, mango etc.
4. Canning of fruits and vegetables
5. Extraction of Pectin (identification pectin rich foods, chemistry and interaction of pectin with other components)
6. Preparation of jams and jellies, marmalade, crystallized & glazed fruit, preserves and candies (knowledge on selection of fruits)
7. Preparation of Syrup, Squash, Crush
8. Preparation of tuti-fruti
9. Preparation of pickles, chutneys
10. Preparation of tomato products
11. Preparation of Papain
12. Drying of fruit and vegetables (Soup powders, dried products)
13. Visit to a Canning Plant
14. Visit to Fruits and Vegetable processing industries; processing of Mushrooms.

Course Outcomes

- The students will learn the all processing methodology of fruit and vegetable products and significance of each unit operation.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

L	T	P	C
0	0	3	1.5

(19A27402P) MECHANICAL OPERATIONS & MATERIAL HANDLING LAB

Course Objectives

- To impart practical orientation of usage of different mills, concept of terminal and settling velocity.
- Calculation of filter cake resistances.

LABORATORY EXPERIMENTS

1. Particle size distribution using sieve shaker.
2. To find out the screen effectiveness of a given sample by vibratory screen
3. To find out the grading efficiency of a given sample by destoner
4. To find out the grading efficiency of a given sample in specific gravity separator
5. To find out the grading efficiency of a given sample in spiral separator
6. Estimation of work index of material in grinding
7. Mixing experimentation and determination of mixing index.
8. Determination of power consumption in mixing/agitation.
9. Determination of equivalent and specific cake resistance in filtration.
10. Determine the efficiency of Cyclone separator.
11. Settling velocity of a particle by sedimentation.
12. Determination of separation efficiency of suspension by using tubular bowl/nozzle centrifuge

Course Outcomes

By the end of the course, the students will be able to

- Find out screen efficiency, grading efficiency & separation efficiency
- Find out particle size distribution
- Find out grinding index
- How to find out resistances in filtration

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

L	T	P	C
3	0	0	0

(19A99301) ENVIRONMENTAL SCIENCE

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 Outcomes

- To know the importance of public awareness
- To know about the various 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.

Course Outcomes:

- To know about various echo systems and their characteristics
- To know about the biodiversity and its conservation

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.

Course Outcomes:

- To know about the various sources of pollution.
- To know about the various sources of solid waste and preventive measures.
- To know about the different types of disasters and their managerial measures**.**

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.

Course Outcomes:

- To know about the social issues related to environment and their protection acts.
- To know about the various sources of conservation of natural resources.
- To know about the wild life protection and forest conservation acts.

UNIT – V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – 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..

Unit Outcomes:

- To know about the population explosion and family welfare programmes.
- To identify the natural assets and related case studies.

Course Outcomes:

At the end of the course, the student will be able to

- Grasp multidisciplinary nature of environmental studies and various renewable and nonrenewable resources.
- Understand flow and bio-geo- chemical cycles and ecological pyramids.
- Understand various causes of pollution and solid waste management and related preventive measures.
- About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
- Casus of population explosion, value education and welfare programmes.

TEXT BOOKS:

1. Text book of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education
3. S.Azeem Unnisa, “Environmental Studies” Academic Publishing Company

4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, Scitech Publications (India), Pvt. Ltd.

REFERENCES:

1. Deeksha Dave and E.Sai Baba Reddy, “Textbook of Environmental Science”, Cengage Publications.
2. M.Anji Reddy, “Text book of Environmental Sciences and Technology”, BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, “Environmental Sciences and Engineering”, Prentice hall of India Private limited
5. G.R.Chatwal, “A Text Book of Environmental Studies” Himalaya Pubilishing House
6. Gilbert M. Masters and Wendell P. Ela, “Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

B.Tech (FT)– III-I Sem

L	T	P	C
2	1	0	3

(19A27501T) HEAT TRANSFER

PREAMBLE

This subject deals with fundamentals of heat transfer mechanisms, emphasis on heat transfer equipment like heat exchangers and evaporators and their selection and applications in food industry.

OBJECTIVES

- To impart knowledge to students on different modes of heat transfer through extended surfaces, study of heat exchanges and evaporators.

UNIT – I

Introduction to heat transfer and general concepts of heat transfer by conduction, convection and radiation. Conduction: Basic concepts of conduction in solids, liquids and gases, steady state temperature fields and one dimensional conduction without heat generation, e.g., through plane walls, cylindrical and spherical surfaces, composite layers, etc. Insulation materials, critical and optimum insulation thickness. Extended surfaces, fins and their practical applications. Introduction to unsteady state heat transfer.

Learning Outcomes:

At the end of unit, students will be able to

- Have basic knowledge on modes of heat transfer
- Understand the concepts of conduction in solids, liquids and gases
- Explain the steady state temp fields and one dimensional conduction without heat generation in plane walls and cylindrical surfaces etc.
- Know the role of insulation and materials used, thickness parameters
- Have idea on practical applications.
- Study the introduction of unsteady state heat transfer

UNIT – II

Convection: Fundamentals of convection, Basic concepts and definitions, natural and forced convection, hydrodynamic and thermal boundary layers, laminar and turbulent heat transfer inside and outside tubes, Dimensional analysis, determination of individual and overall heat transfer coefficients and their temperature dependence, heat transfer in molten metals.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the fundamentals of convection and terminology involved and its types
- Get knowledge on boundary layers and its significance

- Know the laminar and turbulent heat transfer inside and outside tubes
- Have idea on dimensional analysis and role of various numbers in heat transfer
- Determine the individual and overall heat transfer coefficient and their temp dependence

UNIT – III

Radiation: Basic laws of heat transfer by radiation, black body and gray body concepts, view factors, Kirchoff's law, solar radiations, combined heat transfer coefficients by convection and radiation.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the concepts of radiation
- Know the various bodies and its significance
- Get knowledge on solar radiation and its applications
- Study the combined heat transfer coefficient by convection and radiation

UNIT – IV

Heat Transfer with Phase Change: Condensation of pure and mixed vapors, film wise and drop wise condensation, loading in condensers and basic calculation on condensers, heat transfer in boiling liquids, boiling heat transfer coefficients. Heat Transfer Equipment: Classification, principles and design criteria, types of exchangers, viz., double pipe, shell and tube, plate type, extended surface, Furnaces and their classification and application.

Learning Outcomes:

At the end of unit, students will be able to

- Describe the phase changes like condensation and its types, calculation on condensers
- Know the heat transfer in boiling liquids, heat transfer coefficient by boiling
- Understand the heat transfer equipment classification, types and design criteria
- Get knowledge on various applications in food processing

UNIT – V

Evaporation: Elementary principles, parts of evaporator, types of evaporators. Single and multiple effect evaporators and their area calculations, boiling point elevation, selection, types of energy use, thermovapour recompression, mechanical vapor recompression. Fouling prevention, cleaning and hygiene. Applications in food processing.

Learning Outcomes:

At the end of unit, students will be able to

- Know the basic principles of evaporation, parts and types of evaporators.
- Understand the selection criteria and area calculations, boiling point elevation
- Get knowledge on use of energy and various methods
- Explain the occurrence of fouling and its prevention
- Know the cleaning and hygiene
- Have idea on applications of evaporators in food processing

Course Outcomes:

- Students acquire knowledge from different modes of heat transfer, extended surfaces, boiling and condensation process and principles of heat exchangers which are very essential in dairy and food industries

TEXT BOOKS

1. Coulson, J.M. & Richardson, J.F. Butterworth, "Chemical Engineering: Vol-1", 6th Edition. Heinemann(1999)
2. Holman, J.P. "Heat Transfer" 9th Edition.: McGraw Hill (1989).

REFERENCES

1. McAdams W.H. "Heat Transmission", 3rd edition. McGraw-Hill, (1954)
2. Kern D.Q. "Process Heat Transfer" . McGraw Hill Book (1950)
3. Badger W.L. & Bancharo J.T., "Introduction to chemical engineering" Tata McGraw Hill

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B.Tech (FT)– III-I Sem

L	T	P	C
3	0	0	3

(19A27502T) PROCESSING OF MILK AND MILK PRODUCTS

PREAMBLE

This text focuses on physico-chemical properties of milk, equipment used in processing of milk and milk products. Study of different milk products processing and its storage.

OBJECTIVES

- To impart knowledge to the students on milk and milk products processing, manufacturing of indigenous milk products, packaging and storage of milk and milk products

UNIT – I

Fluid Milk: Composition of milk and factors affecting it. Physico-chemical characteristics of milk and milk constituents. Production and collection, cooling and transportation of milk. Tests for milk quality and Adulteration. Pasteurization and Sterilization: Process and equipment for milk pasteurization, direct and indirect sterilization; Ultra - High - Temperature (UHT) sterilization. Fouling of pasteurizers and sterilizers. Aseptic packaging.

Learning Outcomes:

At the end of unit, students will be able to

- Gain knowledge on composition and physicochemical characteristics of milk and its constituents
- Know the importance of quality tests of milk
- Acquires understanding of pasteurization and sterilization, equipment used.

UNIT – II

Homogenizers: principle of operation, design calculation for laminar and turbulent regimes, technology of homogenized milk production. Technology and standards of commercial liquid milk products: Toned, Double Toned Products, Reconstituted, Recombined, Standardized and Fermented Milks etc, FSSAI Specifications. Dairy Chemistry & Microbiology: Roles of lipids, proteins, carbohydrates, minerals, vitamins and enzymes, importance of psychrophilic, mesophilic and thermophilic spoilage organisms in storage.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the importance of homogenizers and equipment design
- Expose various commercial liquid milk products and its standards
- Know the importance of dairy chemistry and microbiology

UNIT – III

Dairy Products Manufacturing: Process Technology and standards of manufacturing of Fermented Products like dahi, shrikhand; lassi; mattha/Chhas and Other Milk Products (Casein, Whey Proteins, Lactose Etc.). Manufacturing of Indigenous dairy products like milk based puddings/ desserts- kheer; payasam; gajar-ka-halwa, FSSAI Specifications.

Learning Outcomes:

At the end of unit, students will be able to

- Illustrate the process technology and standards for manufacturing of different fermented products like dahi, shrikhand, lassi and mattha
- Describe the manufacturing of indigenous dairy products like milk based puddings/desserts – kheer and gajar-ka-halwa
- Know the significance of FSSAI Specifications

UNIT – IV

Definition, Classification, Composition and physico-chemical properties of Cream. Production processes and quality control. Butter: Definition, Classification, Composition and methods of manufacture, Packaging and storage. Butter oil/Ghee. Ice cream: Definition, Classification and Composition, Constituents and their role. Preparation of mixes and freezing of Ice cream, Overrun, Judging, Grading, and defects of Ice cream, FSSAI Specifications.

Learning Outcomes:

At the end of unit, students will be able to

- Gain knowledge on processing of various value added products from milk
- Know the FSSAI Specifications given to milk products

UNIT – V

Evaporated and Condensed milk: Method of manufacture, Packaging and storage. Defects, Causes and prevention. Roller and Spray Drying of milk solids. Instantization. Flow ability, Dustiness, Reconstituability, Dispersability, Wettability, Sinkability and appearance of milk powders. Manufacture of Casein, Whey protein, Lactose from milk or use in formulated foods, FSSAI Specifications.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the process technology of evaporated and condensed milk
- Know the properties of dried milk
- Have knowledge on drying technologies used for milk

Course Outcomes

By the end of the course, the students will be able to

- Know about milk, its constituents, nutritive value, collection and its hygienic handling practices
- Study about Pasteurization, Homogenization and Sterilization of milk
- Learn about manufacture of cream, butter, ghee, yoghurt, cheese, ice-cream, indigenous milk products and milk confectionery

TEXT BOOKS

1. Outlines of dairy technology, Sukumar De. Oxford University Press. New Delhi.
2. P. Walstra, J.T.M.Wouters and T.J. Geurts, "Dairy Science Technology", CRC press, 2nd Edition, 2006.

REFERENCES

1. E. Spreer, "Milk and Dairy Product Technology", 2nd Edition, Marcel Dekker, 1998.
2. R.K. Robinson, "Modern Dairy Technology, Vol. 1: Advances in Milk Processing", 2nd Edition, Aspen Publishers, 1999.
3. R. K. Robinson, "Modern Dairy Technology, Vol. 2: Advances in Milk Products", , 2nd Edition, Aspen Publishers1996.
4. Sukumar De, "Outlines of Dairy Technology", 3rd Edition, Oxford University Press, 2006.
5. C. Eckles, W. Combs, and H. Macy, "Milk and Milk Products", 3rd Edition, Tata McGraw Hill, 2003.
6. E. H. Marth and J. L. Eteele, "Applied Dairy Microbiology", 2nd Edition, Marcel Dekker, 2001.
7. P. Walstra, T.J. Geurts, A. Noomen, and J.S. Van Boekel, "Dairy Technology: Principles of Milk Properties and Processing", Marcel Dekker, Illustrated Edition, 1999.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech – III-I Sem **L T P C**

3 0 0 3

(19A52601T) ENGLISH LANGUAGE SKILLS

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 skills in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. They shouldbe 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 active listening to enable inferential learning through expert lectures and talks
- Impart critical reading strategies for comprehension of complex texts
- Provide training and opportunities to develop fluency in English through participation in formal group discussions and presentations using audio-visual aids
- Demonstrate good writing skills for effective paraphrasing, argumentative essays and formal correspondence
- Encourage use of a wide range of grammatical structures and vocabulary in speech and writing

UNIT -I

Text:

1. **Lines Composed a Few Miles above Tintern Abbey - William Wordsworth**
2. **The Lotos-Eaters - Alfred Tennyson**

Listening: Listening to famous speeches for structure and style

Speaking: Oral presentations on general topics of interest.

Reading: Reading for meaning and pleasure – reading between the lines.

Writing: Appreciating and analyzing a poem –Paraphrasing, note-taking.

Grammar and Vocabulary: Tenses (Advanced Level) Correcting errors in punctuation -Word roots and affixes.

Learning Outcomes

At the end of the module, the learners will be able to

- Understand the purpose of rhythm and rhyme and the use of figures of speech in making the presentation lively and attractive

- Apply the knowledge of structure and style in a presentation, identify the audience and make note of key points
- Make formal structured presentations on general topics using grammatical understanding
- Prioritize information from reading texts after selecting relevant and useful points
- Paraphrase short academic texts using suitable strategies and conventions

UNIT -II

Text: The Model Millionaire – Oscar Wilde

Listening: Following the development of theme; answering questions on key concepts after listening to stories online.
Speaking: Narrating personal experiences and opinions.
Reading: Reading for summarizing and paraphrasing; recognizing the difference between facts and opinions.
Writing: Summarizing, précis writing, letter and note-making
Grammar and Vocabulary: Subject-verb agreement, noun-pronoun agreement, collocations.

Learning Outcomes

At the end of the module, the learners will be able to

- Comprehend academic lectures, take notes and answer questions
- Make formal structured presentations on academic topics
- Distinguish facts from opinions while reading
- Summarize and make a précis of reports
- Use correct english avoiding common errors in formal speech and writing

Unit – III

Text: Speech at IIM Calcutta – AzimPremji

Listening: Identifying views and opinions expressed by different speakers while listening to speeches.
Speaking: Small talks on general topics; agreeing and disagreeing, using claims and examples/ evidences for presenting views, opinions and position.
Reading: Identifying claims, evidences, views, opinions and stance/position.
Writing: Writing structured persuasive/argumentative essays on topics of general interest using suitable claims, examples and evidences.
Grammar and Vocabulary: The use of Active and passive Voice, vocabulary for academic texts
Learning Outcomes

At the end of the module, the learners will be able to

- Critically follow and participate in a discussion
- participate in group discussions using appropriate conventions and language strategies
- comprehend complex texts and identify the author’s purpose

- produce logically coherent argumentative essays
- use appropriate vocabulary to express ideas and opinions

UNIT – IV

Text: A Biography of Steve Jobs

Listening: Listening to identify important moments - Understanding inferences; processing of information using specific context clues from the audio.
Speaking: Group discussion; reaching consensus in group work (academic context).
Reading: Reading for inferential comprehension.
Writing: Applying for internship/ job - Writing one's CV/Resume and cover letter.
Grammar and Vocabulary: Phrasal verbs, phrasal prepositions and technical vocabulary.

Learning Outcomes

At the end of the module, the learners will be able to

- Draw inferences and conclusions using prior knowledge and verbal cues
- Express thoughts and ideas with acceptable accuracy and fluency
- Develop advanced reading skills for deeper understanding of texts
- Prepare a cv and write a cover letter to seek internship/ job
- Understand the use of technical vocabulary in academic writing

UNIT –V

Text: How I Became a Public Speaker - George Bernard Shaw

Listening: Understanding inferences - processing of explicit information presented in the text and implicit information inferable from the text or from previous/background knowledge.
Speaking: Formal team presentations on academic/ general topics.
Reading: Intensive and extensive reading.
Writing: Structure and contents of a Report – Abstract – Project report features.
Grammar and Vocabulary: Correcting common errors, improving vocabulary and avoiding clichés and jargons.

Learning Outcomes

At the end of the module, the learners will be able to

- Develop advanced listening skills for in-depth understanding of academic texts
- Collaborate with a partner to make effective presentations
- Understand and apply the structure of project reports
- Demonstrate ability to use grammatically correct structures and a wide range of vocabulary

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

Text Book

- "Forging Ahead": A Course Book for B.Tech Students. Orient BlackSwan, 2020.

Reference Books

1) Bailey, Stephen. "Academic writing: A handbook for international students". Routledge, 2014.
2) Chase, Becky Tarver. Pathways: Listening, "Speaking and Critical Thinking". Heinley ELT; 2nd Edition, 2018.
3) Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4) Hewings, Martin. "Cambridge Academic English" (B2). CUP, 2012. (Student Book, Teacher Resource Book, CD & DVD)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) – III-I

L	T	P	C
2	0	0	2

(19A27503) FOOD BIOCHEMISTRY & NUTRITION

PREAMBLE

This is an introductory course which gives the necessary details and information to get acquainted with the biochemistry of foods and classification of nutrients as well as nutritional importance.

Course Objectives:

- At the end of this course, the student will have an idea about the various constituents of foods, sources, energy and nutritional requirements and their functions.

UNIT – I

Concepts of food and nutrition: Definition of terms – nutrition, malnutrition (undernutrition, overweight, obesity), health and nutritional status, functions of food, basic food groups – energy yielding, body building and protective, nutrients supplied by food, nutritional needs – requirements and recommended allowances of foods under normal conditions for all age groups. Nutrients: Sources, functions, digestion, absorption, assimilation and transport of carbohydrates, proteins and fats in human beings.

Learning Outcomes:

At the end of unit, students will be able to

- Know basic terminology on nutrition
- Classification of food groups
- Information on RDA of foods
- Role of nutrients in human nutrition

UNIT – II

Mechanism of enzyme action Introduction to enzymes, coenzymes, regulation of enzymatic activity, enzyme kinetics, inhibition effects of pH, allosteric enzymes, derivation of Michaelis-Menten Equation. Nucleic acids Definition and composition of RNA and DNA, structure of various components, viz, bases and sugars, hydrolysis of nucleic acids, structure of RNA and double helical structure of DNA

Learning Outcomes:

At the end of unit, students will be able to

- Explain the enzymes and its types, action mechanism
- Importance of Michaelis-Menten Equation

- Knowledge on Nucleic acids, structure of RNA & DNA

UNIT – III

Metabolism of carbohydrates Biological role of carbohydrates, glycolysis and respiration (TCA cycle), production of ATP- a brief description of electron transport chain, oxidative and substrate phosphorylation. Metabolism of lipids Biological role of lipids, breakdown of triglycerides and phospholipids, β-oxidation of long chain fatty acids, ketosis, biosynthesis of fatty acids, triglycerides and phospholipids.

Learning Outcomes:

At the end of unit, students will be able to

- Acquire knowledge on TCA Cycle and other processes in metabolism of carbohydrates
- Importance of electron transport chain
- Explain the metabolism of lipids

UNIT – IV

Metabolism of proteins Breakdown of proteins, transamination, deamination, decarboxylation, nitrogen fixation, urea cycle. Minerals Functions, sources, factors affecting absorption of minerals, absorption promoters – Vit C for Fe, absorption inhibitors – phytates, tannins, oxalates, effect of deficiency – Calcium, phosphorus, iron, zinc, iodine, fluorine and copper.

Learning Outcomes:

At the end of unit, students will be able to

- Basic concepts of metabolic process related to proteins
- Detailed idea on minerals and its functions

UNIT – V

Vitamins and hormones Classification, functions, sources, effects of deficiency, fat soluble vit (A,D,E,K), water soluble vitamin (thiamine, riboflavin, niacin, cyanocobalamin, folic acid, and ascorbic acid), relationship between vitamins and hormones in terms of their biological role. Physico chemical and nutritional changes during processing Changes during food processing treatment – drying and dehydration, irradiation, freezing, fermentation, canning, restoration, enrichment, fortification and supplementation of foods

Learning Outcomes:

At the end of unit, students will be able to

1. Importance of vitamins and harmones in human nutrition
2. Physic chemical and nutritional changes during processing
3. Changes during processing of foods

Course Outcomes

- Students will able to learn the usefulness of cells and organisms
- Students will understand the metabolic pathways
- Students will get information on types and importance of nutrients

TEXT BOOKS

1. Gaile Moe, Danita Kelley, Jacqueline Berning and Carol Byrd "Perspectives in Nutrition: A Functional Approach", Bredbenner. Wardlaw's McGraw-Hill, Inc., NY, USA. 2013.
2. David L. Nelson and Michael M. Cox. "Principles of Biochemisry", Lehninger 6th Edition. Macmillan Learning, NY, USA. 2012.

REFERENCES

1. Carolyn D. Berdanier, Elaine B. Feldman and Johanna Dwyer."Handbook of Nutrition and Food", 2nd Edition. CRC Press, Boca Raton, FL, USA. 2008.
2. Bob B. Buchanan, Wilhelm Gruissem and Russell L. Jones. "Biochemistry & Molecular Biology of Plants",. John Wiley and Sons, Inc., NY, USA. 2002.
3. Jeremy M. Berg, John L. Tymoczko, Lubert Stryer and Gregory J. Gatto, Jr. "Biochemistry", 7th Edition. W.H. Freeman and Company, NY, USA. 2002.
4. Donald Voet and Judith G. Voet. "Biochemistry", 4th Edition. John Wiley and Sons, Inc., NY, USA. 2011.,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I Sem **L T P C**

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(19A27504a) FOOD NANO TECHNOLOGY
PROFESSIONAL ELECTIVE I

PREAMBLE

This text focuses on usefulness of nanotechnology in food processing and application of nano materials in food industry.

OBJECTIVES

- To understand functional materials in food nanotechnology, Nano-nutraceuticals and Nano functional foods.

UNIT – I

Introduction: Definition of nanotechnology, potential applications related to food, functional materials in food nanotechnology, nano-nutraceuticals and nano functional foods, nanotechnology and risk assessment-regulatory approaches to nanotechnology in food industries.

Learning Outcomes:

At the end of unit, students will be able to

- Know the definition of nanotechnology, potential applications related to food
- Understand functional materials in food nanotechnology, nano-nutraceuticals and nano functional foods
- Get knowledge on nanotechnology and risk assessment-regulatory approaches to nanotechnology in food industries

UNIT – II

Nanomaterials and manufacture: Nanomaterials technology- nano powder production-nano particles manufacture nanotechnology devices- analytical methods for nanotechnology

Learning Outcomes:

At the end of unit, students will be able to

- Acquire knowledge on Nano materials technology, manufacture of nano powder, nano particles
- Explain the manufacture of nanotechnology devices
- Understand the need of analytical methods for nanotechnology

UNIT – III

Nanoparticles: Nanofilters, nanotubes, nanoclay, nanofilms, nanomembranes, nanoemulsions, nanocomposite, nano laminates, nanoscale food additives – nanolycopene

Learning Outcomes:

At the end of unit, students will be able to

- Know about Nanofilters, nanotubes, nanoclay, nanofilms, nanomembranes, nanoemulsions
- Get knowledge on nanocomposite, nano laminates, nanoscale food additives – nanolycopene

UNIT – IV

Nanoscale delivery systems for food functionalization: Liposom**es-** nano cochleates- hydrogels based nanoparticles- dendrimers- lipid nanoparticles- polymeric nano particles- anno crystalline particles – delivery systems – mode of action.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the nanoscale delivery systems for food functionalization like Liposomes- nano cochleates
- Study the hydrogels based nanoparticles- dendrimers- lipid nanoparticles- polymeric nano particles- anno crystalline particles – delivery systems and their mode of action

UNIT – V

Nanotech for food industries: Nanotechnology in food industry- Food quality monitoring- nanosensors nanotechnology in food microbiology-bacterial identification- antimicrobial packaging-improved food storage- green packaging-tracking-tracing and brand products- nanotechnology research in food industry.

Learning Outcomes:

At the end of unit, students will be able to

- Get knowledge Nanotechnology in food industry & Food quality monitoring
- Narrate the nanosensors nanotechnology in food microbiology
- Discuss about the nanotechnology research in food industry

Course Outcomes

- By the end of this course student will attain knowledge on nanotechnology and risk assessment-regulatory approaches to nanotechnology in food industries

TEXT BOOKS

1. Pandua W., “Nanotech Research Methods for Foods and Bioproducts”, Wiley publications 2012.
2. Fulekar M.H., “Nanotechnology - Implications and Applications”, International Publishing House (P) ltd 2010.

REFERENCES

1. Lestie prey, “Nanotech in Food Products”, Wiley publications 2010.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I Sem

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(19A27504b) FOOD REFRIGERATION AND COLD CHAIN
PROFESSIONAL ELECTIVE I

PREAMBLE

This subject emphasis on principles of refrigeration, role of equipment in refrigeration system, cycles, refrigeration load calculations and commercial applications in food industry.

Course Objectives:

- To know the equipment available to store perishable items for a long time
- To understand to increase the storage life of food items

UNIT – I

Principles of refrigeration: Definition, background with second law of thermodynamics, unit of refrigerating capacity, coefficient of performance; Production of low temperatures: Expansion of a liquid with flashing, reversible/ irreversible adiabatic expansion of a gas/ real gas, thermoelectric cooling, adiabatic demagnetization; Air refrigerators working on reverse Carnot cycle: Carnot cycle, reversed Carnot cycle, selection of operating temperatures;

Learning Outcomes:

At the end of unit, students will be able to

- Study about definition, terms and principles of refrigeration, background with second law of thermodynamics
- Understand the Production of low temperatures: Expansion of a liquid with flashing, reversible/ irreversible adiabatic expansion of a gas/ real gas
- Know the necessity of Carnot cycle, reversed Carnot cycle, selection of operating temperatures

UNIT – II

Air refrigerators working on Bell Coleman cycle: Reversed Brayton or Joule or Bell Coleman cycle, analysis of gas cycle, polytropic and multistage compression; Vapour refrigeration: Vapor as a refrigerant in reversed Carnot cycle with p-V and T-s diagrams, limitations of reversed Carnot cycle; Vapour compression system: Modifications in reverse Carnot cycle with vapour as a refrigerant (dry vs wet compression, throttling vs isentropic expansion), representation of vapor compression cycle on pressure- enthalpy diagram, super heating, sub cooling;

Learning Outcomes:

At the end of unit, students will be able to

- Get knowledge on Reversed Brayton or Joule or Bell Coleman cycle, analysis of gas cycle, polytropic and multistage compression
- Study the importance of reversed Carnot cycle with p-V and T-s diagrams, limitations
- Explain the Vapour compression system: Modifications (dry vs wet compression, throttling vs isentropic expansion)
- Make the representation of vapor compression cycle on pressure- enthalpy diagram, super heating, sub cooling

UNIT – III

Liquid-vapour regenerative heat exchanger for vapour compression system, effect of suction vapour super heat and liquid sub cooling, actual vapour compression cycle; Vapour-absorption refrigeration system: Process, calculations, maximum coefficient of performance of a heat operated refrigerating machine, Common refrigerants and their properties: classification, nomenclature, desirable properties of refrigerants- physical, chemical, safety, thermodynamic and economical; Azeotropes; Components of vapour compression refrigeration system, evaporator, compressor, condenser and expansion valve;

Learning Outcomes:

At the end of unit, students will be able to

- Understand the Liquid-vapour regenerative heat exchanger for vapour compression system
- Explain Vapour-absorption refrigeration system: Process, calculations, Common refrigerants and their properties
- Classify and its nomenclature, desirable properties of refrigerants
- Describe the Azeotropes; Components of vapour compression refrigeration system

UNIT – IV

Ice manufacture, principles and systems of ice production, Treatment of water for making ice, brines, freezing tanks, ice cans, air agitation, quality of ice; Cold storage: Cold store, design of cold storage for different categories of food resources, size and shape, construction and material, insulation, vapour barriers, floors, frost-heave, interior finish and fitting, evaporators, automated cold stores, security of operations; Refrigerated transport: Handling and distribution, cold chain, refrigerated product handling, order picking, refrigerated vans, refrigerated display;

Learning Outcomes:

At the end of unit, students will be able to

- Understand the Ice manufacture, principles and systems of ice production, Treatment of water for making ice, ice cans
- Get know about Cold store, design of cold storage for different categories of food resources, size and shape, construction and material and etc.
- Acquire knowledge on cold chain, refrigerated product handling, order picking, refrigerated vans and etc.

UNIT – V

Air-conditioning: Meaning, factors affecting comfort air-conditioning, classification, sensible heat factor, industrial air-conditioning, problems on sensible heat factor; Winter/summer/year round air-conditioning, unitary air-conditioning systems, central air-conditioning, physiological principles in air-conditioning, air distribution and duct design methods; design of complete air-conditioning systems; humidifiers and dehumidifiers; Cooling load calculations: Load sources, product cooling, conducted heat, convected heat, internal heat sources, heat of respiration, peak load; etc.

Learning Outcomes:

At the end of unit, students will be able to

- Know the Meaning, factors affecting comfort air-conditioning, classification, sensible heat factor and its problems, industrial air-conditioning
- Understand physiological principles in air-conditioning and various methods of air-conditioning
- Study the design of complete air-conditioning systems, humidifiers and dehumidifiers; Cooling load calculations

Course Outcomes

By the end of the course, the students will

- Understand the different equipment useful to store the food items for a long period.
- Understand to increase the storage life of food items

TEXT BOOKS

1. Arora, C. P. “Refrigeration and Air Conditioning”. Tata MC Graw Hill Publishing Co.Ltd., New Delhi. 1993.

REFERENCES

1. Adithan, M. and Laroiya, S. C. “Practical Refrigeration and Air Conditioning”. Wiley Estern Ltd., New Delhi 1991.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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(19A27504c) FOOD SAFETY MANAGEMENT SYSYTEM
PROFESSIONAL ELECTIVE I

PREAMBLE

This text focuses on coverage in food safety and regulations in various countries and their implementation.

Course Objectives:

- To understand the general aspects of food safety management system.
- To study the importance of implementing Food safety managements systems in industries

UNIT – I

Introduction, concept of food safety and Food Security. Indian and Food Regulatory Regime (Existing and old), FSSAI, PFA Act and Rules, Food Licensing and Registration System, Food Import Clearance System. Food hazards and contaminations - biological (bacteria, viruses and parasites), chemical (toxic constituents / hazardous materials) pesticides residues / environmental pollution / chemicals) and physical factors. Preventive food safety systems - monitoring of safety, wholesomeness and nutritional quality of food. Prevention and control of microbiological and chemical hazards.

Learning Outcomes:

At the end of unit, students will be able to understand following

- Introduction, concept of food safety and Food Security
- Indian and Food Regulatory Regime (Existing and old), FSSAI, PFA Act and Rules
- Food Licensing and Registration System, Food Import Clearance System. Food hazards and contaminations
- Preventive food safety systems, Prevention and control of microbiological and chemical hazards.

UNIT – II

Food Safety and Standards Act, 2006, Food Safety Standards Regulation, Essential Commodities Act, 1955, Global Scenario, Codex Alimentarius, WHO/FAO Expert Bodies (JECFA/JEMRA/JMPR). Food safety inspection services (FSIS) and their utilization. Legal Metrology act, Weight and Measurement act.

Learning Outcomes:

At the end of unit, students will be able to understand the need of studying following

- Food Safety and Standards Act, 2006 & Regulations
- Essential Commodities Act, 1955, Global Scenario, Codex Alimentarius, WHO/FAO Expert Bodies (JECFA/JEMRA/JMPR)
- Food safety inspection services (FSIS) and their utilization.
- Legal Metrology act, Weight and Measurement act.

UNIT – III

Introduction to OIE and IPPC, Other International Food Standards (e.g. European Commission, USFDA etc). WTO: Introduction to WTO Agreements: SPS and TBT Agreement, Export and Import Laws and Regulations, Export (Quality Control and Inspection) Act, 1963. Customs Act and Import Control Regulations, Other Voluntary and mandatory product specific regulations, Other Voluntary National Food Standards: BIS Other product specific standards; AGMARK. Nutritional Labeling, Health claims.

Learning Outcomes:

At the end of unit, students will be able to understand the follwoing

- Introduction to OIE and IPPC, Other International Food Standards (e.g. European Commission, USFDA etc).
- WTO: Introduction to WTO Agreements: SPS and TBT Agreement, Export and Import Laws and Regulations
- Customs Act and Import Control Regulations, Other Voluntary and mandatory product specific regulations
- Other Voluntary National Food Standards: BIS Other product specific standards; AGMARK
- Nutritional Labeling, Health claims

UNIT – IV

Risk assessment studies: Risk management, risk characterization and communication. Concept and Implementation of HACCP in a food premises.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the Risk management, risk characterization and communication
- Know the necessity of Concept and Implementation of HACCP in a food premises.

UNIT – V

Voluntary Quality Standards and Certification. GMP, GHP, GAP, Good Animal Husbandry Practices, ISO 9000, ISO 22000, ISO 14000, ISO 17025, PAS 22000, FSSC 22000, BRC, BRCIOP, IFS, SQF 1000, SQF 2000. Role of NABL, CFLS. Halal & Kosher Standard.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Voluntary Quality Standards and Certification like GMP, GHP, GAP
- ISO 9000, ISO 22000, ISO 14000, ISO 17025 and etc.
- Role of NABL, CFLS. Halal & Kosher Standard

Course Outcomes:

- At the end of the course student will gain knowledge on various food safety and regulatory aspects, Food standards regulatory bodies etc.

TEXT BOOKS

1. Singal RS, "Handbook of Indices of Food Quality and Authenticity". Woodhead Publ. Cambridge, UK.
2. Shapton DA, "Principles and Practices of Safe Processing of Foods". Butterworth Publication, London.

REFERENCES

1. Jacob MB, "The Chemical Analysis of Foods and Food Products". CBS Publications. New Delhi.
2. Pomeranze Y, "Food Analysis - Theory and Practice". CBS Publications, New Delhi.
3. FSSAI website: www.fssai.gov.in
4. Winton AL, "Techniques of Food Analysis". Allied Science Publications New Delhi.

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(19A27504d) MARKETING MANAGEMENT & INTERNATIONAL TRADE PROFESSIONAL ELECTIVE I

PREAMBLE

This text focuses on marketing and their strategies and reaching consumer with new marketing methods.

Course Objectives

- To understand advantage of advertising and other sources.
- To know the consumer behavior.

UNIT – I

Concept of marketing, functions of marketing, Concepts of marketing management, scope of marketing management, Marketing management process, Concepts of marketing- mix, elements of marketing- mix. Concept of market structure, Marketing environment -Micro and macro environments

Learning Outcomes:

At the end of unit, students will be able to

- Get knowledge on concept and functions of marketing
- Explain the scope and process involved in marketing management
- Understand the Concepts of marketing- mix, elements of marketing- mix
- Know the Concept of market structure, Marketing environment - Micro and macro environments

UNIT – II

Consumers buying behaviour, consumerism, Marketing opportunities analysis: marketing research and marketing information systems. Market measurement- present and future demand, market forecasting, Market segmentation, targeting and positioning, Allocation and marketing resources

Learning Outcomes:

At the end of unit, students will be able to

- Discuss the Consumers buying behaviour, consumerism
- Understand the Marketing opportunities analysis: marketing research and marketing information systems

- Know the Market measurement- present and future demand, market forecasting
- Explain the Market segmentation, targeting and positioning, Allocation and marketing resources

UNIT – III

Marketing planning process, Product policy and planning: product-mix, product line, product life cycle, new product development process, Product brand, packaging, services decisions, Marketing channel decisions. Retailing, wholesaling and distribution. Pricing decisions, Price determination and pricing policy of milk products in organized and unorganized sectors of dairy industry. Promotion-mix decisions.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the Marketing planning process like product-mix, product line, product life cycle, New product development process
- Get knowledge on Product brand, packaging, services decisions, Marketing channel decisions
- Know the Pricing decisions, Price determination and pricing policy of milk products in organized and unorganized sectors of dairy industry

UNIT – IV

Advertising, how advertising works, deciding advertising objectives, Advertising budget Advertising message, media planning, personal selling, publicity, sales promotion World consumption of food: Patterns and types of food consumption across the globe. International marketing and international trade, salient features of international marketing. Composition & direction of Indian exports, international marketing environment. Deciding which & how to enter international market

Learning Outcomes:

At the end of unit, students will be able to

- Know the need of Advertising, how advertising works, deciding advertising objectives
- Get knowledge on Advertising budget Advertising message, media planning, personal selling, publicity, sales promotion World consumption of food
- Understand the International marketing and international trade, salient features of international marketing.
- Study of Composition & direction of Indian exports, international marketing environment.

UNIT – V

Exports- direct exports, indirect exports, Licensing, Joint ventures, Direct investment. Export trends and prospects of food products in India Government institutions related to international

food trade: APEDA, Tea Board, Spice Board, MOFPI, etc. WTO and world trade agreements related to food business.

Learning Outcomes:

At the end of unit, students will be able to

- Know the Exports- direct exports, indirect exports, Licensing, Joint ventures, Direct investment
- Get knowledge on Export trends and prospects of food products in India Government institutions related to international food trade: APEDA, Tea Board, Spice Board, MOFPI, etc.
- Understand the WTO and world trade agreements related to food business.

Course Outcomes:

By the end of the course

- Students will gain knowledge on concept of marketing and various environments
- Students will acquire knowledge on Exports and different bodies working in India related to exports

TEXT BOOKS

1. Philip Kotler, Kevin Lane Keller, Abraham Koshy, Mithileshwar Jha. 2013. A South Asian Perspective, "Marketing Management", 14th Edition. Pearson Education.

REFERENCES

1. C.N. Sontakki. "Marketing Management". Kalyani Publishers, New Delhi.
2. John Daniels, Lee Radebaugh, Brigham, Daniel Sullivan., "International Business". 15th Edition., Pearson Education.
3. Aswathappa. "International Business". Tata McGraw-Hill Education, New Delhi.
4. Willium J. Stanton. "Fundamentals of Marketing". Tata McGraw-Hill Publication, New Delhi. 1984.
5. Fransis Cherunilam. "International Business: Text and Cases". 5th Edition. PHI Learning, New Delhi.

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(19A27504e) ENERGY AUDIT AND CONSERVATION
PROFESSIONAL ELECTIVE I

PREAMBLE

This text focuses on energy conservation and engineering behind conservation, energy saving by various ways and their utilization.

Course Objectives:

- To know different sources of energy
- To understand the no. of technologies used for energy conservation
- To acquire knowledge on energy saving and their utility

UNIT – I

Fundamentals of Engineering Analysis and Management: Fundamentals of Heat Transfer, Fluid Mechanics, and Thermodynamics in Food Processing, Fundamentals of Energy Auditing, Sustainability in the Food Industry

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Fundamentals of Heat Transfer, Fluid Mechanics, and Thermodynamics in Food Processing
- Fundamentals of Energy Auditing, Sustainability in the Food Industry

UNIT – II

Energy Conservation Technologies Applied to Food Processing Facilities: Energy Conservation in Steam Generation and Consumption System, in Compressed Air System, in Power and Electrical Systems, in Heat Exchangers, Waste-Heat Recovery and Thermal Energy Storage in Food Processing Facilities, novel Thermodynamic Cycles Applied to the Food Industry for Improved Energy Efficiency

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Energy Conservation in Steam Generation and Consumption System, in Compressed Air System, in Power and Electrical Systems, in Heat Exchangers

- Waste-Heat Recovery and Thermal Energy Storage in Food Processing Facilities, novel Thermodynamic Cycles Applied to the Food Industry for Improved Energy Efficiency

UNIT – III

Energy Saving Opportunities in Existing Food Processing Facilities: Energy Consumption pattern, Energy Conservation in Grains and Oilseeds Milling Facilities, in Sugar and Confectionary Processing Facilities, in Fruit and Vegetable Processing Facilities, in Dairy Processing Facilities, in Meat Processing Facilities, in Bakery Processing Facilities

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Energy Consumption pattern, Energy Conservation in Grains and Oilseeds Milling Facilities, in Sugar and Confectionery.
- Energy Conservation in Fruit and Vegetable Processing Facilities, in Dairy Processing Facilities, in Meat Processing Facilities, in Bakery Processing.

UNIT – IV

Energy Conservation in Emerging Food Processing Systems: Membrane Processing of Foods, Energy Efficiency and Conservation in Food Irradiation, in Pulsed Electric Fields Treatment, in High-Pressure Food Processing, in Microwave Heating, in Supercritical Fluid Processing

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Energy Conservation in Membrane Processing of Foods, Energy Efficiency and Conservation in Food Irradiation,
- Energy Conservation in Pulsed Electric Fields Treatment, in High-Pressure Food Processing, in Microwave Heating, in Supercritical Fluid Processing

UNIT – V

Conversion of Food Processing Wastes into Energy: Food Processing Wastes and Utilizations, Anaerobic Digestion of Food Processing Wastes, Fermentation of Food Processing Wastes into Transportation Alcohols, Bio-diesel Production from Waste Oils and Fats, Thermo-chemical Conversion of Food Processing Wastes for Energy Utilization

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Food Processing Wastes and Utilizations, Anaerobic Digestion of Food Processing Wastes

- Fermentation of Food Processing Wastes into Transportation Alcohols, Bio-diesel Production from Waste Oils and Fats
- Thermo-chemical Conversion of Food Processing Wastes for Energy Utilization

Course Outcomes:

By the end of course

- Students will gain knowledge on engineering behind conservation, technologies used for energy conservation and energy from various wastes and saving of energy.

TEXT BOOKS

1. Lijun Wang, "Energy Efficiency and Management in Food Processing Facilities". CRC Press, 1st Edition, 2009.
2. R.P. Singh, "Energy in Food Processing". 1st Edition, Elsevier Publishing Co. Amsterdam, 1986.

REFERENCES

1. Berit Mattsson and Ulf Sonesson, "Environmentally Friendly Food Processing", 1st Edition, CRC Press, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)–III-I

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(19A01506a) EXPERIMENTAL STRESS ANALYSIS
OPEN ELECTIVE-I

Course Objective:

To bring awareness on experimental method of finding the response of the structure to different types of load.

- Demonstrates principles of experimental approach.
- Teaches regarding the working principles of various strain gauges.
- Throws knowledge on strain rosettes and principles of non destructive testing of concrete.
- Gives an insight into the principles of photo elasticity.

UNIT-I

PRINCIPLES OF EXPERIMENTAL APPROACH: - Merits of Experimental Analysis Introduction, uses of experimental stress analysis advantages of experimental stress analysis, Different methods –Simplification of problems.

Learning outcomes:

At the end of the unit, students will be able to:

- Demonstrate the merits and principles of experimental approach
- Give an insight into the uses and advantages of experimental stress analysis

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.

Learning outcomes:

At the end of the unit, students will be able to:

- Introduce various strain gauge systems and their properties
- Give information regarding the gauge factor and materials of adhesion bases

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.

Learning outcomes:

At the end of the unit, students will be able to:

- Introduces various strain rosettes and corrections for strain gauges
- Gives an insight into the destructive and non destructive testing of concrete

UNIT-IV

THEORY OF PHOTOELASTICITY: - Introduction –Temporary Double refraction – The stress Optic Law –Effects of stressed model in a polariscope for various arrangements – Fringe Sharpening. Brewster‟s Stress Optic law.

Learning outcomes:

At the end of the unit, students will be able to:

- Introduces stress optic laws.
- Gives the arrangements and working principles of polariscope.

UNIT-V

TWO DIMENSIONAL PHOTOELASTICITY: - Introduction – Iso-chromatic 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.

Learning outcomes:

At the end of the unit, students will be able to:

- Introduces the understanding of different fringe patterns.
- Introduces model analysis and properties of photo elastic materials.

Course Outcomes:

After completion of the course

- The student will be able to understand different methods of experimental stress analysis
- The student will be able to understand the use of strain gauges for measurement of strain
- The student will be exposed to different Non destructive methods of concrete
- The student will be able to understand the theory of photo elasticity and its applications in analysis of structures

TEXT BOOKS:-

1. J.W.Dally and W.F.Riley, “Experimental stress analysis College House Enterprises”
2. Dr.Sadhu Singh, “Experimental stress analysis”, khanna Publishers

REFERENCE BOOKS:

1. U.C.Jindal, “Experimental Stress analysis”, Pearson Publications.
2. L.S.Srinath, “Experimental Stress Analysis”, MC.Graw Hill Company Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) –III-I

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(19A01506b) BUILDING TECHNOLOGY
OPEN ELECTIVE-I

Course Objectives:

- To impart to know different types of buildings, principles and planning of the buildings.
- To identify the termite control measure in buildings, and importance of grouping circulation, lighting and ventilation aspects in buildings.
- To know the different modes of vertical transportation in buildings.
- To know the utilization of prefabricated structural elements in buildings.
- To know the importance of acoustics in planning and designing of buildings.

UNIT-I

Overview of the course, basic definitions, buildings-types-components- economy and design-principles of planning of buildings and their importance. Definitions and importance of grouping and circulation-lighting and ventilation-consideration of the above aspects during planning of building.

Learning outcomes:

At the end of the unit, students will be able to:

- To be able to plan the building with economy and according to functional requirement**.**

UNIT-II

Termite proofing: Inspection-control measures and precautions- lighting protection of buildings-general principles of design of openings-various types of fire protection measures to be considered while panning a building.

Learning outcomes:

At the end of the unit, students will be able to:

- Able to know the termite proofing technique to the building and protection form lightening effects.
- To be able to know the fire protection measure that are to be adopted while planning a building.

UNIT-III

Vertical transportation in a building: Types of vertical transportation-stairs-different forms of stairs- planning of stairs- other modes of vertical transportation – lifts-ramps-escalators.

Learning outcomes:

At the end of the unit, students will be able to:

- To be able to know the different modes of vertical transportation and their suitability

UNIT-IV

Prefabrication systems in residential buildings- walls-openings-cupboards-shelves etc., planning and modules and sizes of components in prefabrication. Planning and designing of residential buildings against the earthquake forces, principles, seismic forces and their effect on buildings.

Learning outcomes:
At the end of the unit, students will be able to:

- Identify the adoption of prefabricated elements in the building.
- Know the effect of seismic forces on buildings

UNIT-V

Acoustics – effect of noise – properties of noise and its measurements, principles of acoustics of building. Sound insulation- importance and measures.

Learning outcomes:
At the end of the unit, students will be able to:

- To know the effect of noise, its measurement and its insulation in planning the buildings

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

- Understand the principles in planning and design the buildings.
- Know the different methods of termite proofing in buildings.
- Know the different methods of vertical transportation in buildings.
- Know the implementation of prefabricated units in buildings and effect of earthquake on buildings.
- Know the importance of acoustics in planning and designing of buildings.

TEXT BOOKS :

1. Varghese, “Building construction”, PHI Learning Private Limited.
2. Punmia.B.C, “Building construction”, Jain.A.K and Jain.A.K Laxmi Publications.
3. S.P.Arora and S.P.Brndra “Building construction”, Dhanpat Rai and Sons Publications, New Delhi
4. “Building construction-Technical teachers training institute”, Madras, Tata McGraw Hill.

REFERENCE BOOKS:

1. National Building Code of India, Bureau of Indian Standards

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) –III-I

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(19A02506a) ELECTRICAL ENGINEERING MATERIALS
(OPEN ELECTIVE-I)

Course Objectives:

To make the students learn about

- Classification of materials.
- Properties of materials and its applications.
- Domestic wiring and earthing

UNIT-I Conducting Materials

Introduction – classification of materials – Metals and Non metals, physical, thermal, mechanical and electrical properties of materials – classification of electrical materials – concept of atom – electron configuration of atom, conductors, general properties of conductors, factors effecting resistivity of electrical materials –electrical/mechanical/thermal properties of copper, aluminum, iron, steel, lead, tin and their alloys – applications.

Learning outcomes:

At the end of the unit, students will be able to:

- Uunderstand the classification of conducting materials.
- Analyze the properties of different conducting materials
- Apply the materials where it is applicable
- Know about electron configuration of atom

UNIT-II Dielectric and High Resistivity Materials

Introduction – solid, liquid and gaseous dielectrics, leakage current, permittivity, dielectric constant, dielectric loss – loss angle – loss constant, Breakdown voltage and dielectric strength of – solid, liquid and gaseous dielectrics, effect of break down– electrical and thermal effects, Polarization – electric, ionic and dipolar polarization. Effect of temperature and Frequency on dielectric constant of polar dielectrics. High Resistivity materials – electrical / thermal / mechanical properties of Manganin, Constantan, Nichrome, Tungsten, Carbon and Graphite and their applications in electrical equipment.

Learning outcomes:

At the end of the unit, students will be able to:

- Understand the classification of dielectric and high resistivity materials.
- Analyze the properties of dielectric and high resistivity materials
- Understand about concept of polarization and dipolar polarization
- Apply the materials where it is applicable

UNIT-III Solid Insulating Materials

Introduction – characteristics of a good electrical insulating materials – classification of insulating materials – electrical, thermal, chemical and mechanical properties of solid insulating materials - Asbestos, Bakelite, rubber, plastics, thermo plastics. Resins, polystyrene, PVC, porcelain, glass, cotton and paper.

Learning outcomes:

At the end of the unit, students will be able to:

- Understand about various characteristics of solid insulating materials
- Understand the classification of solid insulating materials.
- Analyze the properties of solid insulating materials
- Apply the materials where it is applicable

UNIT-IV Liquid & Gas Insulating Materials

Liquid insulating materials – Mineral oils, synthetic liquids, fluorinated liquids – Electrical, thermal and chemical properties – transformer oil – properties – effect of moisture on insulation properties Gaseous insulators – classification based on dielectric strength – dielectric loss, chemical stability properties and their applications.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the classification of liquid insulating materials.
- Analyze the properties of liquid insulating materials
- Apply the materials where it is applicable
- Understand about properties and classification of gaseous insulators

UNIT-V Domestic Wiring

Wiring materials and accessories – Types of wiring – Types of Switches - Specification of Wiring – Stair case wiring - Fluorescent lamp wiring- Godown wiring – Basics of Earthing – single phase wiring layout for a residential building.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand about wiring materials and accessories
- Understand about earthing and wiring layout of domestic buildings
- Design and develop Residential wiring
- Know about godown wiring

Course Outcomes:

After completing the course, the student should be able to:

- Understand the classification of materials, domestic wiring materials and earthing.
- Analyze the properties of different electrical materials
- Apply where the materials are applicable based on properties of materials
- Design and develop Residential wiring, godown wiring and earthing.

Text Books:

1. G.K. Mithal, “Electrical Engineering Materials”, Khanna publishers, 2nd edition, 1991.
2. R.K. Rajput, A course in “Electrical Engineering Materials”, Laxmi publications, 2009.

Reference Books:

1. C.S. Indulkar and S. Thiruvengadam, "An Introduction to Electrical Engineering Materials" S Chand & Company, 2008.
2. Technical Teachers Training Institute, "Electrical engineering Materials", 1st Edition, Madras, McGraw Hill Education, 2004.
3. by S.P. Seth, "A course in Electrical Engineering Materials Physics Properties & Applications", Dhanapat Rai & Sons Publications, 2018.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I

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(19A03506a) INTRODUCTION TO HYBRID AND ELECTRIC VEHICLES
OPEN ELECTIVE-I

Course Objectives:

- Provide good foundation on hybrid and electrical vehicles.
- To address the underlying concepts and methods behind power transmission in hybrid and electrical vehicles.
- Familiarize energy storage systems for electrical and hybrid transportation.
- To design and develop basic schemes of electric vehicles and hybrid electric vehicles.

UNIT I: Electric Vehicle Propulsion and Energy Sources

Introduction to electric vehicles, vehicle mechanics - kinetics and dynamics, roadway fundamentals propulsion system design - force velocity characteristics, calculation of tractive power and energy required, electric vehicle power source - battery capacity, state of charge and discharge, specific energy, specific power, Ragone plot. battery modeling - run time battery model, first principle model, battery management system- soc measurement, battery cell balancing. Traction batteries - nickel metal hydride battery, Li-Ion, Lipolymer battery.

Learning Outcomes:

After successful completion of this unit, the students will be able to

- Summaries the concepts of electrical vehicle propulsion and energy sources. (l2)
- Identify the types of power sources for electrical vehicles.(l3)
- Demonstrate the design considerations for propulsion system. (l2)
- Solve the problems on tractive power and energy required. (l3)

UNIT II: Electric Vehicle Power Plant And Drives

Introduction electric vehicle power plants. Induction machines, permanent magnet machines, switch reluctance machines. Power electronic converters-DC/DC converters - buck boost converter, isolated DC/DC converter. Two quadrant chopper and switching modes. AC drives-PWM, current control method. Switch reluctance machine drives - voltage control, current control.

Learning Outcomes:

After successful completion of this unit, the students will be able to

- Choose a suitable drive scheme for developing an electric vehicles depending on resources.(l1)
- List the various power electronic converters. (l1)
- Describe the working principle dc/dc converters and buck boost convertor. (l2)
- Explain about ac drives. (l2)

UNIT III: Hybrid And Electric Drive Trains

Introduction hybrid electric vehicles, history and social importance, impact of modern drive trains in energy supplies. Hybrid traction and electric traction. Hybrid and electric drive train topologies. Power flow control and energy efficiency analysis, configuration and control of DC motor drives and induction motor drives, permanent magnet motor drives, switch reluctance motor drives, drive system efficiency.

Learning Outcomes:

After successful completion of this unit, the students will be able to

- Identify the social importance of hybrid vehicles. (l3)
- Discus impact of modern drive trains in energy supplies. (l6)
- Compare hybrid and electric drive trains.(l2)
- Analyze the power flow control and energy efficiency. (l6)

UNIT IV: Electric and Hybrid Vehicles - Case Studies

Parallel hybrid, series hybrid -charge sustaining, charge depleting. Hybrid vehicle case study – Toyota Prius, Honda Insight, Chevrolet Volt. 42 V system for traction applications. Lightly hybridized vehicles and low voltage systems. Electric vehicle case study - GM EV1, Nissan Leaf, Mitsubishi Miev. Hybrid electric heavy duty vehicles, fuel cell heavy duty vehicles.

Learning Outcomes:

After successful completion of this unit, the students will be able to

- List the various electric and hybrid vehicles in the present market. (l1)
- Discus lightly hybridized vehicle and low voltage systems.(l6)
- Explain about hybrid electric heavy duty vehicles and fuel cell heavy duty vehicles. (l2)

UNIT V: Electric And Hybrid Vehicle Design :

Introduction to hybrid vehicle design. Matching the electric machine and the internal combustion engine. Sizing of propulsion motor, power electronics, drive system. Selection of energy storage technology, communications, supporting subsystem. Energy management strategies in hybrid and electric vehicles - energy management strategies- classification, comparison, implementation.

Learning Outcomes:

After successful completion of this unit, the students will be able to

- Illustrate matching the electric machine and the internal combustion engine. (l2)
- Select the energy storage technology. (l3)
- Select the size of propulsion motor. (l3)

- Design and develop basic schemes of electric and hybrid electric vehicles. (l3)

Course outcomes:

After learning the course the students will be able to:

- Explain the working of hybrid and electric vehicles. (l2)
- Choose a suitable drive scheme for developing an hybrid and electric vehicles depending on resources. (l3)
- Develop the electric propulsion unit and its control for application of electric vehicles.(l3)
- Choose proper energy storage systems for vehicle applications. (l3)
- Design and develop basic schemes of electric vehicles and hybrid electric vehicles.(l3)

Text Books :

1. Iqbal Hussein, "Electric and Hybrid Vehicles: Design Fundamentals", 2nd edition, CRC Press, 2003.
2. Amir Khajepour, M. Saber Fallah, Avesta Goodarzi, "Electric and Hybrid Vehicles: Technologies, Modeling and Control - A Mechatronic Approach", illustrated edition, John Wiley & Sons, 2014.
3. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004.

References:

1. James Larminie, John Lowry, "Electric Vehicle Technology", Explained, Wiley, 2003.
2. John G. Hayes, G. Abas Goodarzi, "Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles", 1st edition, Wiley-Blackwell, 2018.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) – III-I

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(19A03506b) RAPID PROTOTYPING
OPEN ELECTIVE-I

Course Objectives:

- Familiarize techniques for processing of CAD models for rapid prototyping.
- Explain fundamentals of rapid prototyping techniques.
- Demonstrate appropriate tooling for rapid prototyping process.
- Focus Rapid prototyping techniques for reverse engineering.
- Train Various Pre – Processing, Processing and Post Processing errors in RP Processes.

UNIT – I **10 Hours**

Introduction: Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP. **RP Software:** Need for RP software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, SolidView, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.

Learning Outcomes:

At the end of the unit, the student will be able to

- Explain prototyping process. (l2)
- Classify different rapid prototyping processes. (l2)
- Summarize rp software's and represent a 3d model in stl format, other rp data formats. (l2)

UNIT – II **8 Hours**

Solid and Liquid Based RP Systems: Stereolithography (SLA): Principle, Process, Materials, Advantages, Limitations and Applications. Solid Ground Curing (SGC): Principle, Process, Materials, Advantages, Limitations, Applications.

Fusion Deposition Modeling (FDM): Principle, Process, Materials, Advantages, Limitations, Applications. **Laminated Object Manufacturing (LOM):** Principle, Process, Materials, Advantages, Limitations, Applications.

Learning Outcomes:

At the end of the unit, the student will be able to

- Explain the principles, advantages, limitations and applications of Solid and Liquid based AM systems. (L2)
- Identify the materials for Solid and Liquid based AM systems. (L2)

UNIT – III **8 Hours**

Powder Based RP Systems: Principle and Process of Selective Laser Sintering (SLS), Advantages, Limitations and Applications of SLS, Principle and Process of Laser Engineered Net Shaping (LENS), Advantages, Limitations and Applications of LENS, Principle and Process of Electron Beam Melting (EBM), Advantages, Limitations and Applications of EBM.
Other RP Systems: Three Dimensional Printing (3DP): Principle, Process, Advantages, Limitations and Applications. Ballastic Particle Manufacturing (BPM): Principle, Process, Advantages, Limitations, Applications. Shape Deposition Manufacturing (SDM): Principle, Process, Advantages, Limitations, Applications.

Learning Outcomes:

At the end of the unit, the student will be able to

- Explain the principles, advantages, limitations and applications of powder based AM systems. (L2)
- Understand the principles, advantages, limitations and applications of other Additive Manufacturing Systems such as 3D Printing, Ballistic Particle Manufacturing and Shape Deposition Modeling. (L2)

UNIT – IV **8 Hours**

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.
Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development.

Learning Outcomes:

At the end of the unit, the student will be able to

- Classify Rapid Tooling methods. (L2)
- Explain the concepts of reverse engineering and scanning tools. (L2)

UNIT – V **8 Hours**

Errors in RP Processes: Pre-processing, processing, post-processing errors, Part building errors in SLA, SLS, etc.
RP Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Learning Outcomes:

At the end of the unit, the student will be able to

- Identify various Pre – Processing, Processing and Post – Processing errors in RP processes. (L2)

- Apply of RP in engineering design analysis and medical applications. (L3)

Course Outcomes:

At the end of the course, the student will be able to

- Use techniques for processing of CAD models for rapid prototyping. (L3)
- Understand and apply fundamentals of rapid prototyping techniques. ((L3)
- Use appropriate tooling for rapid prototyping process. (L3)
- Use rapid prototyping techniques for reverse engineering. (L3)
- Identify Various Pre – Processing, Processing and Post Processing errors in RP processes. (L3)

Text Books:

1. Chua C.K., Leong K.F. and Lim C.S., "Rapid Prototyping: Principles and Applications", 2nd edition, World Scientific Publishers, 2003.
2. Ian Gibson, David W. Rosen, Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", 1st Edition, Springer, 2010.
3. Rafiq Noorani, "Rapid Prototyping: Principles and Applications in Manufacturing", John Wiley & Sons, 2006.

Reference Books:

1. Liou W. Liou, Frank W., Liou, "Rapid Prototyping and Engineering Applications: A Tool Box for Prototype Development", CRC Press, 2007.
2. Pham D.T. and Dimov S.S., "Rapid Manufacturing; The Technologies and Application of RPT and Rapid tooling", Springer, London 2001.
3. Gebhardt A., "Rapid prototyping", Hanser Gardener Publications, 2003.
4. Hilton P.D. and Jacobs P.F., "Rapid Tooling: Technologies and Industrial Applications", CRC Press, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I **L T P C**

3 0 0 3

(19A04506a) ANALOG ELECTRONICS
OPEN ELECTIVE-I

Course Objectives:

- To understand the characteristics of various types of electronic devices and circuits (L1).
- To apply various principles of electronic devices and circuits to solve complex Engineering problems (L2).
- To analyze the functions of various types of electronic devices and circuits (L3).
- To evaluate the functions of various types of electronic devices and circuits in real time applications (L3).
- To design various types of electronic circuits for use in real time applications (L4).

UNIT-I:

Diodesand Applications

Properties of intrinsic and extrinsic semiconductor materials. Characteristics of PN junction diode and Zener diode. Applications of PNdiode as a switch, rectifier and Zener diode as regulator. Special purpose diodes: Schottky diode, Tunnel diode, Varactor diode, 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 (L1).
- Apply the principles of diodes to solve complex Engineering problems (L2).
- Analyze the functions of diodes in forward and reverse bias conditions (L3).
- Evaluate the functions of diodes in real time applications (L3).
- Design rectifiers and switches using diodes (L4).

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 (L1).
- Apply the principles of BJT to solve complex Engineering problems (L2).

- Analyse the functions of BJT in various configurations (L3).
- Evaluate the functions of BJT in real time applications (L3).
- Design amplifiers and switches using BJT (L4).

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 (L1).
- Apply the principles of FETsto solve complex Engineering problems (L2).
- Analyze the functions of FETs in CSconfiguration (L3).
- Evaluate the functions of FETs in real time applications (L3).
- Design amplifiers and switches using FETs (L4).

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 (L1).
- Apply the principles of feedback amplifiers and oscillators to solve complex Engineering problems (L2).
- Analyze the functions of feedback amplifiers and oscillators (L3).
- Evaluate the functions of feedback amplifiers and oscillators in real time applications (L3).
- Design feedback amplifiers and oscillators for specific applications (L4).

UNIT-V:
Wave-Shaping & Multivibrator Circuits and Linear Integrated Circuits

Wave-Shaping & Multivibrator Circuits: Introduction, Waveform Shaping Circuits –RC and RL Circuits. Clippers, Comparator and Clampers. Bistable, Schmitt Trigger, Monostable and Astable Multivibrators.

Linear Integrated Circuits: Operational Amplifier: Introduction, Block diagram, Basic applications – Inverting, Non-inverting, Summing amplifier, Subtractor, Voltage Follower. IC 555 Timer and IC 7805 Regulator.

Learning Outcomes:

At the end of the unit, the student should be able to

- Understand the operation of Wave-Shaping & Multivibrator Circuits and Linear Integrated Circuits (L1).
- Apply the principles of Wave-Shaping & Multivibrator Circuits and Linear Integrated Circuits to complex Engineering solve problems (L2).
- Analyse the functions of Wave-Shaping & Multivibrator Circuits and Linear Integrated Circuits (L3).
- Evaluate the functions of Wave-Shaping & Multivibrator Circuits and Linear Integrated Circuits in real time applications (L3).
- Design Wave-Shaping & Multivibrator Circuits and Linear Integrated Circuits for specific applications (L4).

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.

TEXT BOOKS:

1. S. Salivahanan and N. Suresh Kumar, “Electronic Devices and Circuits”, 4th Edition, McGraw Hill Education (India) Pvt Ltd., 2017.

REFERENCES:

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.

Blooms' learning levels:

L1: Remembering and Understanding
L2: Applying
L3: Analyzing/Derive
L4: Evaluating/Design
L5: Creating

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I **L T P C**

3 0 0 3

(19A04506b) 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 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.

Learning Outcomes:

At the end of the unit, the student should be able to:

- Learn Boolean algebra and logical operations in Boolean algebra. (L1)
- Apply different logic gates to functions and simplify them. (L2)
- Analyze the redundant terms and minimize the expression using Kmaps and tabulation methods (L3)

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.

Learning Outcomes:

At the end of the unit, the student should be able to:

- Apply the logic gates and design of combinational circuits(L2)
- Design of different combinational logic circuits(L4)

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.

Learning Outcomes:

At the end of the unit, the student should be able to:

- Understand the clock dependent circuits (L1)
- Identify the differences between clocked and clock less circuits, apply clock dependent circuits(L2)
- Design clock dependent circuits(L4)

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

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. (L1)
- Implement combinational logic circuits using memory and programmable logic devices (L2)

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.

Learning Outcomes:

At the end of the unit, the student should be able to:

- Understand how synchronous and asynchronous sequential circuit works (L1)
- Understand the FSM and its design principles. (L1)
- Analyze the procedure to reduce the internal states in sequential circuits (L3)
- Illustrate minimization of complete and incomplete state machines and to write a minimal cover table(L2)

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.

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.
2. Zvi Kohavi, "Switching and Finite Automata Theory", 3rd Edition, South Asian Edition, 2010,

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

B.Tech (FT)– III-I

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(19A05506a) FREE AND OPEN SOURCES SYSTEMS
(Open Elective –I)
(Common to CSE & IT)

Course Objectives:

This course is designed to:

- Understand the context and operation of free and open source software (FOSS) communities and associated software projects.
- Motivate the students to contribute in FOSS projects
- Familiarize with programming languages like Python, Perl, Ruby
- Elucidate the important FOSS tools and techniques

UNIT I PHILOSOPHY

Notion of Community--Guidelines for effectively working with FOSS community--, Benefits of Community based Software Development --Requirements for being open, free software, open source software –Four degrees of freedom - FOSS Licensing Models - FOSS Licenses – GPL- AGPL-LGPL - FDL - Implications – FOSS examples.

Learning outcomes:

At the end of the unit, students will be able to:

- Analyze the benefits of Community based Software Development. (L4)
- Explain the degrees of Freedom. (L2)

UNIT II LINUX

Linux Installation and Hardware Configuration – Boot Process-The Linux Loader (LILO) - The Grand Unified Bootloader (GRUB) - Dual-Booting Linux and other Operating System - Boot-Time Kernel Options- X Windows System Configuration-System Administration – Backup and Restore Procedures- Strategies for keeping a Secure Server.

Learning outcomes:

At the end of the unit, students will be able to:

- Demonstrate Linux Installation and hardware configuration. (L2)
- Compare Linux and Windows System Configurations. (L4)

UNIT III PROGRAMMING LANGUAGES

Programming using languages like Python, Perl, Ruby

Learning outcomes:

At the end of the unit, students will be able to:

- Explain the syntax of programming Languages Python, Perl and Ruby. (L2)
- Develop applications in the Open source programming Languages. (L6)

UNIT IV PROGRAMMING TOOLS AND TECHNIQUES

Usage of design Tools like Argo UML or equivalent, Version Control Systems like Git or equivalent, – Bug Tracking Systems- Package Management Systems

Learning outcomes:

At the end of the unit, students will be able to:

- List various programming tools and explain their uses (L1)
- Make use of the various tools while building applications (L3)

UNIT V FOSS CASE STUDIES

Open Source Software Development - Case Study – Libre office -Samba

Learning outcomes:

At the end of the unit, students will be able to:

- Elaborate the open Source Software Development(L6)
- Compare Libre office with its proprietary equivalent (L5)

Course Outcomes:

Upon completion of the course, the students should be able to:

- Demonstrate Installation and running of open-source operating systems.(L2)
- Justify the importance of Free and Open Source Software projects. (L5)
- Build and adapt one or more Free and Open Source Software packages. (L6)
- Utilize a version control system. (L3)
- Develop software to and interact with Free and Open Source Software development projects.(L3)

TEXT BOOK:

Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, “Linux in a Nutshell”, Sixth Edition, OReilly Media, 2009.

REFERENCES:

1. Philosophy of GNU URL: http://www.gnu.org/philosophy/.
2. Linux Administration URL: http://www.tldp.org/LDP/lame/LAME/linux-admin-made-easy/.
3. The Python Tutorial available at http://docs.python.org/2/tutorial/.
4. Perl Programming book at http://www.perl.org/books/beginning-perl/.
5. Ruby programming book at http://ruby-doc.com/docs/ProgrammingRuby/.
6. Version control system URL: http://git-scm.com/.
7. Samba: URL : http://www.samba.org/.
8. Libre office: http://www.libreoffice.org/.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I **L T P C**

3 0 0 3

(19A05506b) COMPUTER GRAPHICS and MULTIMEDIA ANIMATION

(Open Elective –I)

(Common to CSE & IT)

Course Objectives:

This course is designed to:

- Introduce the use of the components of a graphics system and become familiar with the building approach of graphics system components and related algorithms.
- Understand the basic principles of 3- 3-dimensional computer graphics.
- Provide insites on how to scan, convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
- Provide an understanding of mapping from world coordinates to device coordinates, clipping, and projections.
- Discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.

UNIT I OVERVIEW OF COMPUTER GRAPHICS SYSTEM

OverView of Computer Graphics System – Video display devices – Raster Scan and random scan system – Input devices – Hard copy devices.

Learning outcomes:

At the end of the unit, students will be able to:

- Explain the overview of computer graphics with visualization. (L2)
- Classify the Input devices. (L2)
- Distinguish raster scan and random scan systems. (L4)

UNIT II OUTPUT PRIMITIVES AND ATTRIBUTES

Drawing line, circle and ellipse generating algorithms – Scan line algorithm – Character Generation – attributes of lines, curves and characters – Antialiasing.

Learning outcomes:

At the end of the unit, students will be able to:

- Analyse output primitives and attributes. (L4)
- Design algorithms based on output. (L6)

UNIT III TWO DIMENSIONAL GRAPHICS TRANSFORMATIONS AND VIEWING:

Two-dimensional Geometric Transformations – Windowing and Clipping – Clipping of lines and clipping of polygons.

Learning outcomes:

At the end of the unit, students will be able to:

- Create two-dimensional graphics. (L6)
- Examine the clipping of polygon. (L4)
- Compare different forms of variations. (L2)

UNIT IV THREE DIMENSIONAL GRAPHICS AND VIEWING

Three-dimensional concepts – Object representations- Polygon table, Quadric surfaces, Splines, Bezier curves and surfaces – Geometric and Modelling transformations – Viewing - Parallel and perspective projections.

Learning outcomes:

At the end of the unit, students will be able to:

- Create three-dimensional graphics. (L6)
- Explain the Quadric surfaces and polygon table. (L2)
- Define modelling transformations. (L1)

UNIT V REMOVAL OF HIDDEN SURFACES

Visible Surface Detection Methods – Computer Animation.

Learning outcomes:

At the end of the unit, students will be able to:

- List the different types of detection methods. (L1)
- Compare various computer animations. (L2)

Course outcomes:

Upon completion of the course, the students should be able to:

- Explain the basic concepts used in computer graphics. (L2)
- Inspect various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping. (L4)
- Assess the importance of viewing and projections. (L5)
- Define the fundamentals of animation, virtual reality and its related technologies. (L3)
- Analyze the typical graphics pipeline (L4)

TEXTBOOK

1. Hearn, D. and Pauline Baker,M., Computer Graphics (C-Version), 2nd Edition, Pearson Education, 2002.

REFERENCES

1. Neuman, W.M., and Sproull, R.F., Principles of Interactive Computer Graphics, Mc Graw Hill Book Co., 1979.
2. Roger, D.F., Procedural elements for Computer Graphics, Mc Graw Hill Book Co., 1985.
3. Asthana, R.G.S and Sinha, N.K., Computer Graphics, New Age Int. Pub. (P) Ltd., 1996.
4. Floey, J.D., Van Dam, A, Feiner, S.K. and Hughes, J.F, Computer Graphics, Pearson Education, 2001.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I

L	T	P	C
3	0	0	3

(19A27506a) BREWING TECHNOLOGY

OPEN ELECTIVE - I

PREAMBLE

This course covers the origin of brewing and ingredients used, methods and equipment used and innovations in this field.

Coues Objectives

- To understand the Beer manufacturing, ingredients and their roles.
- To understand overall view of a brewing industry

UNIT – I

Introduction of brewing, history of brewing; Raw materials: barley, hops, water, yeast; Adjuncts for beer production: Maize, rice, millet, wheat, sugar etc. Malt production, role of enzymes for malting; Barley storage, steeping, germination, kilning, cooling, storage;

Learning Outcomes:

At the end of the unit, the student should be able to:

- Introduction of brewing, history of brewing
- Raw materials like barley, hops, water, yeast
- Adjuncts for beer production: Maize, rice, millet, wheat, sugar etc
- Malt production, role of enzymes for malting
- Barley storage, steeping, germination, kilning, cooling, storage

UNIT – II

Malt from other cereals, caramel malt, roasted malt, smoked malt, malt extract; Malt quality evaluation, Wort production, malt milling, Mashing, Mashing vessels; Wort boiling, clarification, cooling and aeration Enzyme properties, starch degradation, b-glucan degradation; Conversion of fatty matter, Biological acidification

Learning Outcomes:

At the end of the unit, the student should be able to:

- Malt from other cereals, caramel malt, roasted malt, smoked malt, malt extract

- Malt quality evaluation, Wort production, malt milling, Mashing, Mashing vessels
- Wort boiling, clarification, cooling and aeration Enzyme properties, starch degradation, b-glucan degradation
- Conversion of fatty matter, Biological acidification

UNIT – III

Beer production methods, fermentation technology, changes during fermentation; Filtration procedure and equipment, beer stabilization conditions and durations, beer carbonation process; Packaging equipment and packaging materials, storage conditions and distribution process

Learning Outcomes:

At the end of the unit, the student should be able to:

- Beer production methods, fermentation technology, changes during fermentation
- Filtration procedure and equipment, beer stabilization conditions and durations, beer carbonation process
- Packaging equipment and packaging materials, storage conditions and distribution process

UNIT – IV

Brewing Equipment. Grain mill, kettles, siphons, carboys, fermentation equipment, wort chillers, pumps beer bottles, cans, labels, bottle caps, sanitation equipments Preventive Production of beer against technology, ling phenomenon of beer, possible measures against staling reactions, oxidation

Learning Outcomes:

At the end of the unit, the student should be able to:

- Brewing Equipments like Grain mill, kettles, siphons, carboys, fermentation equipment, wort chillers
- pumps beer bottles, cans, labels, bottle caps, sanitation equipments
- Preventive Production of beer against technology, ling phenomenon of beer, possible measures against staling reactions, oxidation

UNIT – V

Recent advances: Immobilized Cell Technology in Beer Production, immobilized yeast cell technology Energy management in the brewery and maltings; waste water treatment Automation and plant planning

Learning Outcomes:

At the end of the unit, the student should be able to:

- Immobilized Cell Technology in Beer Production, immobilized yeast cell technology

- Energy management in the brewery and maltings
- waste water treatment Automation and plant planning

Course Outcomes:

By the end of this course, students will attain the:

- Knowledge of beer making, chemistry of ingredients used for brewing,
- Knowledge on brewing industry, Unit operations and equipments involved.

TEXT BOOKS

1. Brewing: “Science and Practice, Brookes and Roger Stevens”, Dennis E. Briggs, Chris A. Boulton, Peter A. 2004, Woodhead publishing limited.
2. Die Deutsche “Bibliothek Technology: “Brewing and Malting”, Wolfgang Kunze. 2010, Bibliographic information published

REFERENCES

1. “Handbook of Brewing”: Process, Technology, Markets, Hans Michael Eblinger. 2009, Wiley-VCH Verlag GmbH & Co.
2. Brewing: “New Technologies”, Charles W. Bamforth. 2006, Woodhead Pub.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I **L T P C**

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(19A27506b) COMPUTER APPLICATIONS IN FOOD INDUSTRY (OPEN ELECTIVE – I)

PREAMBLE

This course covers all facets of computerization and various software's used and their usage.

Course Objectives

- Able to know about "The necessity of Software & their applications in Food Industries"
- Able to Implement the Programs in 'C' to perform various operations that are related to Food Industries.

UNIT – I

Computerization, Importance of Computerization in food industry and IT applications in food industries. Computer operating environments and information system for various types of food industries. Introduction to Bar charts and Pie charts & the procedure to develop bar charts and pie charts on given Data.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Computerization, Importance of Computerization in food industry and IT applications in food industries.
- Computer operating environments and information system for various types of food industries.
- Introduction to Barcharts and Piecharts & the procedure to develop barcharts and piecharts on given Data.

UNIT – II

Introduction to Software & Programming Languages, Properties, Differences of an Algorithm and Flowcharts, Advantages and disadvantages of Flowcharts & Algorithms. Introduction, Fundamentals & advantages of 'C'. Steps in learning 'C' (Character set, Identifiers, Keywords) Steps in learning 'C' (Data types, Constants, Variables, Escape sequences).

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Introduction to Software & Programming Languages, Properties, Differences of an Algorithm and Flowcharts

- Advantages and disadvantages of Flowcharts & Algorithms. Introduction, Fundamentals & advantages of 'C'.
- Steps in learning 'C' (Character set, Identifiers, Keywords)
- Steps in learning 'C' (Data types, Constants, Variables, Escape sequences).

UNIT – III

Steps in learning 'C' (Operators, Statements) Steps in learning 'C' (Header Files, Input & Output functions: Formatted I/O functions, Unformatted I/O functions). Basic Structure of a simple 'C' program. Decision Making/Control Statements. Branching, Concept of Looping & Looping statements.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Steps in learning 'C' (Operators, Statements)
- Steps in learning 'C' (Header Files, Input & Output functions: Formatted I/O functions, Unformatted I/O functions).
- Basic Structure of a simple 'C' program. Decision Making/Control Statements.
- Branching, Concept of Looping & Looping statements.

UNIT – IV

Concept of Functions (Defining a function & Function Prototypes, Types of functions: Library functions & User defined functions. Concept of various types of User Defined Functions (i.e., About 4 types). Concept of Arrays & Types of Arrays (Single, Double and Multi-Dimensional Arrays). Concept of a String Library Functions.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Concept of Functions (Defining a function & Function Prototypes, Types of functions: Library functions & User defined functions.
- Concept of various types of User Defined Functions (i.e., About 4 types).
- Concept of Arrays & Types of Arrays (Single, Double and Multi-Dimensional Arrays).
- Concept of a String Library Functions.

UNIT – V

Concept of Pointers, Structures & Unions. Introduction to Data Structures, Types of Data Structures (Primary & Secondary Data Structures) Concept of Linked Lists, Types of Linked Lists & Basic operations on linked Lists. Concept of Stacks & Operations on Stacks (PUSH & POP Operations) Concept of Queues and types of Queues Operations on a Queue (ENQUEUE & DEQUEUE Operations)

Learning Outcomes:

At the end of unit, students will be able to understand the following

1. Concept of Pointers, Structures & Unions. Introduction to Data Structures, Types of Data Structures (Primary & Secondary Data Structures)
2. Concept of Linked Lists, Types of Linked Lists & Basic operations on linked Lists.
3. Concept of Stacks & Operations on Stacks (PUSH & POP Operations)
4. Concept of Queues and types of Queues Operations on a Queue (ENQUEUE & Dequeue Operations)

Course Outcomes

By the end of the course, the students will be able to

- know about the various steps which are related to computer and Software and their application in Food Industries
- know about the various steps which are necessary to implement the programs in 'C'

TEXT BOOKS

1. Yeswanth Kanethkar, Let us 'C'
2. Balaguruswamy E., "Computer Programming in 'C'"
3. Mark Allen Waise , "Data Structures"

REFERENCES

1. M. S Excel 2000, Microsoft Corporation
2. M. S. Office – Microsoft Corporation
3. Verton M.V. "Computer concepts for Agri Business", AVI Pub. Corp., West Port, USA.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) –III-I

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3	0	0	3

(19A54506a) OPTIMIZATION TECHNIQUES
(OPEN ELECTIVE-I)

Course Objectives:

The student will be able to learn:

- The basic concepts of Optimization
- The emphasis of this course is on different classical Optimization techniques linear programming and simplex algorithms.
- About optimality of balanced transportation Problems
- About Constrained and unconstrained nonlinear programming.
- About principle of optimality and dynamic programming

UNIT – I Introduction and Classical Optimization Techniques:

Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems. Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraints – Kuhn – Tucker conditions – Numerical examples.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- To know how to formulate statement of optimization problem with or without constraints
- To know about classification of single and multivariable optimization problems
- To know about necessary and sufficient conditions in defining the optimization problems
- To understand how to formulate Kuhn-Tucker conditions and to solve numerical problems

UNIT – II Linear Programming

Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm – Numerical examples.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- To know about formulation of LPP
- To know about formulations of GPP

- To understand various theorems in solving simultaneous equations
- To understand about necessity of Simplex method and to solve numerical problems

UNIT – III Nonlinear Programming – One Dimensional Minimization methods

Introduction, Unimodal function, Elimination methods- Unrestricted Search, Exhaustive Search, Dichotomous Search, Fibonacci Method, Golden Section Method and their comparison; Interpolation methods - Quadratic Interpolation Method, Cubic Interpolation Method and Direct Root Methods – Numerical examples.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- To know about NLP in one dimensional optimization problems
- To understand about various search methods
- To learn about various interpolation methods
- To distinguish and compare the various elimination methods with numerical examples

UNIT – IV Unconstrained & Constrained Nonlinear Programming

Unconstrained Optimization Techniques: Introduction- Classification of Unconstrained Minimization Methods, General Approach, Rate of Convergence, Scaling of Design Variables; Direct Search methods- Random Search Methods, Grid Search Method, Pattern Directions, Powell's Method and Simplex Method

Constrained Optimization Techniques: Introduction, Characteristics of a Constrained Problem, Direct Search Methods - Random Search Methods, Basic Approach in the Methods of Feasible Directions, Rosen's Gradient Projection Method, Generalized Reduced Gradient Method and Sequential Quadratic Programming.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- To distinguish between unconstrained and constrained optimization problems
- To learn about direct search methods in unconstrained NLP problems and comparison
- To understand about direct search methods in constrained NLP problems and comparison
- To do exercises for solving numerical examples of various methods

UNIT – V Dynamic Programming

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution – Numerical examples.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- To know what is DP problem?
- To know about computational procedure in solving DPP
- To know Calculus and Tabular methods of solving with numerical examples of various methods

Course Outcomes:

The student gets thorough knowledge on:

- Basic methods, principles in optimization
- Formulation of optimization models, solution methods in optimization
- Finding initial basic feasible solutions.
- Methods of linear and non-linear (constrained and unconstrained) programming.
- Applications to engineering problems.

TEXT BOOKS:

1. S. S. Rao, "Engineering optimization": Theory and practice 3rd edition, New Age International (P) Limited, 1998.
2. H.S. Kasana & K.D. Kumar, "Introductory Operations Research Springer (India)", 2004.

REFERENCES:

1. R Fletcher, "Practical Methods of Optimization" , 2nd Edition, Wiley Publishers, 2000.
2. Jorge Nocedal and Wright S, "Numerical Optimization Springer", 1st Edition, 1999.
3. by K.V. Mital and C. Mohan, "Optimization Methods in Operations Research and systems Analysis" 3rd Edition, New Age International (P) Limited, 1996.
4. by S.D. Sharma, "Operations Research", Kedar Nath, 2012.
5. by H.A. Taha, "Operations Research", 9th Edition, An Introduction Pearson, 2010.
6. G. Hadley, "Linear Programming", Narosa, 2002.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) – III-I

L	T	P	C
3	0	0	3

(19A52506a) TECHNICAL COMMUNICATION AND PRESENTATION SKILLS (OPEN ELECTIVE)

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

SYLLABUS

UNIT -1:

Basics of Technical Communication – Introduction – Objectives & Characteristics of Technical Communication – Importance and need for Technical communication - LSRW Skills – Barriers to effective communication

Learning Outcomes:

At the end of the module, the learners will be able to

- Understand the importance of LSRW skills
- Identify and overcome the barriers to effective communication
- Realize the need and importance of technical communication

UNIT -II

Informal and Formal Conversation - Verbal and Non-verbal communication –Kinesics, Proxemics, Chronemics, Haptics, Paralanguage

Learning Outcomes:

At the end of the module, the learners will be able to

- State the difference between formal and informal conversation.
- Apply the knowledge of the difference between the verbal and non-verbal communication
- Evaluate the different aspects of non-verbal communication.

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

Learning Outcomes:

At the end of the module, the learners will be able to

- Know the difference between written and spoken communication
- Apply the awareness of features of effective writing.
- Implement the understanding of 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

Learning Outcomes:

At the end of the module, the learners will be able to

- State the importance of presentation skills in corporate climate.
- Analyze the demography of the audience.
- Plan, prepare and present individual and group presentations.

UNIT -V

Interview Skills – The Interview process –Characteristics of the job interview – Pre-interview preparation techniques – Projecting the positive image – Answering Strategies

Learning Outcomes:

At the end of the module, the learners will be able to

- Identify the characteristics of the job interview.
- Understand the process of Interviews.
- Develop a positive image using strategies in answering FAQs in interviews

Course Outcomes

- Understand the importance of effective technical communication
- Apply the knowledge of basic skills to become good orators
- Analyze non-verbal language suitable to different situations in professional life
- Evaluate different kinds of methods used for effective presentations
- Create trust among people and develop employability skills

TEXT BOOKS:

1. Ashrif Rizvi, "Effective Technical Communication"**,** TataMcGrahill, 2011
2. Meenakshi Raman &Sangeeta Sharma, "Technical Communication", 3rd Edition, O U Press 2015

REFERENCES:

1. Pushpalatha & Sanjay Kumar, "Communication Skills", Oxford Univsesity Press
2. Barron's/Books on TOEFL/GRE/GMAT/CAT/IELTS DELTA/Cambridge University Press.2012.
3. Butterfield Jeff, "Soft Skills for Everyone", Cengage Publications, 2011.
4. Universities Press (India) Pvt Ltd., "Management Shapers Series", Himayatnagar, Hyderabad 2008.
5. John Hughes & Andrew Mallett, "Successful Presentations" Oxford.
6. Edgar Thorpe and Showick Thorpe, "Winning at Interviews" Pearson
7. Munish Bhargava, "Winning Resumes and Successful Interviews", McGraw Hill

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) – III-I

L	T	P	C
3	0	0	3

(19A51506a) CHEMISTRY OF ENERGY MATERIALS

Course Objectives:

- To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
- To understand the basic concepts of processing and limitations of fossil fuels and Fuel cells & their applications.
- To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method
- Necessasity of harnessing alternate energy resources such as solar energy and its basic concepts.
- To understand and apply the basics of calculations related to material and energy flow in the processes.

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.**

Learning Outcomes:

At the end of this unit, the students will be able to

- Solve the problems based on electrode potential (L3)
- Describe the Galvanic Cell (L2)
- Differentiate between Lead acid and Lithium ion batteries (L2)
- Illustrate the electrical double layer (L2)

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,.

Learning Outcomes:

At the end of this unit, the students will be able to

- Describe the working Principle of Fuel cell (L2)
- Explain the efficiency of the fuel cell (L2)
- Discuss about the Basic design of fuel cells (L3)
- Classify the fuel cell (L2)

UNIT-3: 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.

Learning Outcomes:

At the end of this unit, the students will be able to

- Differentiate Chemical and Physical methods of hydrogen storage (L2)
- Discuss the metal organic frame work (L3)
- Illustrate the carbon and metal oxide porous structures (L2)
- Describe the liquification methods (L2)

UNIT-4: Solar Energy: Solar energy introduction and prospects, photo voltaic (PV) technology, concentrated solar power (CSP), Solar Fuels, Solar cells.

Learning Outcomes:

At the end of this unit, the students will be able to

- Apply the photo voltaic technology (L3)
- Demonstrate about solar energy and prospects (L2)
- Illustrate the Solar cells (L2)
- Discuss about concentrated solar power (L3)

UNIT-5: Photo and Photo electrochemical Conversions: Photochemical cells and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions.

Learning Outcomes:

At the end of this unit, the students will be able to

- Differentiate between Photo and Photo electrochemical Conversions (L2)
- Illustrate the photochemical cells (L2)
- Identify the applications of photochemical reactions (L3)
- Interpret advantages of photoelectron catalytic conversion (L2)

Course Outcome:

- Ability to perform simultaneous material and energy balances.
- Student learn about various electrochemical and energy systems
- Knowledge of solid, liquid and gaseous fuels
- To know the energy demand of world, nation and available resources to fulfill the demand
- To know about the conventional energy resources and their effective utilization
- To acquire the knowledge of modern energy conversion technologies
- To be able to understand and perform the various characterization techniques of fuels

- To be able to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I Sem

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19A27501 HEAT TRANSFER LAB

OBJECTIVES

- To determine the thermal conductivity of different materials and heat transfer coefficient of heat exchangers.

LABORATORY EXPERIMENTS

1. To find the thermal conductivity of metallic rod at different temperature and draw the temperature profile for steady and unsteady state conduction.
2. To find out the thermal conductivity of insulating powder.
3. To find the thermal conductivity of liquid / gases.
4. To find the emissivity of grey plate with respect to black plate
5. To study the critical heat flux behavior of a liquid
6. To find the heat transfer coefficient for parallel and counter current flow condition for a Double pipe heat exchanger
7. To study the shell & Tube heat exchanger and find the heat duty and Over all heat transfer coefficient for parallel flow condition.
8. To study the shell & Tube heat exchanger and find the heat duty and Over all heat transfer coefficient for counter flow condition.
9. Compare the heat duty for parallel &Counter flow and find the energy saving.
10. To study the Plate heat exchanger and find the Overall heat transfer coefficient
11. To study the performance of heat pipe.
12. To find the heat transfer coefficient for open pan evaporator for steady and unsteady state condition.
13. To study Single/Double/Tripple effect Evaporator and find its Steam economy.

Course Outcomes:

By the end of the course the students will be able to

- Know how to find out heat transfer coefficient
- Know how to find out emissivity, conductivity, heat flux etc.
- Know how to find out steam economy in evaporators

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I Sem

L	T	P	C
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(19A27502P) PROCESSING OF MILK AND MILK PRODUCTS LAB

OBJECTIVES

- To conduct various quality tests for milk and different products prepared from milk.

LABORATORY EXPERIMENTS

1. Sampling of milk and milk products
2. Platform tests of raw milk (clot on boiling (COB) test, alcohol test
3. Determination of physical properties of milk
4. Determination of proximate composition and biochemical properties of milk
5. Determination of microbiological properties of milk
6. Detection of adulterants in milk
7. Identification and demonstration of liquid milk processing equipment, pipes and fittings
8. Preparing standardized milk as per requirement
9. Separation of fat from milk
10. Pasteurization and homogenization of milk
11. Packaging of liquid milk
12. Preparation of sterilized flavored milk
13. Preparation of reconstituted milk/rehydrated milk
14. Preparation of cream
15. Preparation of buttermilk
16. Preparation of curd and yogurt
17. Preparation of Lassi
18. Visit to chilling center and dairy plant

Course Outcomes:

Students will be able to learn

- Different quality tests for milk
- Various process technologies for preservation and quality of milk
- Processing of value added products from milk

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I Sem

L	T	P	C
0	0	3	1.5

(19A52601P) ENGLISH LANGUAGE SKILLS LAB

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

Unit 1

1. Phonetics for listening comprehension of various accents - 2
2. Formal Presentations using PPT slides without Graphic Elements
3. Paraphrasing

Learning Outcomes

At the end of the module, the learners will be able to

- Understand different accents spoken by native speakers of English
- Make formal structured presentations on general topics using PPT slides without graphical elements
- Paraphrase short academic texts using suitable strategies and conventions

Unit 2

1. Debate – 2 (Following Argument)
2. Listening to short speeches/ short stories for note-making and summarizing
3. E-mail Writing

Learning Outcomes

At the end of the module, the learners will be able to

- Participate in formal discussions and speak clearly on a specific topic using suitable discourse markers
- Make formal structured presentations on academic topics using ppt slides with relevant graphical elements
- Write formal emails in the standard format

Unit 3

1. Listening for Discussions
2. Group Discussions
3. Writing Persuasive/argumentative essays on general topics

Learning Outcomes

At the end of the module, the learners will be able to

- Follow a discussion to identify the salient points
- Participate in group discussions using appropriate conventions and language strategies
- Produce logically coherent persuasive/argumentative essays

Unit4

1. Reviewing film/ book
2. Group Discussions – reaching consensus in Group Work
3. Resume Writing – Cover Letter – Applying for Internship

Learning Outcomes

At the end of the module, the learners will be able to

- Judge a film or book
- Express thoughts and ideas with acceptable accuracy and fluency with a view to reach consensus in group discussions
- Prepare a CV and write a cover letter to seek internship/ job

Unit 5

1. Writing Project Reports
2. Editing Short Texts
3. Answering FAQs in Interviews

Learning Outcomes

At the end of the module, the learners will be able to

- Collaborate with a partner to make effective presentations
- Understand the structure and produce an effective project report.
- Edit short texts according to different needs of the work place.

Course Outcomes

- Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
- Apply communication skills through various language learning activities
- Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- Evaluate and exhibit acceptable etiquette essential in social and professional settings
- Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

SUGGESTED SOFTWARE:

1. Walden Infotech English Language Communication Skills.
2. iTell- Orell Digital Language Lab
3. Digital Teacher
4. LES(Learn English Select) 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:

The software consisting of the prescribed topics elaborated above should be procured and used.

1. Meenakshi Raman &Sangeeta Sharma, "Technical Communication**"** O U Press 2009.
2. Barron's Books on TOEFL/GRE/GMAT/CAT/IELTS /DELTA/Cambridge University Press.2012.
3. Butterfield Jeff, "Soft Skills for Everyone"**,** Cengage Publications, 2011.
4. "Practice Psychometric Tests": How to familiarize yourself with genuine recruitment tests, 2012.
5. David A McMurrey& Joanne Buckely **"**Handbook for Technical Writing**"** CENGAGE Learning 2008.
6. "A Textbook of English Phonetics for Indian Students", 2nd Edition, T.Balasubramanyam. (Macmillan), 2012.
7. "A Handbook for English Laboratories", E. Suresh Kumar, P. Sreehari, Foundation Books, 2011

Note: Links provided by APSHE on LSRW, grammar and vocabulary

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I Sem

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(19A27505) SOCIALLY RELEVANT PROJECT

1. **Nutrition**
   Survey on nutrition
   Assessment of malnutrition status in school children
   Nutritive value of assessment locally available Fruit & Vegetables
2. **Waste reduction**
   Minimization of post harvest losses
   Minimization of processed food losses
3. **Hygiene & Safety**
   Improving RO Plant Quality
   Improving Hygiene of Street foods
   Assessment of quality standards of purified water & public supplied water
   Improvement of hygienic conditions of overhead tanks
   Drinking water quality standards & demonstration of water purifying techniques
   Improvement of hygiene & sanitation in rural areas
   Improvement of hygiene & sanitation in urban slums
4. **Labelling**
   Awareness on food labelling
   Comparison of food labels of organized and unorganized sectors
5. **Adulteration of foods**

The above themes are examples. However, the department can explore more.

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B.Tech (FT) – III-I Sem **L T P C**

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(19A99601) MANDATORY COURSE: RESEARCH METHODOLOGY

Course Objectives :

The objective of this course is

- 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
- To create awareness on ethical issues n research

Syllabus

UNIT I

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

- Understand the concept of research and its process
- Explain various types of research
- Know the steps involved in research design
- 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

- Understand the concept of sampling and sampling design
- Explain various techniques in measurement and scaling

- Learn various methods of data collection
- Design survey questionnaires for different kinds of research
- 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

- Know the association of two variables
- Understand the importance of correlation and regression
- Compare and contrast correlation and regression
- Learn various types of correlation
- 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

- Know the statistical inference
- Understand the hypothesis testing procedure
- Compare and contrast Parametric and Non-parametric Tests
- Understand the use of chi-square test in investigating the distribution of categorical variables
- 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

- Learn about report writing
- Understand how to write research paper
- Explain various techniques of interpretation

- Understand the importance of professional ethics in research
- Design a scientific paper to present in the conferences/seminars

Course Outcomes:

At the end of the course, students will be able to

- Understand basic concepts and its methodologies
- Demonstrate the knowledge of research processes
- Read. comprehend and explain research articles in their academic discipline
- Analyze various types of testing tools used in research
- Design a research paper without any ethical issues

Text books:

1. C.R.Kothari, "Research Methodology:Methods and Techniques",2nd edition, New Age International Publishers.
2. A Step by Step Guide for Beginners, "Research Methodology": Ranjit Kumar, Sage Publications

REFERENCES:

1. P.Narayana Reddy and G.V.R.K.Acharyulu, "Research Methodology and Statistical Tools", 1st Edition, Excel Books,New Delhi.
2. Donald R. "Business Research Methods", Cooper & Pamela S Schindler, 9th edition.
3. S C Gupta, "Fundamentals of Statistics", 7th edition Himalaya Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II Sem **L T P C**

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(19A27601T) FOOD AND INDUSTRIAL MICROBIOLOGY

PREAMBLE

To make the student to understand the causes of food spoilage and predict the micro-organism that can spoil a given food, when prepared, processed and stored under given condition and take corrective measures to control the spoilage and pathogenic micro-organism in food. To help the students to understand the machines and their components so as to enable them manage the machineries in the food industries. And also concepts of bio processing, fermentation technology, kinetics of microbial growth, up and downstream processing and production of useful enzymes.

Course Objectives:

- To understand the role of beneficial micro-organisms in food processing and preservation.
- To list the major food spoilage microorganisms.
- To analyze methods used to control or destroy micro-organism commonly found in food.
- Fermentation technology and its application in Food industry
- Industrially important Microorganisms and their application in food industry

UNIT – I

Importance and significance of microbes in food science, Sources of microorganisms in foods and their effective control. Shelf life: Calculation of shelf life, Shelf life requirements, deteriorative reactions, accelerated testing; Simulations of product: Package environment interaction, shelf life simulation for moisture, oxygen, and light sensitive products

Learning Outcomes:

At the end of unit, students will be able to

- Understand the significance of microorganisms in foods
- Know various sources of microorganisms in foods
- Calculate shelf life and its requirements and other parameters

UNIT – II

Microbial spoilage in Foods: Types of micro-organisms in food via meat, poultry, sea foods, vegetables, dairy products, fruits and vegetables. Assessing microbial population in food- meat, poultry, fish and dairy products- microbial spoilage of fruits, vegetables, cereal and bakery products, meat products and egg.

Learning Outcomes:

At the end of unit, students will be able to

- Explain the microbial spoilage in various foods like meat, poultry and sea foods
- Enumerate the microbial population in different foods

UNIT – III

Harmful Micro-organism and Beneficial Micro-organism: Food borne diseases – food infection and food intoxication, Food borne viruses: types of food involved, noroviruses, Rota viruses, prion diseases, toxicity and symptoms. Microbial toxins: Bacterial toxins, fungal toxins, algal toxins and mushroom toxins – symptoms, causes and control measures. Micro-organisms as food- Single Cell Protein Fermented food- pickles, sauerkraut- vinegar and lactic acid.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the difference in harmful and beneficial microorganisms
- Know various food borne diseases
- Explain use of microorganism as a food

UNIT – IV

Basic concepts: Historical development of bioprocess technology, Kinetics of microbial growth and product formation. Phases of cell growth in batch cultures, Simple unstructured kinetic models for microbial growth, Monod model, Growth of filamentous organisms. Growth associated (primary) and non-growth associated (secondary) product formation kinetics. Fermentation process: Basic design and construction of fermenter and ancillaries, main parameters to be monitored and controlled in fermentation processes. Types of fermentation and fermenters and its applications.

Learning Outcomes:

At the end of unit, students will be able to

- Know the developments in bioprocess technology
- Explain the process of fermentation, types and equipment used
- Gain knowledge on fermentation applications

UNIT – V

Downstream processing operations; Immobilized enzyme technology: enzyme immobilization, industrial processes, utilization and regeneration of cofactors. Immobilized enzyme kinetics. Industrial production of important products; Production of pectic Enzymes, Industrial production of Glucose transforming enzymes; Organisms involved, production, purification and immobilization of Glucose isomerase and Oxidase. Industrial scale production of Bakers' yeast and Brewer's yeast; Microbial oil production and Bio pesticides.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the description of downstream processing operations
- Know the immobilization technology for enzymes
- Acquire knowledge on industrial applications of various enzymes

Course Outcomes:

- The students become familiar with identification and its activity of microorganisms in various foods.
- The students would understand the spoilage of foods due to harmful microorganisms.
- The students also get to know the various methods to eliminate/inactivate the growth of microorganisms in different foods
- Know about Industrial fermentation techniques
- Know about different Industrially important micro organisms
- Know about different growth regulators (Hormones)
- Know about different products produced by Industrial fermentation process

TEXT BOOKS

1. Pelczar,M.J., E.C.S. Chan and N.R. Krieg "Microbiology".. McGraw-Hill New York 1993.
2. Frazier, W.C. and Westhoff, D.C. "Food Microbiology". 4th Edition. Tata McGraw Hill Publishing Co. Ltd., New Delhi 2008.

REFERENCES

1. Banwart, G.J, "Basic Food Microbiology" Van No Strand Reinhold Publishers, New York 1989.
2. Jay, J.M., "Modern Food Microbiology". CBS Publishers & Distributors, New Delhi 2000.
3. S.C. Prescott and C.G. Dunn, "Industrial MicrobiologyAgrobios (India)", 1st Edition, 2007.
4. A. H. Patel, "Industrial Microbiology", 2nd Edition, McMillan India Ltd., 2009.
5. Katoh and Fumitake Yoshida, "Biochemical Engineering Fundamentals". 1st Edition,Wiley VCH, 2009., J. E. Bailey, F. 2nd Edition, Oilis, Tata Mc Graw Hill, 2010.
6. M. L. Shuller, F. Kargi, "Bioprocess Engineering- Basic Concepts", 2nd Edition, PHI, 2002.
7. P.F. Stanbary, A. Whitaker, Hall, "Principles of Fermentation Technology", 2nd Edition, Aditya Books Pvt. Ltd., 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II Sem **L T P C**

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(19A27602) PLANT DESIGN AND PROCESS ECONOMICS

PREAMBLE

This subject broadly covers the principles and types of plant layout and design, peculiarities of food plant layouts, sale up and pilot plant studies.

Course Objectives:

- To impart knowledge on food plant layout and design of food industries and it's considering factors, cost economics and etc.

UNIT – I

Introduction to Plant Design, Peculiarities of food processing industries, Process Development, Process selection, Flow sheet preparation, sketching techniques, Equipment numbering, Stream designation, Material and energy balances.

Plant Design basis, Selection of equipment, specification and design of equipment's, Optimisation of different process equipment, materials of construction, Plant location, Plant layout and installation, Safety, Start up, Shutdown and Operating guidelines.

Learning Outcomes:

At the end of unit, students will be able to

- Acquire knowledge on Introduction to Plant Design, Peculiarities of food processing industries
- Know the necessity of Process Development, Process selection, Flow sheet preparation and Material and energy balances
- Understand the Selection of equipment, specification and design of equipment's
- Explain the Plant location, Plant layout and installation, Safety, Start up, Shutdown and Operating guidelines

UNIT – II

Development and presentation of the layout, selection of site and Location of plant, General points of consideration for designing food plant, floor plant types of layouts, Food building planning, preparation of machinery layout for fruit, vegetables and meat-size reduction machinery layout.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the Development and presentation of the layout, selection of site and Location of plant

- Know the General points of consideration for designing food plant, floor plant types of layouts
- Explain the Food building planning, preparation of machinery layout for fruit, vegetables and meat-size reduction machinery layout.

UNIT – III

Evaporation plant layout-single, multiple, vacuum and film evaporators-types and concepts, drying plant layout, drying process, dryer types, selection of dryers. Baking oven and frying plant-types, concepts and layout. Filling closing and labelling of plant layout. Organization and trends in plant layout - sample layout, installation procedure for food processing plant.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the Evaporation plant layout-single, multiple, vacuum and film evaporators-types and concepts
- Know about the drying plant layout, drying process, dryer types, selection of dryers
- Have knowledge on Baking oven and frying plant-types, concepts and layout
- Explain the Organization and trends in plant layout - sample layout, installation procedure for food processing plant.

UNIT – IV

Cost Engineering Time value of money and equivalence, Interest, cost comparisons by present worth, Annual equivalent cost and capitalised cost methods, Uniform gradient and series. Depreciation, Taxes and Insurances, Nature of depreciation, Methods of determining depreciation, depreciation rates in current Indian situation, Types of taxes and insurances, Procedure for cost comparison after taxes.

Learning Outcomes:

At the end of unit, students will be able to

- Get knowledge on Cost Engineering Time value of money and equivalence, Interest, cost comparisons by present worth
- Know the Annual equivalent cost and capitalised cost methods, Uniform gradient and series
- Understand the Depreciation, Taxes and Insurances, Nature of depreciation, Methods of determining depreciation
- Explain the depreciation rates in current Indian situation, Types of taxes and insurances, Procedure for cost comparison after taxes

UNIT – V

Cost Estimation- Types of cost estimation, capital investment cost, fixed capital cost, working capital cost, start-up costs, process equipment cost estimation, cost index, Equipment costs due to inflation, Battery limit investments, estimation of plant cost, Estimation of total product cost, Manufacturing cost, General expenses. Profitability Criteria of profitability, Payout period, Return on investment, Present value, Cash flow analysis, Alternative investment analysis, Sensitive analysis in project profitability. Preparation of techno-economic feasibility report.

Learning Outcomes:

At the end of unit, students will be able to

- Describe the Types of cost estimation, capital investment cost, fixed capital cost, working capital cost, start-up costs
- Understand the Equipment costs due to inflation, Battery limit investments, estimation of plant cost
- Know the Estimation of total product cost, Manufacturing cost, General expenses
- Explain the Profitability Criteria of profitability, Payout period, Return on investment, Present value
- Get knowledge on Cash flow analysis, Alternative investment analysis, Sensitive analysis in project profitability
- Prepare techno-economic feasibility report.

Course Outcomes:

By the end of the course, the students will

- Acquire knowledge on theoretical aspects to be considered for site selection, layout selection and design considerations for a food plant.

TEXT BOOKS

1. Antonio Lopez-Gomez, Gustavo V. Barbosa-Canovas, “Food Plant Design”. CRC Press 2005.
2. George D. Saravacos and Zacharias B. Maroulis. “Food Plant Economics”. CRC Press 2007.

REFERENCES

1. Peters M., Timmerhaus K. & Ronald W., “Plant Design & Economics for Chemical Engineers”,. McGraw Hill
2. James R Couper, “Process Engg. Economics (Chemical Industries)”. CRC Press 3. Aries & Newton, Chemical Engg. Cost Estimation, McGraw Hill.

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3 0 0 3

(19A27603T) PROCESSING OF MEAT AND POULTRY PRODUCTS

PREAMBLE

This subject covers the scope and importance of meat and poultry processing, and their value added products, various preservation methods, equipment used.

Course Objectives:

- To enable the students to learn about national and international prospects of Meat industry along with processing and preservation technology of Meat, Egg and Poultry Products.

UNIT – I

Sources and importance of meat and poultry; Status of Meat and poultry industry in India; World production of meat and poultry, consumption pattern and nutritive value; characteristics and structure of meat and poultry muscle. Abattoir design and layout. Preslaughter operations and slaughtering operations for animals; stunning, methods of stunning –bleeding-skinning of animals. Ante-mortem inspection, Evaluation of animal carcasses.

Learning Outcomes:

At the end of unit, students will be able to

- Know the importance and status of meat and poultry in India and world
- Understand the characteristics and structure of meat and poultry muscle
- Describe the abattoir design and layout
- Acquire knowledge on preslaughter and slaughtering operations for animals and other processing operations

UNIT – II

Post slaughter care-post mortem and Biochemical changes in meat-rigour mortis – Factors affecting post-mortem changes, properties and shelf life of meat; meat tenderization-artificial tenderization-muscle stretching-mechanical disruption by artificial enzymes. Mechanical deboning, grading and aging; Preservation of meat by chilling, freezing, pickling, curing, cooking and smoking, dehydration, radiation, chemical and biological preservatives; Meat emulsions; Eating and cooking quality of meat.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the post slaughter care and changes occurs during post mortem
- Know the factors affecting post mortem changes and shelf life of meat

- Get knowledge on meat tenderization
- Explain the various preservation techniques of meat

UNIT – III

Meat cutting and handling; Preparation, preservation and equipment for manufacture of smoked meat and its quality evaluation; Preparation, packaging and equipment for manufacture of dehydrated meat products and their quality evaluation; Preparation, preservation and equipment for manufacture of meat sausages and their quality evaluation;, comminuted meat products: ham, bacon, meat analogues; effect of processing on nutritive value; hygiene in meat processing, spoilage of meat, contaminants and naturally occurring toxicants

Learning Outcomes:

At the end of unit, students will be able to

- Describe the scope of meat cutting and different cuts
- Get knowledge on equipment used for various meat products
- Know the various comminuted meat products
- Have overview on effect of processing on nutrition, hygiene & spoilage of meat processing

UNIT – IV

Poultry: Pre-slaughter care and consideration; Operations in preparation of dressed poultry, its storage and marketing, processing of poultry. Egg: structure, composition, nutritive value, egg products, dehydrated egg powder. Effect of processing on nutritive value; additives used in poultry products

Learning Outcomes:

At the end of unit, students will be able to

- Know the poultry pre slaughtering operations
- Get awareness on storage methods and marketing of processed poultry meat
- Understand the structure, composition, nutritional value of egg
- Explain the various egg value added products and their processing on nutritional value, role of additives in value addition of poultry processing

UNIT – V

Meat plant sanitation and safety; By-products of meat, poultry and eggs and their utilization; Safety standards in meat industry: HACCP/ISO/FSSAI/Kosher/Halal.

Learning Outcomes:

At the end of unit, students will be able to

- Know the importance of sanitation and safety measures used in meat industry
- Have an idea on utilization of meat by products from meat, poultry and egg.
- Acquire knowledge on food safety standards like HACCP, ISO,FSSAI, Kosher and Halal used in meat industry

Course Outcomes:

- At the end the course students will acquire knowledge on composition and structure of Meat, Egg, Poultry & effective preservation techniques along with concepts of value addition & quality assessment of Meat and sanitary measures in meat industry.

TEXT BOOKS

1. B.D. Sharma and Kinshuki Sharma. "Outlines of Meat Science and Technology". Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi. 2011.
2. B.D. Sharma. "Modern Abattoir Practices and Animal Byproducts Technology". Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi. 2003.

REFERENCES

1. B.D. Sharma. "Meat and Meat Products Technology Including Poultry Products Technology". Jaypee Brothers Medical Publishers Pvt. Ltd, New Delhi. 1999.
2. Alan H. Varnam and Jane P. Sutherland. "Meat and Meat Products: Technology, Chemistry and Microbiology". Chapman & Hall, London. 1995.
3. William J. Stadelman and Owen J. Cotterill. "Egg Science and Technology". 4th Edition. Food Products Press, NY, USA. 1995.
4. R.A. Lawrie. "Meat Science" 4th Ed. Pergamon Press, Oxford, UK. 1985.
5. Vikas Nanda. "Meat, Egg and Poultry Science & Technology". I.K. International Publishing House Pvt. Ltd., New Delhi. 2014.
6. Howard J. Swatland. "Meat Cuts and Muscle Foods". 2nd Ed. Nottingham Univ. Press, Nottingham. 2004.

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B.Tech (FT)– III-II Sem **L T P C**

3 0 0 3

(19A27605a) THERMAL OPERATIONS IN FOOD PROCESS ENGINEERING
PROFESSIONAL ELECTIVE II

UNIT 1: Fundamentals of food processing and preservation. Modern technologies used for preservation of foods.

UNIT 2 One dimensional conduction heat transfer in Cartesian coordinate. One dimensional conduction heat transfer in cylindrical coordinate. Transient heat transfer by conduction.

UNIT 3: Drying technology- Equipments used in dairy, different dairy products .

Unit 4 : Preservation by high temperature processing. Multiple effect evaporators. Process time calculations. Boiling and condensation.

UNIT 5 : Heat Exchangers. Convective heat transfer. Distillation used in food process industries.

Books & References:

1. Transfer Process: Momentum, heat and mass transfer-CJ Jeankoplis
2. Transport phenomena-RB Bird, WE Stewart, and EN Lightfoot
3. Chemical Engineering-JM Coulson and JF Richardson
4. Transport Phenomena in food process engineering-AK Datta
5. Unit operations in Chemical Engineering WL McCabe and JC Smith and PHarriot
6. Fundamental and Operations in Food Process Engineering by SK Das and M Das

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(19A27605b) THERMAL PROCESSING OF FOODS
PROFESSIONAL ELECTIVE II

Unit 1 Food microbiology: microbial growth and concerns in various foods, Blanching, Pasteurization, Ultra-pasteurization, Hot fill and UHT. Thermal processing equipment, Milk pasteurization, Canning operations .Temperature distribution and heat penetration, Kinetics of reactions, F value and process requirements.

UNIT 2 Quality considerations and process optimization, Shelf life studies, Validation of heat processes.Fundamentals of aseptic processing, Aseptic equipment design, Aseptic process design.

UNIT 3 Microwave and radio frequency heating, Ohmic heating, Overview of non-thermal processing technologies.Advanced separation processes, High pressure, dialysis, ultrafiltration and reverse osmosis, Nanofiltration, electro dialysis and membrane separation.

UNIT 4: Various types of heat exchangers for food process engineering, Various types of driers for food process engineering. Importance and applications of extrusion technology in food processing, Changes of properties and functional components of extruded foods.

UNIT 5; Food biosensors, Types of functional foods: Probiotics and nutraceuticals.Packaging considerations: Barrier and mechanical properties of different food packaging materials, Biocomposite/bionanocomposite materials for food packaging applications. Sanitary components and requirements, Regulatory considerations.

Books and references

1. Chan, E. C. S., Pelczar, M. J., Jr. Krieg N. R. 2010. Microbiology. 5th edition. Tata McGraw Hill, Delhi.
2. Banwart, G.J. 1989. Basic Food Microbiology. 2nd edition. Chapman & Hall, New York.
3. Meyer, L.H. 2004. Food Chemistry. 1st edition. CBS Publishers & Distributors, Delhi.
4. McCabe, W. L., Smith J., Harriot P. 2014. Unit Operations of Chemical Engineering. 7th edition. McGraw - Hill, International.
5. Nelson, P.E. (Editor). 2010. Principles of Aseptic Processing and Packaging. 3rd edition. Purdue university press.
6. Sun, D. (Editor). 2005. Emerging Technologies for Food Processing. Elsevier Academic Press.
7. Metaxas, A.C., Meridith, R.J. 1993. Industrial Microwave Heating. Peter Pergrinus Ltd., London.
8. Soroka, W. 1999. Fundamentals of Packaging Technology. Institute of Packaging Professionals.
9. Curtis, P.A. 2005. Guide to food laws regulations. Blackwell Publishing.

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(19A27605c) FOOD ENGINEERING
PROFESSIONAL ELECTIVE II

UNIT 1

Introduction to Food Technology
The Importance and Source of Food.Plant Products- Grains (cereals) , Pulses , Fruits, Melons and squashes. Vegetables. Tuber products, Nuts, Fungi, Manna. Sugars sugar cane, sugar beet, maple syrup Oilseeds soybean Seaweed. Beverage ingredients.

UNIT 2

Raw material selection.Definition of QualityAppearance Factors Size, Shape, Color and Gloss Consistency.Texture Factors, Expected texture ,Flavor factors, Additional Quality Factors. Nutritional Quality.Sanitary Quality May not always be apparent by sensory observation. Keeping Quality Nutritional Quality

UNIT 3

Principles of Quality Control. Raw Material Control. Process Control . Finished Product Inspection.The Importance of Raw Material Selection. A poor raw material cannot be converted into a good finished product.

UNIT 4

Definition of Food Technology.Scope of Food Technology . Multiple products,Transportation intensive; and End user marketing intensive. Components of Food Technology .Food analysis and chemistry. Food Quality Factors and their Measurement.Nutritive aspects of food constituents and effect of processing and handling.Food microbiology, mycology, and toxicology Food processing and engineering Dietary guidelines and nutrition education .Concern about food safety issues

UNIT 5

Increased attention to food interactions and bioavailability of nutrients. Improved analytical and detection methods, and research and education in food safety. New product development, particularly in the area of reduced-fat and reduced-calorie
products is predicted. New processing technologies such as high energy electric pulse processing, freeze concentration, and hydrostatic pressure processing (which are often not yet available in the U.S.) show promise. Biotechnology

Books &References

 http://www.ub.edu/web/ub/en/estu
dis/oferta_formativa/graus/fitxa/F/G1052/presentac
io/index.html

 http://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&v
ed=0CD8QFjAC&url=http%3A%2F%2Fwww.newagepublishers.com%2Fsamplecha
pter%2F000294.pdf&ei=XhDzUojqJYz7rAfJhoHwAQ&usg=AFQjCNFP_lKNgis8be
llQ2gQG9b1iDK8Pg&sig2=ycgfeBuskhQFZMq0rTeOGA

 http://www.sciencedirect.com/science/book/9780126702569

 http://link.springer.com/chapter/10.1007%2F978-1-4684-6453-5_1#page-1

 http://en.wikipedia.org/wiki/Food_industry

 http://link.springer.com/chapter/10.1007%2F978-0-387-33957-3_13#page-1

 http://www.intechopen.com/books/food-industry/quality-management-importantaspects-for-
the-food-industry

 http://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=6&cad=rja&v
ed=0CFYQFjAF&url=http%3A%2F%2Fnptel.ac.in%2Fcourses%2F103107088%2F
module1%2Flecture1%2Flecture1.pdf&ei=qhLzUsXTFoSFrgf8hYGABg&usg=AFQj
CNF47bTxaBViLh0J7Z9TiGZrgrgRow&sig2=nw0yBxqwR0fO-2PwizMwEw

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II Sem **L T P C**

3 0 0 3

(19A27605d) NOVEL TECHNOLOGIES FOR FOOD PROCESSING AND SHELF LIFE EXTENSION

PROFESSIONAL ELECTIVE II

UNIT 1 :

Introduction to food processing, preservation and quality. Basic principles & methods, water activityvs. food stability, structure-function relationship.Chemical changes in food during processing. Browning reactions (enzymatic and non-enzymatic),protein interactions, carbohydrate interactions, Rancidity & reversion.

UNIT 2 :

High pressure processing and Membrane technologies in food processing.

:Food irradiation, RF & microwave heating; Super critical -fuid extraction and ultrasonication.:Food extrusion technology, RTE snack foods, Textured vegetable protein, Rice and dal analogues.

UNIIT 3:

Hurdle technology concept, Natural antimicrobials &bacteriocin; Freeze drying.Controlled atmosphere storage of food grains; ozone, microwave treatment for disinfestation of grains. Detection of spoilage in grains.

UNIT 4 :

Modifed atmosphere packaging, Active packaging and Edible coating of fruits & vegetables :Extraction and processing of oil, Mechanical expellers, solvent extraction, refining, hydrogenation,winterization :Shelf life extension of oils using natural antioxidants. Concept and, measurement of rancidity.

UNIT 5 :

Microencapsulation of bioactive and Technology of oil powder. Functional foods and Nutraceuticals. Ready to eat therapeutic food, micronutrient fortified high energy bar, gluten free bread, lactose free milk, carbonated cereal beverage.

Books & references:

- Food Chemistry, Revised and Expanded Edition by Owen R Fennema.
- Modern Food Microbiology by James M Jay.
- Mechanism of Action of Food Preservation Procedures by G W Gould.
- Principles of Food Science (Part II): Physical Principles of Food Preservation by
- M Karel Owen R Fennema and D B Lund.
- Food Processing Technologies Principles and Practices by P J Fellows.

- Food Processing Principles and Application by Stephanie Clark and others.
- Food Processing and Preservation Techniques by Peter Zeuthen and Leif Bagh,
- Non Thermal Preservation of Foods by Gustavo V Barbosa and others.
- Food Product and Process Innovations (2 volumes) by Hari Niwas Mishra.

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(19A27605e) DAIRY AND FOOD PROCESS AND PRODUCTS TECHNOLOGY PROFESSIONAL ELECTIVE II

UNIT 1

Basic principles and methods of food processing and preservation .Emerging Technologies in food processing. Food additives and preservatives. Food laws and standards. Effect of processing on acceptability and nutritive value of food.

UNIT 2 :

Physico-chemical properties and structure of milk and milk constituents.:Chemical and microbial spoilage of milk and milk products; Fluid milk Processing, packaging and distribution.

UNIT 3 :

Common dairy processes – cream separation(standardization), pasteurization, sterilization and Homogenization.:Process technology for manufacture of evaporatedmilk, condensed milk, dried milk, malted milk, infant and baby foods, ice-cream, cheese, butter, fermented milk and indigenous dairy Products. Methods and procedures for sampling and testing of milk and milk products. Laws and standards for milk and milk products.

UNIT 4 :

Technological processes for industrially manufactured foods of commercial importance, from plant and animal origin. :Cereals, vegetables,fruits, meats, poultry and eggproducts; Bakery, pasta and confectionary products,ready to eat foods, fermented foods, alcoholic andnon-alcoholicBeverages, tea, coffee and cocoa,fabricated foods.

UNIT 5 :

Packaging materials; Characteristics, properties andtheir design. Packaging requirement for Differentprocessed and unprocessed foods.:Working Principles of various typeof fillers : form-fill-seal machine:Gas packaging and modified atmosphere Package design. Shelf life prediction of foods in packages. Quality control inFood packaging. Product safetyandpackaging regulations.

Books & References:

1.The Technology of Food Preservation –N.W. Desrosier and J.N. Desrosier.
2. Elements of Food Technology –N.W. Desrosier.
3. Food Processing and Preservation –B. Shivashankar.
4. Food Processing: Biotechnical Applications –S.S. Marwaha and J.K.Arora.
5. Foods : Facts and Principles –N.S. Manay and M. Shadaksharaswamy.

6. Milk and Milk Products –C.H. Eckles, W.B. Combs, and H. Macy.
7. Outlines of Dairy Technology – Sukumar De.
8.Spices and Seasonings : A Food Technology Handbook –D.R. Tainter and A.T. Grenis.
9. Principles of food science –Marcus Karel, Owen R. Fennema, & D.B. Lund

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B.Tech (FT) – III-II **L T P C**

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(19A01604a) INDUSTRIAL WASTE AND WASTE WATER MANAGEMENT

OPEN ELECTIVE-II

Course Objectives:

- To teach Health and Environment Concerns in waste water management
- To teach material balance and design aspects of the reactors used in waste water treatment.
- To impart knowledge on selection of treatment methods for industrial waste water
- To teach common methods of treatment in different industries
- To provide knowledge on operational problems of common effluent treatment plant

UNIT –I

Industrial water Quantity and Quality requirements:
Boiler and cooling waters–Process water for Textiles, Food processing, Brewery Industries, power plants, fertilizers, sugar mills Selection of source based on quality, quantity and economics. Use of Municipal wastewater in Industries – Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, Freezing, Elutriation, Removal of Colour, Odour and Taste.

Learning Outcomes:

At the end of the unit, students will be able to:

- Learn the procedures for assessment of quality of Industrial water
- Suggest different processes of handling waste water

UNIT –II

Basic theories of Industrial Wastewater Management: Industrial waste survey - Measurement of industrial wastewater Flow-generation rates – Industrial wastewater sampling and preservation of samples for analysis -Wastewater characterization-Toxicity of industrial effluents-Treatment of wastewater-unit operations and processes-Volume and Strength reduction – Neutralization and Equalization, Segregation and proportioning- recycling, reuse and resources recovery

Learning Outcomes:

At the end of the unit, students will be able to:

- Measure industrial waste water flow
- Characterize waste water
- Suggest techniques for treatment of waste water.

UNIT –III

Industrial wastewater disposal management: Discharges into Streams, Lakes and oceans and associated problems, Land treatment - Common Effluent Treatment Plants: advantages and suitability, Limitations and challenges- Recirculation of Industrial Wastes- Effluent Disposal Method

Learning Outcomes:

At the end of the unit, students will be able to:

- Understand options for waste water disposal.
- Explain functioning of common effluent treatment plants

UNIT – IV

Process and Treatment of specific Industries-1: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Steel plants, Fertilizers, Textiles, Paper and Pulp industries, Oil Refineries, Coal and Gas based Power Plants

Learning Outcomes:

At the end of the unit, students will be able to:

- Understand the character of waste water from Steel plants and refineries
- Suggest suitable waste water treatment techniques

UNIT – V

Process and Treatment of specific Industries-2: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Tanneries, Sugar Mills, Distillers, Dairy and Food Processing industries, Pharmaceutical Plants

Learning Outcomes:

At the end of the unit, students will be able to:

- Understand the character of waste water from tanneries and distilleries
- Suggest suitable waste water treatment techniques

Course Outcomes:

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

- Design treatment methods for any industrial wastewater.
- Examine the manufacturing process of various industries.
- Assess need for common effluent treatment plant for an industry
- Test and analyze BOD, COD, TSS and MPN in waste water.

TEXT BOOK

1. M. N. Rao and A. K. Dutta, “Wastewater Treatment”, Oxford & IBH, New Delhi.
2. K.V. S. G. Murali Krishna, “Industrial Water and Wastewater Management”.

REFERENCES

1. A. D. Patwardhan, “Industrial Wastewater treatment”, PHI Learning, Delhi
2.Metcalf and Eddy Inc., “Wastewater Engineering”, Tata McGraw Hill co., New Delhi.
3.G. L. Karia & R.A. “Christian Wastewater Treatment- Concepts and Design Approach”, Prentice Hall of India.

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B.Tech (FT)– III-II

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(19A01604b) BUILDING SERVICES AND MAINTAINANCE
OPEN ELECTIVE-II

Course Objectives:

- To impart knowledge in concepts of building maintenance
- To insists the student to observe various practices of good building maintenance
- To teach the importance safety in buildings
- To demonstrate the use of ventilation in buildings.
- To give the list of different types of machineries in buildings

UNIT – I

PLUMBING SERVICES: Water supply system- fixing of pipes in buildings – maintenance of buildings- water meters-sanitary fittings-design of building drainage- gas supply systems

Learning Outcomes:

At the end of the unit, students will be able to:

- Understand water supply system
- Understand the building drainage system.

UNIT – II

VENTILATION: Necessity of ventilation – functional requirements – systems of ventilation-natural ventilation-artificial ventilation-air conditioning-systems of air conditioning-essentials of air conditioning-protection against fire caused by air conditioning systems.

Learning Outcomes:

At the end of the unit, students will be able to:

- Understand concepts of ventilation
- Understand concepts of air conditioning

UNIT – III

THERMAL INSULATION: Heat transfer system-thermal insulating materials-methods of thermal insulation-economics of thermal insulation-thermal insulation of exposed walls, doors,windows and roofs.

Learning Outcomes:

At the end of the unit, students will be able to:

- Understand methods of insulation
- Understand materials of insulation

UNIT – IV

FIRE SAFETY: Causes of fire in buildings-fire safety regulations-charecteristics of fire resisting materials- fire resistant construction-heat and smoke detecters-fire alarms-fire fighting pump and water storage.

Learning Outcomes:

At the end of the unit, students will be able to:

- Understand safety regulations of fire system
- Know about the implementation and usage of various fire resistant materials in building construction

UNIT – V

MACHINERIES IN BUILDINGS: Lifts-essential requirements-design considerations-escalators-essential requirements-electrical installations in buildings-lighting in buildings-methods of electrical wiring-earthing

Learning Outcomes:

At the end of the unit, students will be able to:

- Understanding of different machineries of buildings
- Understanding of electrical installation of buildings

Course Outcomes:

Student will be able to understand

- Concepts of plumbing, drainage system and gas supply system
- Concepts of ventilation and air conditioning
- Concepts of thermal insulation and economics of thermal insulation
- Concepts of fire safety in buildings and fire resistant construction
- Concepts of different machineries of buildings

TEXT BOOKS:

1. B.C.Punmia, Er. Ashok K jain, Arun K Jain "Building construction", Laxmi publications pvt.ltd. New Delhi.
2. Janardhan Jah, S.K Sinha, "Building construction", Khanna publishers
3. Rangwala, "Building construction", Charothar publishing house.

REFERENCE BOOKS:

1. David V Chaddrton, "Building services engineering", Outledge
2. P.C Varghees "Building construction", Printice hall india

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B.Tech (FT)– III-II Sem

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(19A02604a) INDUSTRIAL AUTOMATION
OPEN ELECTIVE-II

Course Objectives:

- To understand the basic concepts of Automation
- To understand the concepts of automation cycle and hardware components
- To gain knowledge about pneumatic and hydraulic devices
- To understand the concepts of sensors and actuators
- To know the use of Robotics used in industries automation

UNIT -I:

Introduction to Automation

Definition and fundamentals of automation, reasons for Automating, basic elements of an automated system: Power, Program and control system, safety, maintenance & repair diagnosis, error detection and recovery, Automation principles and strategies: USA principle, strategies of automation and production system, automation migration strategy

Learning Outcomes:

At the end of the unit, students will be able to:

- To understand the fundamental concepts of automation and its basic elements
- To understand system safety requirements
- To understand about maintenance and repair strategies
- To know about production system automation

UNIT- II:

Mechanization and Automation

Basic principles of Mechanization and automation, product cycle, hard Vs flexible automation, Capital- intensive Vs low cost automation. Types of systems-mechanical, electrical, hydraulic, pneumatic and hybrid systems, Automation using CAMS, Geneva mechanisms, gears etc. Assembly line Automation: automated assembly systems, transfer systems, vibratory bowl feeders, non-vibratory feeders, part orienting, feed track, part placing & part escapement systems. Introduction to Material storage/ handling and transport systems, and its automation using AS/RS, AGVS and conveyors etc.

Learning Outcomes:

At the end of the unit, students will be able to:

- To know about how to analyse the various automation methods
- To know about assembling and placing of various parts

- To distinguish between mechanization and automation of systems
- To know about material storage, handling and automation using various approaches

UNIT -III:

Pneumatics and hydraulics

Hydraulic and pneumatic devices-Different types of valves, Actuators and auxiliary elements in Pneumatics & hydraulics , their applications and use of their ISO symbols. Synthesis and design of circuits (up to 3 cylinders)–pneumatic, electro pneumatics and hydraulics. Design of Electro-Pneumatic Circuits using single solenoid and double solenoid valves; with and without grouping.

Learning Outcomes:

At the end of the unit, students will be able to:

- To know design of various pneumatic and hydraulic components
- To understand about synthesis and design of Pneumatic circuits
- To understand about electro pneumatic circuits
- To design using various solenoid valves with and without grouping

UNIT -IV:

Sensors & Actuators Sensors

Selection of sensors (Displacement, temperature, acceleration, force /pressure) based on static and dynamic characteristics. Interfacing: Concept of interfacing, bit accuracy and sampling speed, amplifying electronics, and microcontroller. Actuators: Principle and selection of electro mechanical actuators (1) DC motors (2) Stepper Motors (3) Solenoid Actuators (4) Servo Motors (5) BLDC

Learning Outcomes:

At the end of the unit, students will be able to:

- To know about selection of sensors and actuators based on dynamic characteristics
- To understand about necessity of interfacing sensors with Microcontroller
- To understand principle and selection of actuators
- To apply various electro mechanical actuators to certain machines

UNIT- V:

Robots and their applications

Introduction to robots, Types, Classifications, Selection of robots, Robot Degrees of freedom, Robot configuration, Accuracy and repeatability, Specification of a robot, Robot feedback controls: Point to point control and Continuous path control, Control system for robot joint, Adaptive control, Drives and transmission systems, End effectors, Industrial robot applications of robots

Learning Outcomes:

At the end of the unit, students will be able to:

- To know about Robots, classification, selection and specifications
- To understand the use of robotics in industrial applications
- To know about various feedback controls of Robot
- To understand how adaptive control strategies can be used in Robots

Course Outcomes:

1. Understand the basic concepts of Industrial automation
2. Design and analysis of automation methods, placing and assembling of various parts
3. Design of various processing and control circuits using pneumatic and hydraulic elements
4. Selection of sensors based on the industrial application
5. Role of robotics in industrial applications

TEXT BOOKS:

1. Stamatios Manesis and George Nikolakopoulos, "Introduction to Industrial Automation", CRC Press, 2018.
2. Frank Lamb, "Industrial Automation", Hands on, Mc Graw Hill Education, 2013.

REFERENCES:

1. Richerd L. Shell and Ernest L. Hall, "Hand Book of Industrial Automation", CRC Press, 2000.

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B.Tech (FT)– III-II Sem

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(19A02604b) SYSTEM RELIABILITY CONCEPTS
(OPEN ELECTIVE-II)

Course Objectives:

To make the students learn about:

- The Basic concepts, rules for combining probabilities of events, failure density and distribution functions.
- Evaluation of network Reliability / Unreliability and types of redundancies.
- Evaluation of network Reliability / Unreliability using conditional probability method.
- Expected value and standard deviation of Exponential distribution and Measures of reliability.
- Evaluation of Limiting State Probabilities of one, two component repairable models.

UNIT-I:

Basic Probability Theory

Basic concepts – Rules for combining Probabilities of events – Failure Density and Distribution functions – Bernoulli's trials – Binomial distribution – Expected value and standard deviation for binomial distribution – Examples

Learning Outcomes:

At the end of the unit, students will be able to:

- To know about basic rules for probabilities of events
- To distinguish between pdf and cdf
- Get detailed information about Probability of failure density and distribution functions
- Obtain the expected value and standard deviation for binomial distribution.

UNIT-II:

Network Modeling and Reliability Evaluation

Basic concepts – Evaluation of network Reliability / Unreliability – Series systems, Parallel systems, Series - Parallel systems, partially redundant systems – Types of redundancies - Evaluation of network Reliability / Unreliability using conditional probability method – Paths based and Cutset based approach – complete event tree and reduced event tree methods - Examples.

Learning Outcomes:

At the end of the unit, students will be able to:

- How to find the Probability of success and failures of network using different approaches for series-parallel configurations.
- Classification of redundancies.
- To find reliability / unreliability of complex systems using different methods
- Comparison of approaches to solve probability index of SISO system

UNIT-III:

Time Dependent Probability

Basic concepts – Reliability functions f(t), Q(t), R(t), h(t) – Relationship between these functions – Bath tub curve – Exponential failure density and distribution functions - Expected value and standard deviation of Exponential distribution – Measures of reliability – MTTF, MTTR, MTBF – Evaluation of network reliability / Unreliability of simple Series, Parallel, Series-Parallel systems - Partially redundant systems - Evaluation of reliability measure – MTTF for series and parallel systems – Examples.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the concepts of time domain functions and relationship between them.
- Obtain the expected value and standard deviation for exponential distribution.
- Obtain the values of probabilistic measures for series and parallel configurations.
- To obtain probabilistic measures for fully redundant and partially redundant configurations

UNIT-IV:

Discrete Markov Chains & Continuous Markov Processes

Markov Chains: Basic concepts – Stochastic transitional Probability matrix – time dependent probability evaluation – Limiting State Probability evaluation – Absorbing states.
Markov Processes: Modeling concepts – State space diagrams – time dependent reliability evaluation of single component repairable model – Evaluation of Limiting State Probabilities of one, two component repairable models – Frequency and duration concepts – Frequency balance approach - Examples.

Learning Outcomes:
At the end of the unit, the student will be able to

- Understand the concepts of Stochastic Transitional Probability Matrix, Limiting State Probability
- To know about evaluation for one and two component repairable models.
- Understand the concept of Frequency balance approach.
- To distinguish between Markov chains and Markov processes

UNIT-V:

Multi Component & Approximate System Reliability Evaluation

Recursive relation for evaluation of equivalent transitional rates– cumulative probability and cumulative frequency and 'n' component repairable model – Series systems, Parallel systems, Basic probability indices – Series, Parallel systems – Complex Systems– Cutset approach – Examples.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the concepts of recursive relation for evaluation of equivalent transitional rates.
- Obtain the cumulative probability and cumulative frequency for different systems
- To know about computation of basic probability indices for series, parallel configurations
- To know how to evaluate basic probability indices using cut set approach

Course Outcomes:

After completing the course, the student should be able to do the following:

- Understand the concepts for combining Probabilities of events, Bernoulli's trial, and Binomial distribution.
- Network Reliability/Unreliability using conditional probability, path and cutset based approach, complete event tree and reduced event tree methods.
- Understanding Reliability functions and to develop relationship between these functions, expected value and standard deviation of Exponential distribution and measures of reliabilities.
- Analyze the time dependent reliability evaluation of single component repairable model, frequency and duration concepts, Frequency balance approach.
- Recursive relation for evaluation of equivalent transitional rates, cumulative probability and cumulative frequency and 'n' component repairable model.

Text Books:

1. Roy Billinton and Ronald N. Allan, "Reliability Evaluation of Engineering Systems", Reprinted in India B. S. Publications, 2007.
2. E. Balagurusamy, "Reliability Engineering", Tata McGraw Hill, 2003.

Reference Books:

1. E. E. Lewis , "Introduction to Reliability Engineering" Wiley Publications.
2. Charles E. Ebeling, "Reliability and Maintainability Engineering", Tata McGraw Hill, 2000.
3. by Ajit Kumar Verma, Srividya Ajit and Durga Rao Karanki, Springer, "Reliability and Safety Engineering" 2nd edition, 2016.
4. Rausand and Arnljot Hoyland, "System Reliability Theory Marvin", Wiley Publictions.

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B.Tech (FT)– III-II Sem

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(19A03604a) INTRODUCTION TO MECHATRONICS
OPEN ELECTIVE

Course Objectives:

- Familiarize the technologies behind modern mechatronic systems.
- Explain fundamentals for the development of fully automated system.
- Develop a robotic or automated systems focusing on the hardware and software integration.
- Demonstrate the development and design of mechatronic system and MEMS.

UNIT – I

Introduction: Definition of Mechatronics, Need for Mechatronics in Industry, Objectives of mechatronics, mechatronics design process, Mechatronics key elements, mechatronics applications – Computer numerical control (CNC) machines, Tool monitoring systems, Flexible manufacturing system (FMS), Industrial Robots, Automatic packaging systems, Automatic inspection systems.

Learning Outcomes:

At the end of the unit, the student will be able to

- Explain the role of mechatronics in industry.(l2)
- Identify the application of mechatronics in automation industry.(l3)

UNIT – II

Sensors: Static characteristics of sensors, Displacement, Position and Proximity sensors, Force and torque sensors, Pressure sensors, Flow sensors, Temperature sensors, Acceleration sensors, Level sensors, Light sensors, Smart material sensors, Micro and Nano sensors, Selection criteria for sensors.

Learning Outcomes:

At the end of the unit, the student will be able to

- Classify various types of sensors. (l2)
- Choose sensors for particular application. (l3)
- Measure different quantity's using sensors. (l4)

UNIT – III

Actuators: Mechanical, Electrical, Hydraulic and Pneumatic Actuation systems, Characteristics and their limitations, Design of Hydraulic and Pneumatic circuits, Piezoelectric actuators, Shape memory alloys, Selection criteria for actuators.

Learning Outcomes:

At the end of the unit, the student will be able to

- Classify various actuation systems. (l2)
- Choose the criterion for different actuators. (l1)

UNIT – IV

Microprocessors, Microcontrollers and Programmable Logic Controllers: Architecture of of Microprocessor, Microcontroller and Programmable Logic Controller, PLC Programming using ladder diagrams, logics, latching, sequencing, timers relays and counters, data handling, Analog input/output, selection of controllers.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the architecture of microprocessors, microcontrollers and PLC. (L2)
- Formulate various programs using PLC. (L6)

UNIT – V

Design of mechotronics systems**,** Mechotronics design elements, Traditional mechatronics systems, Embedded systems, Procedure for designing a mechotronic systems.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understanding design of mechotronics . (L2)
- Various Mechotronics systems. (L4)
- Design Aspects of Mechotronic systems. (L2)

Course Outcomes

Upon successful completion of this unit, the student will be able to:

- Explain mechatronics systems in industry. (l2)
- Identify mechatronic systems encountered in practice. (l3)
- Examine the components of a typical mechatronic system. (l4)
- Compare the various techniques used for development of mems. (l4)
- Develop programs using plc. (l6)

Text books:

1. Er R. Rajput, " A Text book of Mechatronics", S.Chand,2nd edition-2016.
2. James J Allen, "Micro Electro Mechanical Systems Design", CRC Press Taylor & Francis group, 2005.

Reference Text books:

1. WBolton, “Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering”, 3rd edition, Pearson Education Press, 2005.
2. Devadas Shetty and Richard A Kolk, “Mechatronic System Design”, 2nd edition, Cengage learning, 2010.
3. Clarence W. de Silva, “Mechatronics an Integrated Approach”, CRC Press, 2004.
4. Ganesh S Hedge, “Mechatronics”, Jones & Bartlett Learning, 2010.

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(19A03604b) OPTIMIZATION TECHNIQUES THROUGH MATLAB

OPEN ELECTIVE-II

Course Objectives

- Introduce basics of MATLAB
- Familiarize the fundamentals of optimization
- Explain single variable optimization using various methods
- Implement multi variable optimization using various methods
- Train various evolutionary algorithms.

UNIT -I

Introduction to MAT LAB: Overview, MATLAB Preliminaries, Basics of MATLAB, Beyond the Basics of MATLAB, Popular Functions and Commands, Plotting using MATLAB, Optimization with MATLAB.

Learning Outcomes:

After completion of this unit, students will be able to

- Write simple codes in MATLAB. (L3)
- Plot the data using MATLAB. (L3)
- Implement optimization models in MATLAB. (L3)

UNIT -II

Introduction to Optimization: Statement of an optimization problem, Classifications of optimization Problems: Single variable optimization, Multi variable optimization with no constraints, Multi variable optimization with equality constraints, Multi variable optimization with inequality constraints, Convex and Concave programming.

Learning Outcomes:

After completion of this unit, students will be able to

- Build optimization problem. (l1)
- Solve various optimization problems(l3)
- Compare convex and concave programming (l4)

UNIT -III

Single Variable Optimization: Finite difference method, Central difference method, Runge-Kutta method, interval halving method, golden section method with MATLAB code.

Learning Outcomes:

After completion of this unit, students will be able to

- Understand various methods involving single variable optimization. (l2)
- Develop codes in matlab for different methods. (l3)

- Identify methods for solving a single variable optimization problem. (l3)

UNIT- IV

Multi Variable Optimization: Conjugate gradient method, Newton's method, Powell's method, Flectcher- Reeves method, Hook and Jeeves method, interior penalty function with MATLAB code.

Learning Outcomes:

After completion of this unit, students will be able to

- Apply various methods involving multi variable optimization. (l2)
- Develop codes in matlab for solving various multi variable optimization problems. (l3)
- Choose methods for solving a multi variable optimization problem. (l3)

UNIT -V

Evolutionary Algorithms: Overview, Genetic Algorithms: Basics of Genetic Algorithms, Options in MATLAB, Multi Objective Optimization using Genetic Algorithms, Ant Colony Optimization, Simulated Annealing, Particle Swarm Optimization.

Learning Outcomes:

After completion of this unit, students will be able to

- Apply different types of genetic algorithms. (l3)
- Model optimization problems using genetic algorithms in matlab. (l3)
- Compare different genetic algorithms for performance. (l5)

Course Outcomes:

After completion of this course the student can be able to

- Use optimization terminology and concepts, and understand how to classify an optimization problem.(l4)
- Apply optimization methods to engineering problems.(l3)
- Implement optimization algorithms.(l3)
- Compare different genetic algorithms. (l5)
- Solve multivariable optimization problems. (l4)

TEXT BOOKS:

1. Rao V.Dukkipati, MATLAB: "An Introduction with Applications", Anshan, 2010.
2. Achille Messac, "Optimization in practice with MATLAB", Cambridge University Press, 2015.
3. Jasbir S Arora, "Introduction to optimum design", 2nd edition. Elsevier, 2004.

REFERENCES:

1. Cesar Perez Lopez, “MATLAB Optimization Techniques”, Academic press, Springer publications, 2014.
2. Steven C.Chapra, “Applied Numerical Methods with MATLAB for Engineers and scientists”: 4th edition, McGraw-Hill Education, 2018.

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(19A04604a) BASICS OF VLSI

OPEN ELECTIVE-II

Course Objectives:

The objectives of the course are to

- Learn and Understand IC Fabrication process steps required for various MOS circuits
- Understand and Experience VLSI Design Flow
- Learn Transistor-Level CMOS Logic Design
- Understand VLSI Fabrication and Experience CMOS Physical Design
- Learn to Analyze Gate Function and Timing Characteristics

UNIT – I

Introduction: Introduction to MOS Technology – MOS, PMOS, NMOS, CMOS and BiCMOStechnologies, fabrication fundamentals: Oxidation, Lithography, Diffusion, Ionimplantation, Metallization and Encapsulation.

Basic Electrical Properties: Basic Electrical Properties of MOS,CMOS and BiCMOS Circuits, I_{DS}-V_{DS}relationships, MOS transistor threshold Voltage, g_m, g_{ds}, figure of merit ωo, Passtransistor, NMOS inverter, Various pull - ups, Determination of pull-up to pulldown ratio (Z_{pu} / Z_{pd}) , CMOS Inverter analysis and design, BiCMOS inverters,Latch-up in CMOS circuits.

Learning Outcomes:

After completion of this unit, students will be able to

- Demonstrate a clear understanding of CMOS fabrication flow and technology scaling (L2)
- Analyze the electrical properties of MOS and BiCMOS circuits (L3)
- Design MOSFET based logic circuit (L4)

UNIT – II

VLSI Circuit Design Processes:VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layouts,Lambda based design rules, Contact cuts , CMOS Lambda based design rules,Layout Diagrams for logic gates, Transistor structures, wires and vias, Scaling ofMOS circuits- Scaling models, scaling factors, scaling factors for device parameters, Limitations of Scaling.

Learning Outcomes:

After completion of this unit, students will be able to

- Understand the design rules and layout diagram for logic gates, limitations of scaling (L1)
- Draw the Layout of simple MOS circuit using Lambda based design rules (L2)

UNIT – III

Gate Level Design and Layout: Architectural issues, Switch logic networks: Gate logic, Alternate gate circuit:Pseudo-NMOS Dynamic CMOS logic. Basic circuit concepts, Sheet ResistanceR_S and its concept to MOS, Area Capacitance Units, Calculations, The delay unitT, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-inand fan-out, Choice of layers

Learning Outcomes:

After completion of this unit, students will be able to

- Apply basic circuit concepts to MOS circuits. (L2)
- Estimate the propagation delays in CMOS circuits (L3).

UNIT – IV

Subsystem Design: Subsystem Design, Shifters, Adders, ALUs, Multipliers: Array multiplier, SerialParallel multiplier, Parity generator, Comparators, Zero/One Detectors, Up/DownCounter, Memory elements: SRAM, DRAM, ROM, Serial Access Memories.

Learning Outcomes:

After completion of this unit, students will be able to

- Apply the Lambda based design rules for subsystem design (L2)
- Design of Adders, Multipliers and memories etc(L4)
- Design digital systems using MOS circuits(L4)

UNIT – V

Semiconductor Integrated Circuit Design:PLDs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic,Programmable Logic Array Design Approach.

Learning Outcomes:

After completion of this unit, students will be able to

- Analyze various architectures and device technologies of PLDs(L3)
- Design simple logic circuit using PLA, PAL, FPGA and CPLD.(L4)

Course Outcomes:

- Learn the basic fabrication process of MOS transistors, study CMOS inverter circuits, basic circuit concepts such as Sheet Resistance, Area Capacitance and Delay calculation, Field programmable gate arrays and realization techniques, CPLDs and FPGAs for implementing the various logic functions.

- Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality.

- Analyze the performance of CMOS Inverter circuits

- Compare various Scaling models and understand the effect of scaling on device parameters

TEXT BOOKS:

1. Kamran Eshraghian, "Essentials of VLSI circuits and systems", EshraghianDouglesand
   A. Pucknell, PHI, 2005 Edition
2. Wayne Wolf, "Modern VLSI Design", 3rd Edition, Pearson Education, 1997.

REFERENCE BOOKS:

1. John .P. Uyemura, "CMOS logic circuit Design", Springer, 2007.
2. Neil H. E Weste, "CMOS VLSI Design – A Circuits and Systems Perspective", 3rd edition, DavidHarris, Ayan Banerjee, Pearson, 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II Sem

L	T	P	C
3	0	0	3

(19A04604b) PRINCIPLES OF COMMUNICATION SYSTEMS
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.

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 (L1).
- Apply the concept of amplitude modulationto solve engineering problems (L2).
- Analyse various amplitude modulation schemes (L3).
- Evaluate various amplitude modulation schemes in real time applications (L3).

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 (L1).
- Apply the concept of frequency modulation to solve engineering problems (L2).
- Analyse angle modulation schemes (L3).
- Evaluate frequency modulation scheme in real time applications (L3).

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 (L1).
- Analyse various pulse modulation schemes (L3).

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 (L1).
- Analyze various digital modulation schemes (L3).

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 (L1).

Note: The main emphasis is on qualitative treatment. Complex mathematical treatment may be avoided.

Course Outcomes:

- Understand the concept of various modulation schemes and multiplexing (L1).

- Apply the concept of various modulation schemes to solve engineering problems (L2).
- Analyse various modulation schemes, and evaluate various modulation scheme in real time applications (L3).

TEXT BOOKS:

1. Herbert Taub, Donald L Schilling and Goutam Saha, "Principles of Communication Systems", 3rdEdition, Tata McGraw-Hill Publishing Company Ltd., 2008.

REFERENCES:

1. B. P. Lathi, Zhi Ding and Hari M. Gupta, "Modern Digital and Analog Communication Systems", 4th Edition, Oxford University Press, 2017.
2. K. Sam Shanmugam "Digital and Analog Communication Systems", Wiley India Edition, 2008.

Blooms' Learning levels:

L1: Remembering and Understanding
L2: Applying
L3: Analyzing, Evaluating

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B.Tech (FT)– III-II Sem

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(19A05604a) FUNDAMENTALS OF VR/AR/MR

Open Elective-II

(Common to CSE & IT)

Course Objectives:

This course is designed to:

- Explore the history of spatial computing and design interactions
- Understand the foundational principles describing how hardware, computer vision algorithms function
- Learn Virtual reality animation and 3D Art optimization
- Demonstrate Virtual reality
- Introduce to the design of visualization tools

UNIT-I

How Humans interact with Computers: Common term definition, introduction, modalities through the ages (pre- 20th century, through world war-II, post world war-II, the rise of personal computing, computer miniaturization), why did we just go over all of this?, types of common HCI modalities, new modalities, the current state of modalities for spatial computing devices, current controllers for immersive computing systems, a note on hand tracking and hand pose recognition.

Designing for our Senses, Not our Devices: Envisioning a future, sensory technology explained, who are we building this future for?, sensory design, five sensory principles, Adobe's AR story.

Learning Outcomes:

At the end of the unit, students will be able to:

- Explain common modalities and their pros and cons.(L2)
- Demonstrate Mapping modalities to current industry inputs(L2)
- Explore the importance of design with spatial computing(L5)

UNIT-II

Virtual Reality for Art: A more natural way of making 3D art, VR for animation.

3D art optimization: Introduction, draw calls, using VR tools for creating 3D art, acquiring 3D models vs making them from scratch.

How the computer vision that makes augmented reality possible works: Who are we?, a brief history of AR, how and why to select an AR platform, mapping, platforms, other development considerations, the AR cloud.

Learning Outcomes:

At the end of the unit, students will be able to:

- Utilize VR tools for creating 3D Animations(L3)
- Analyze how and why to Select an AR Platform(L4)

UNIT-III

Virtual reality and augmented reality: cross platform theory: Why cross platform? The role of game engines, understanding 3D graphics, portabiltity lessons from video game design, simplifying the controller input.

Virtual reality toolkit: open source framework for the community: What is VRTK and why people use it?, the history of VRTK, welcome to the steam VR unity toolkit, VRTK v4, the future of VRTK, success of VRTK.

Three virtual reality and augmented reality development practices: Developing for virtual reality and augmented reality, handling locomotion, effective use of audio, common interaction paradigms.

Learning Outcomes:

At the end of the unit, students will be able to:

- Explain why the design approach should be considered at a holistic high level based on the goal of the experience(L2)
- Build VR solutions using Virtual reality toolkit(L6)
- Interpret the development practices in three Virtual reality and Augmented reality development(L2)

UNIT-IV

Data and machine learning visualization design and development in spatial computing: Introduction, understanding data visualization, principles for data and machine learning visualization design and development in spatial computing, why data and machine learning visualization works in spatial computing, 2D data visualization vs 3D data visualization in spatial computing, interactivity in data visualizations and in spatial computing, animation, failures in data visualization, good data visualization design optimize 3D spaces, data representations, info graphics, and interactions, defining distinctions in data visualization and big data for machine, how to create data visualization: data visualization creation pipeline, webXR, data visualization challenges in XR, data visualization industry use case examples of data visualization, 3D reconstruction and direct manipulation of real world data, data visualization is for everyone, hands on tutorials, how to create data visualization, resources.

Learning Outcomes:

At the end of the unit, students will be able to:

- Understand, define, and set data and machine visualization design and development principles in embodied reality(L1)
- Demonstrate best practices, and practical tools to create beautiful and functional data visualizations.(L2)

UNIT-V

Character AI and Behaviors: Introduction, behaviors, current practice: Reactive AI, more intelligence in the system, Deliberative AI, machine learning.

The virtual and augmented reality health technology ecosystem: VR/AR health technology application design, standard UX isn't intuitive, tutorial: insight Parkinson's experiment, companies, case studies from leading Academic institutions.

Learning Outcomes:

At the end of the unit, students will be able to:

- Design a behavioral AI system for a video game(L6)
- Identify issues related to design of virtual reality (VR) and augmented reality (AR) experiences deployed in a health-care context(L3)
- Explain the use of motion data from controllers to reduce the visible tremor of a Parkinson's patient in a virtual environment(L2)

Course outcomes

Upon completion of the course, the students should be able to:

- Explain how the humans interact with computers (L2)
- Apply technical and creative approaches to make successful applications and experiences. (L3)
- Design audio and video interaction paradigms (L6)
- Design Data visualization tools (L6)
- Apply VR/MR/AR in various fields in industry (L3)

Text book

1. Erin Pangilinan, Steve lukas, and Vasanth Mohan, "Creating Augmented & Virtual Realities", 1st edition, O'REILLY, 2019.

References

1. Steve Aukstakalnis, "Practical Augmented Reality", Pearson Education, 2017.

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B.Tech (FT)– III-II Sem

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(19A05604b) DATA SCIENCE
Open Elective-II
(Common to CSE & IT)

Course Objectives

This course is designed to:

- Understand the approaches for handling data related problems
- Explore the mathematical concepts required for Data science
- Explain the basic concepts of data science.
- Elucidate various Machine Learning algorithms.
- Introduce Natural Language Processing and Recommender Systems

UNIT- I

Introduction to Data Science, A Crash Course in Python, Visualising Data.

Learning Outcomes:

At the end of the unit, students will be able to:

- Describe the importance of data analysis (L1).
- Identify the key connectors of Data Science (L4).
- Interpret and Visualize the data using bar charts, line charts and scatter plots (L3).

UNIT-II

Linear Algebra, Statistics, Probability, Hypothesis and Inference, Gradient Descent.

Learning Outcomes:

At the end of the unit, students will be able to:

- Identify the Correlation between two vectors (L4).
- Test a given hypothesis (L3).
- Compute mean, median and mode for the given data (L3).

UNIT-III

Getting Data, Working with Data, Machine Leaning, k-Nearest Neighbors, Naïve Bayes.

Learning Outcomes:

At the end of the unit, students will be able to:

- Compute dimensionality reduction using PCA (L3).
- Differentiate supervised and unsupervised learning methods (L4).
- Describe overfitting, under fitting, bias, variance and goodness of learning (L1).
- Solve classification problem using k-nearest neighbour classifier (L3).
- Apply Naïve Bayes classifier to solve decision making problem (L3).

UNIT-IV

Simple Linear Regression, Multiple Regression, Logistic Regression, Decision Trees, Neural Networks.

Learning Outcomes:

At the end of the unit, students will be able to:

- Describe gradient descent approach, maximum likelihood estimation and method of least squares (L1).
- Apply SVM to determine a hyperplane with maximum margin (L3).
- Determine decision tree for given data (L5).
- Describe Perceptron and Back Propagation (L3).

UNIT-V

Clustering, Natural Language Processing, Network Analysis, Recommender Systems.

Database and SQL, MapReduce

Learning Outcomes:

At the end of the unit, students will be able to:

- Determine Clusters in data using k-means and Hierarchical Clustering methods (L5).
- Apply basic SQL Operations using NotQuiteABase (L3).
- Compare User-Based and Item-Based Collaborative Filtering (L2).
- Describe Grammer and MapReduce (L1).

Course Outcomes:

After completion of this course the student would be able to

- Visualize the data using bar charts, line charts and scatter plots (L4).
- Analyse Correlation between two data objects (L4).
- Demonstrate feature selection and dimensionality reduction.(L2)
- Solve decision making problems using k-NN, Naïve Bayes, SVM and Decision. Trees (L3).
- Determine Clusters in data using k-means and Hierarchical Clustering methods (L3).
- Design basic SQL Operations using NotQuiteABase (L6)
- Demonstrate the way to use machine learning algorithms using python. (L2)

Text Books:

1. Data Science from Scratch, First Principles with Python - Joel Grus, O'Reilly, First Edition.

Reference Books:

1. The Data Science Handbook, Field Cady, WILEY.
2. An Introduction to Data Science, Jeffrey M. Stanton, Jeffrey Stanton, 2012

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B.Tech (FT)– III-II Sem

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(19A27604a) FOOD TOXICOLOGY
OPEN ELECTIVE II

PREAMBLE

This text covers about toxins and their relation in food. Examination, identification and prevention of toxins.

Course Objectives

- To know the various toxins and their evaluation.
- To understand their tolerance and control measures.

UNIT – I

Principles of Toxicology: classification of toxic agents; characteristics of exposure; spectrum of undesirable effects; interaction and tolerance; biotransformation and mechanisms of toxicity. Evaluation of toxicity: risk vs. benefit: experimental design and evaluation: prospective and retrospective studies: Controls :Statistics (descriptive, inferential): animal models as predictors of human toxicity: Legal requirements and specific screening methods: LD50 and TD50: in vitro and in vitvo studies; clinical trials.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Classification of toxic agents; characteristics of exposure;
- Spectrum of undesirable effects; interaction and tolerance; biotransformation and mechanisms of toxicity.
- Evaluation of toxicity: risk vs. benefit: experimental design and evaluation:
- Prospective and retrospective studies: Controls: Statistics (descriptive, inferential): animal models as predictors of human toxicity:
- Legal requirements and specific screening methods: LD50 and TD50: in vitro and in vitvo studies; clinical trials.

UNIT – II

Natural toxins in food: natural toxins of importance in food- toxins of plant and animal origin; microbial toxins (e.g., bacterial toxins, fungal toxins and Algal toxins), natural occurrence, toxicity and significance, determination of toxicants in foods and their management.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Natural toxins in food: natural toxins of importance in food- toxins of plant and animal origin
- Microbial toxins (e.g., bacterial toxins, fungal toxins and algal toxins), natural occurrence, toxicity and significance
- Determination of toxicants in foods and their management

UNIT – III

Food allergies and sensitivities: natural sources and chemistry of food allergens; true/untrue food allergies; handling of food allergies; food sensitivities (anaphylactoid reactions, metabolic food disorders and idiosyncratic reactions); Safety of genetically modified food: potential toxicity and allergenisity of GM foods. Safety of children consumables.

Learning outcomes:

At the end of unit, students will be able to understand the following

- Natural sources and chemistry of food allergens; true/untrue food allergies; handling of food allergies
- Food sensitivities (anaphylactoid reactions, metabolic food disorders and idiosyncratic reactions)
- Potential toxicity and allergenisity of gm foods. Safety of children consumables.

UNIT – IV

Environmental contaminants and drug residues in food: fungicide and pesticide residues in foods; heavy metal and their health impacts; use of veterinary drugs (e.g. Malachite green in fish and β- agonists in pork); other contaminants in food, radioactive contamination of food, Food adulteration and potential toxicity of food adulterants.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Fungicide and pesticide residues in foods; heavy metal and their health impacts
- Use of veterinary drugs (e.g. Malachite green in fish and β- agonists in pork); other contaminants in food, radioactive contamination of food
- Food adulteration and potential toxicity of food adulterants.

UNIT – V

Food additives and toxicants added or formed during food processing: safety of food additives; toxicological evaluation of food additives; food processing generated toxicants: nitroso-compounds, heterocyclic amines, dietary Supplements and toxicity related to dose: common dietary supplements; relevance of the dose; possible toxic effects.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Safety of food additives; toxicological evaluation of food additives;
- Nitroso-compounds, heterocyclic amines, dietary supplements and toxicity related to dose
- Common dietary supplements; relevance of the dose; possible toxic effects.

Course Outcomes

By the end of course

- Student will gain knowledge on principles of toxicity and characteristics of toxins and their classification. Examination and prevention of toxins in foods and etc.

TEXT BOOKS

1. Helferich, W., and Winter, C.K "Food Toxicology",. CRC Press, LLC. Boca Raton, FL. 2007.
2. Shibamoto, T., and Bjeldanes, L. "Introduction to Food Toxicology", 2009, 2nd Edition. Elsevier Inc., Burlington, MA.
3. Watson, D.H. "Natural Toxicants in Food", CRC Press, LLC. Boca Raton, FL1998.

REFERENCES

1. Duffus, J.H., and Worth, H.G. J. "Fundamental Toxicology", The Royal Society of Chemistry. 2006.
2. Stine, K.E., and Brown, T.M. "Principles of Toxicology", 2nd Edition. CRC Press. 2006.
3. Tönu, P. "Principles of Food Toxicology". CRC Press, LLC. Boca Raton, FL. 2007.

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B.Tech (FT)– III-II Sem

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(19A27604b) FOOD PLANT EQUIPMENT DESIGN
OPEN ELECTIVE - II

PREAMBLE

This text focuses on materials used for food plant equipment and factors considered for design of various equipment.

Course Objectives:

- To understand the material properties and codes used.
- To know the design considerations.
- To study the design of evaporators, dryers, crystallizers and etc.

UNIT – I

Materials and properties: Materials for fabrication, mechanical properties, ductility, hardness, corrosion, protective coatings, corrosion prevention linings equipment, choice of materials, material codes. Design considerations: Stresses created due to static and dynamic loads, combined stresses, design stresses and theories of failure, safety factor, temperature effects, radiation effects, effects of fabrication method, economic considerations

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Materials for fabrication, mechanical properties, ductility, hardness, corrosion, protective coatings
- Corrosion prevention linings equipment, choice of materials, material codes
- Stresses created due to static and dynamic loads, combined stresses, design stresses and theories of failure, safety factor
- Temperature effects, radiation effects, effects of fabrication method, economic considerations

UNIT – II

Design of pressure and storage vessels: Operating conditions, design conditions and stress; Design of shell and its component, stresses from local load and thermal gradient, mountings and accessories. Design of heat exchangers: Design of shell and tube heat exchanger, plate heat exchanger, scraped surface heat exchanger, sterilizer and retort

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Design of pressure and storage vessels includes operating conditions, design conditions and stress
- Design of shell and its component, stresses from local load and thermal gradient, mountings and accessories
- Design of heat exchangers like shell and tube heat exchanger, plate heat exchanger, scraped surface heat exchanger, sterilizer and retort

UNIT – III

Design of evaporators and crystallizers: Design of single effect and multiple effect evaporators and its components; Design of rising film and falling film evaporators and feeding arrangements for evaporators; Design of crystallizer and entrainment separator

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Design of evaporators like single effect and multiple effect evaporators and its components; rising film and falling film evaporators and feeding arrangements for evaporators;
- Design of crystallizer and entrainment separator

UNIT – IV

Design of agitators and separators: Design of agitators and baffles; Design of agitation system components and drive for agitation. Design of centrifuge separator; Design of equipment components, design of shafts, pulleys, bearings, belts, springs, drives, speed reduction systems. Design of freezing equipment: Design of ice-ream freezers and refrigerated display system

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Design of agitators and baffles like Design of agitation system components and drive for agitation.
- Design of centrifuge separator like equipment components, design of shafts, pulleys, bearings, belts, springs, drives, speed reduction systems.
- Design of freezing equipment like ice-ream freezers and refrigerated display system

UNIT – V

Design of dryers: Design of tray dryer, tunnel dryer, fluidized dryer, spray dryer, vacuum dryer, freeze dryer and microwave dryer. Design of extruders: Cold and hot extruder design, design of screw and barrel, design of twin screw extruder. Design of fermenters: Design of fermenter vessel, design problems

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Design of dryers like tray dryer, tunnel dryer, fluidized dryer, spray dryer, vacuum dryer, freeze dryer and microwave dryer
- Design of extruders like Cold and hot extruder design, design of screw and barrel, design of twin screw extruder.
- Design of fermenter vessel, design problems

Course Outcomes

By the end of the course, the students will

- acquires knowledge on theoretical aspects to be design considerations for a food plant equipment and designing of evaporators, separators, storage vessels and etc.

TEXT BOOKS

1. Antonio Lopez-Gomez, Gustavo V. Barbosa-Canovas, “Food plant design”, CRC press 2005.
2. George D. Saravacos and Zacharias B. Maroulis, “Food Plant Economics”, CRC Press 2007.

REFERENCES

1. Peters M., Timmerhaus K. & Ronald W., “Plant Design & Economics for Chemical Engineers”, McGraw Hill.
2. James R Couper, “Process Engg. Economics (Chemical Industries) CRC Press 3. Aries & Newton, Chemical Engg. Cost Estimation”, McGraw Hill.

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B.Tech (FT)– III-II Sem **L T P C**

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(19A54604a) WAVELET TRANSFORMS AND ITS APPLICATIONS

OPEN ELECTIVE-II

Course Objective:

This course provides the students to understand Wavelet transforms and its applications.

UNIT-I-

Wavelets

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.

Learning Outcomes:

Students will be able to

- Understand wavelets and wavelet expansion systems.
- Find wavelet transforms in continuous as well as discrete domains.

UNIT-II-

A Multiresolution Formulation of Wavelet Systems

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.

Learning Outcomes:

Students will be able to

- Illustrate the multi resolution analysis, scaling function.
- Implement parseval theorem.

UNIT-III-

Filter Banks and the Discrete Wavelet Transform : 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.

Learning Outcomes:

Students will be able to

- Form fine scale to coarse scale analysis.
- Perform decimating synthesis.

- Find the lattices and lifting.

UNIT-IV

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.

Learning Outcomes:

Students will be able to

- Perform multi resolution versus time frequency analysis.
- Perform numerical complexity of discrete wavelet transforms.

UNIT-V

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.

Learning Outcomes:

Students will be able to

- Understand the orthogonal bases and Biorthogonal Bases.
- Find the Frames and Tight Frames using Fourier series.

Course Outcomes:

After the completion of course, students 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.

TEXT BOOKS:

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.

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B.Tech (FT)– III-II Sem **L T P C**

3 0 0 3

(19A52604a) SOFT SKILLS
(OPEN ELECTIVE-II)

Course Objectives

- To develop awareness in students of the relevance and importance of soft skills
- To provide students with interactive practice sessions to make them internalize soft skills
- To develop Time management, Positive thinking & Decision making skills
- To enable to manage stress effectively
- To enable them to develop employability skills

SYLLABUS

UNIT – I

INTRODUCTION

Definition – Scope – Importance- – Methods of improving soft skills – Limits- Analysis – Interpersonal and intrapersonal skills - Verbal and Non-verbal skills.

Learning Outcomes:

At the end of the module, the learners will be able to

- Understand the importance of soft skills
- Identify the methods of improving soft skills
- Analyze various soft skills in different situations
- Distinguish various soft skills
- Apply various soft skills in day to day life and in workplace

UNIT – II INTRAPERSONAL SKILLS

Knowing self/temperaments/traits - Johari windows – quotient skills(IQ, EQ, SQ), creativity, decision-making-Attitude – Confidence Building - Positive Thinking –Time Management – Goal setting.

Learning Outcomes:

At the end of the module, the learners will be able to

- Understand self and its temperament.
- Apply various techniques to know the self.
- Develop positive thinking
- Develop creative thinking and decision-making skills

- Apply self-knowing tools in day to day and professional life.

UNIT – III

INTERPERSONAL SKILLS

Leadership Skills – Negotiation skills –- Team-building – Crisis Management – Event Management –Ethics and Etiquettes.

Learning Outcomes:

At the end of the module, the learners will be able to

- Understand the importance of interpersonal skills
- Analyze various tactics in negotiation skills.
- Develop team building spirit.
- Develop crisis management
- Apply interpersonal skills through etiquettes.

UNIT – IV

VERBAL SKILLS

Importance of verbal skills in corporate climate, Listening skills –Mother Tongue Influence (MTI) - Speaking skills – Public speaking - Oral presentations - Writing skills –E-mail etiquettes – Memos - Indianism

Learning Outcomes:

At the end of the module, the learners will be able to

- Understand the importance of verbal skills in corporate climate.
- Explain the need of listening skills.
- Explore MTI and suggest remedies to avoid it.
- Interpret various contexts of speaking.
- Apply verbal skills in personal and professional life.

UNIT – V NON-VERBAL SKILLS

Importance of body language in corporate culture – body language-Facial expressions – eye contact – posture – gestures – Proxemics – Haptics – Dress Code – Paralanguage –Tone, pitch, pause& selection of words

Learning Outcomes:

At the end of the module, the learners will be able to

- Comprehend the importance of non-verbal communication.

- Expound the need of facial expressions, postures and gestures.
- Analyze proxemics,haptics etc.
- Understand the importance of dress code.
- Apply various techniques to use para language

Course Outcomes

- Recognize the importance of verbal and non verbal skills
- Develop the interpersonal and intrapersonal skills
- Apply the knowledge in setting the SMART goals and achieve the set goals
- Analyze difficult situations and solve the problems in stress-free environment
- Create trust among people and develop employability skills

Text Books

1. Meenakshi Raman &ShaliniUpadhyay " Soft Skills",Cengage Learning, 2018.
2. S. Balasubramaniam, "Soft Skills for Interpersonal Communication", Orient Black Swan, 2017.

References

1. Barun K. Mitra, "Personality Development and Soft Skills**",** –OXFORD Higher Education 2018.
2. AlkaWadkar, "Life Skills for Success ", Sage Publications 2016.
3. Robert M Sheffield, "Developing Soft Skills", Pearson, 2010.
4. DianaBooher, "Communicate With Confidence",Tata McGrawhill, 2012.

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B.Tech (FT)– III-II Sem **L T P C**

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(19A51604a) CHEMISTRY OF POLYMERS AND ITS APPLICATIONS

Course Objectives:

- To understand the basic principles of polymers
- To synthesize the different polymeric materials and their characterization by various instrumental methods.
- To impart knowledge to the students about fundamental concepts of Hydro gels of polymer networks, surface phenomenon by micelles
- To enumerate the applications of polymers in engineering

Unit – I : Polymers-Basics and Characterization

Basic concepts: monomers, repeat units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: condensation, addition, radical chain, ionic and coordination and copolymerization. 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.

Learning Outcomes:

At the end of this unit, the students will be able to

- Classify the polymers (L3)
- Explain polymerization mechanism (L2)
- Differentiate addition, condensation polymerizations (L2)
- Describe measurement of molecular weight of polymer (L2)

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 and melamine Epoxy and Ion exchange resins. Characterization of polymers by IR, NMR, XRD.

Learning Outcomes:

At the end of this unit, the students will be able to

- Differentiate Bulk, solution, Suspension and emulsion polymerization (L2)
- Describe fibers and elastomers (L2)

- Identify the thermosetting and thermo polymers (L3)
- Characterize the properties of polymers by IR, NMR, XRD etc.,

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, PEAK.

Learning Outcomes:

At the end of this unit, the students will be able to

- Describe the properties and applications of polymers (L2)
- Interpret the properties of cellulose, lignin, starch, rosin, latex etc., (L2)
- Discuss the special plastics of PES, PAES, PEEK etc., (L3)
- Explain modified cellulosics (L2)

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.

Learning Outcomes:

At the end of this unit, the students will be able to

- Identify types of polymer networks (L3)
- Describe methods involve in hydrogel preparation (L2)
- Explain applications of hydrogels in drug delivery (L2)
- Demonstrate the advanced drug delivery systems and controlled release (L2)

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.

Learning Outcomes:

At the end of this unit, the students will be able to

- Demonstrate electrical phenomena at interfaces including electrokinetics, miselles, reverse micelles etc., (L2)
- Explain photoelectron spectroscopy (L2)
- Discuss ESCA and Auger spectroscopy to the study of surfaces (L3)
- Differentiate micelles and reverse micelles (L2)

Course Outcomes

At the end of the course, the student will be able to:

- Understand the state of art synthesis of Polymeric materials
- Understand the hydro gels preparation, properties and applications in drug delivery system.
- Characterize polymers materials using IR, NMR, XRD.
- Analyze surface phenomenon fo micelles and characterise using photoelectron spectroscopy, ESCA and Auger spectroscopy.

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)–III-II **L T P C**

3 0 0 3

HUMANITIES ELECTIVE-I

(19A52602a) ENTREPRENEURSHIP & INCUBATION

COURSE OBJECTIVES :

The objective of this course is

- 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

Syllabus

UNIT-I

Entrepreneurship - Concept, knowledge and skills requirement - Characteristics of successful entrepreneurs - Entrepreneurship process - Factors impacting emergence of entrepreneurship - Differences between Entrepreneur and Intrapreneur - Understanding individual entrepreneurial mindset and personality - Recent trends in Entrepreneurship.

Learning Outcomes:

At the end if the Unit, the learners will be able to

- Understand the concept of Entrepreneur and Entrepreneurship in India
- Know Entrepreneurship process and emergence of Entrepreneurship
- Analyze the differences between Entrepreneur and Intrapreneur
- Develop a creative mind set and personality
- Understand recent trends in Entrepreneurship across the globe

UNIT-II

Starting the New Venture - Generating business idea – Sources of new ideas & methods of generating ideas - Opportunity recognition - Feasibility study - Market feasibility, technical/operational feasibility - Financial feasibility - Drawing business plan - Preparing project report - Presenting business plan to investors.

Learning Outcomes:

At the end if the Unit, the learners will be able to

- Know the process of starting a new venture
- Analyze the sources of new methods in generating business idea
- Evaluate market feasibility, financial feasibility and technical feasibility
- Design and draw business plans in project preparation and prepare project reports

UNIT-III

Sources of finance - Various sources of Finance available - Long term sources - Short term sources - Institutional Finance – Commercial Banks, SFC's in India - NBFC's in India - their way of financing in India for small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions in aid of entrepreneurship development

Learning Outcomes:

At the end of the Unit, the learners will be able to

- Know the various sources of finance to start a new venture
- Contrast & compare between Long term & Short term finance sources
- Analyze the role of banks and other financial institutions in promoting entrepreneurship in India
- Evaluate the need and importance of MSMEs in the growth of country

UNIT-IV

Women Entrepreneurship - Entrepreneurship Development and Government - Role of Central Government and State Government in promoting women Entrepreneurship - Introduction to various incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions available - Women entrepreneurship - Role and importance - Growth of women entrepreneurship in India - Issues & Challenges - Entrepreneurial motivations.

Learning Outcomes:

At the end of the Unit, the learners will be able to

- Understand the role of government in promoting women entrepreneurship
- Know various incentives, subsidies and grants available to women entrepreneurs
- Analyze the role of export-oriented units
- Know about the tax concessions available for Women entrepreneurs
- Prepare to face the issues and challenges.

UNIT-V

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 the Type/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.
- Contrast & Compare between business incubation and business incubators.
- Design their own business incubation/incubators as viable-business unit.

Course Outcomes:

At the end of the course, students will be able to

- Understand the concept of Entrepreneurship and challenges in the world of competition.
- Apply the Knowledge in generating ideas for New Ventures.
- Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
- Evaluate the role of central government and state government in promoting Entrepreneurship.
- Create and design business plan structure through incubations.

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.Janakiramand M.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

B.Tech (FT)– III-II

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(19A52602b) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Objectives :

The objective of this course is

- 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.
- To provide fundamental skills on Accounting and to explain the process of preparing Financial statements

Syllabus

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.

Learning Outcomes:

At the end of the Unit, the learners will be able to

- Know the nature and scope of Managerial Economics and its importance
- Understand the concept of demand and its determinants
- Analyze the Elasticity and degree of elasticity
- Evaluate Demand forecasting methods
- Design the process of demand estimation for different types of demand

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.

Learning Outcomes:

At the end of the Unit, the learners will be able to

- Know 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

INTRODUCTION TO FORMS OF BUSINESS ORGANIZATIONS AND MARKETS

Market structures - Forms of Business Organizations - Sole Proprietorship - 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

- Know 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
- Interpret Pricing Methods and Strategies

UNIT -IV

CAPITAL AND CAPITAL BUDGETING Concept of Capital - Significance - Types of Capital - Components of Working Capital - Sources of Short-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)

Learning Outcomes:

At the end of the Unit, the learners will be able to

- Know 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

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.

Learning Outcomes:

At the end of the Unit, the learners will be able to

- Know 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

Data Books Required:

Present Value Factors table

Course Outcomes:

At the end of the course, students will be able to

- Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
- Apply concepts of production , cost and revenues for effective business decisions
- Students can analyze how to invest their capital and maximize returns
- Evaluate the capital budgeting techniques
- Prepare the accounting statements and evaluate the financial performance of business entity.

TEXT BOOKS:

1. Varshney & Maheswari: "Managerial Economics", Sultan Chand, 2013.
2. Aryasri: "Business Economics and Financial Analysis", 4th edition, MGH, 2019

REFERENCES:

1. Ahuja Hl "Managerial economics" 3rd edition, Schand, ,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", 2nd edition, Pearson, New Delhi.

4. Domnick Salvatore: “Managerial Economics in a Global Economy”, Cengage, 2013.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II

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3	0	0	3

(19A52602c) BUSINESS ETHICS AND CORPORATE GOVERNANCE

Course Objectives :

The objectives of this course are

- To make the student understand the principles of business ethics
- To enable them in knowing the ethics in management
- To facilitate the student role in corporate culture
- Impart knowledge about the fair trade practices
- Encourage the student in knowing them about the corporate governance

Syllabus

BUSINESS ETHICS AND CORPORATE GOVERNANCE

UNIT -I

Introduction – Meaning - Nature and Scope – Loyalty and Ethical Behaviour, Values across Cultures; Business Ethics – Ethical Practices inManagement. Types of Ethics – Characteristics – Factors influencing , Business Ethics – Importance of Business Ethics - Arguments for and against business ethicsB asics of business ethics Corporate Social Responsibility – Issues of Management – Crisis Man agement

Learning Outcomes:

After completion of this unit student will

- Understand the meaning of loyalty and ethical Behavior
- Explain various types of Ethics
- Know about the factors influencing business ethics
- Understand the corporate social responsibility of management

UNIT –II
ETHICS IN MANAGEMENT

Introduction – Ethics in HRM – Marketing Ethics – Ethical aspects of Financial 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

- Understand the meaning of Marketing Ethics
- Analyze Differentiate between Technical ethics and professional ethics
- Know about the ethical value system
- Understand the Code and culture

UNIT-III

ROLE OF CORPORATE CULTURE IN BUSINESS

Meaning – Functions – Impact of corporate culture – cross cultural issues in ethics,Emotional Honesty – Vi ue of humility – Promote happiness – karma yoga – proactive – flexibility and purity of mind. The Ethic Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individu Ethics.

Learning Outcomes:

After completion of this unit student will

- Understand the corporate culture in business
- Analyze Ethical Value System Know about the ethical value system
- Know Universalism, Utilitarianism, Distributive Justice
- Differentiate Ethical Values in different Cultures

UNIT- IV

Law and Ethics – Relationship between Law and Ethics, Other Bodies in enforcing Ethical Business Behavior, Impact of Laws on Business Ethics; Social Responsibilities of Business – Environmental Protection, Fair Trade Practices, Fulfilling all National obligations under various Laws, Safeguarding Health and wellbeing of Customers.

Learning Outcomes:

After completion of this unit student will

- Understand Law and Ethics
- Analyze Social Responsibilities of Business
- Know Environmental Protection and Fair Trade Practices
- Implementing National Safeguarding Health and wellbeing of Customers

UNIT –V

CORPORATE GOVERNANCE

Meaning – scope - Issues, need, corporate governance code, transparency & disclosure, role of auditors, board of directors and shareholders; Global issues of governance, accounting and

regulatory frame work, corporate scams, committees in India and abroad, corporate social responsibility
composition of BODs - Cadbury Committee - various committees - reports on corporate g overnance - Benefits and Limitations
of Corporate Governance with living examples.

Learning Outcomes:

After completion of this unit student will

- Understand corporate governance code
- Analyze role of auditors, board of directors and shareholders
- Know accounting and regulatory frame work
- Implementing corporate social responsibility

Course Outcomes:

At the end of the course, students will be able to

- Understand business ethics and ethical practices in management.
- Understand the role of ethics in management
- Apply the knowledge in cross cultural ethics
- Analyze law and ethics
- Evaluate corporate governance

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", HP
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

B.Tech (FT)– III-II

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(19A52602d) ENTERPRISE RESOURCE PLANNING

Course Objectives :

The objectives of this course are

- To provide a contemporary and forward-looking on the theory and practice of
- Enterprise Resource Planning
- To enable the students in knowing the Advantages of ERP
- To train the students to develop the basic understanding of how ERP enriches the
- Business organizations in achieving a multidimensional growth.
- Impart knowledge about the historical background of BPR
- To aim at preparing the students, technologically competitive and make them ready to self-upgrade with the higher technical skills.

Syllabus

UNIT-I

Introduction to ERP: Enterprise – An Overview Integrated Management Information, Business Modeling, Integrated Data Model Business Processing Reengineering(BPR), Data Warehousing, Data Mining, On-line Analytical Processing(OLAP), Supply Chain Management (SCM), Customer Relationship Management(CRM),

Learning Outcomes:

After completion of this unit student will

- Understand the concept of ERP
- Explain various Business modeling
- Know the contemporary technology like SCM, CRM
- Understand the OLAP

UNIT-II

Benefits of ERP: Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Design-making Capability

Learning Outcomes:

After completion of this unit student will

- Understand the Advantages of ERP
- Explain the challenges associated with ERP System
- Analyze better customer satisfaction
- Differentiate Improved Information Accuracy and Design-making Capability

UNIT-III

ERP Implementation Lifecycle: Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation Team Training, Testing, Going Live, End-user Training, Post-implementation (Maintenance mode)

Learning Outcomes:

After completion of this unit student will

- Understand the implementation of ERP life cycle
- Explain the challenges associated with implementing ERP system
- Analyze the need of re-engineering
- Know the recent trends in team training testing and go-live

UNIT-IV

BPR: Historical background: Nature, significance and rationale of business process reengineering (BPR), Fundamentals of BPR. Major issues in process redesign: Business vision and process objectives, Processes to be redesigned, Measuring existing processes,

Learning Outcomes:

After completion of this unit student will

- Understand the business process reengineering
- Explain the challenges associated with BPR
- Analyze the need of process redesign
- Differentiate between process to be redesign and measuring existing process

UNIT-V

IT in ERP: Role of information technology (IT) and identifying IT levers. Designing and building a prototype of the new process: BPR phases, Relationship between BPR phases. MIS - Management Information System, DSS - Decision Support System, EIS - Executive Information System.

Learning Outcomes:

After completion of this unit student will

- Understand the role of IT
- Explain the challenges in Designing and building a prototype of the new process
- Analyze the need of MIS
- Differentiate between DSS and EIS

Course outcomes:

At the end of the course, students will be able to

- Understand the basic use of ERP Package and its role in integrating business functions.
- Explain the challenges of ERP system in the organization
- Apply the knowledge in implementing ERP system for business
- Evaluate the role of IT in taking decisions with MIS
- Create reengineered business processes with process redesign

TEXT BOOKS:

1. Pankaj Sharma. "Enterprise Resource Planning". Aph Publishing Corporation, New Delhi, 2004.
2. Alexis Leon, "Enterprise Resource Planning", IV Edition, Mc.Graw Hill, 2019

REFERENCE BOOKS:

1. Marianne Bradford "Modern ERP", 3rd edition.
2. "ERP making it happen Thomas f. Wallace and Michael
3. Directing the ERP Implementation Michael w pelphrey

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II **L T P C**

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(19A52602e) SUPPLY CHAIN MANAGEMENT

Course Objectives :

The objectives of this course are

- To provide Knowledge on logistics and supply chain management
- To enable them in designing the distribution network
- To train the students in knowing the supply chain Analysis
- Impart knowledge on Dimensions of logistic
- To know the recent trends in supply chain management

Syllabus

UNIT-1

Introduction to Supply Chain Management

Supply chain - objectives - importance - decision phases - process view -competitive and supply chain strategies - achieving strategic fit – supply chain drivers - obstacles – framework - facilities -inventory-transportation-information-sourcing-pricing.

Learing Outcomes:-

After completion of this unit student will

- Understand the meaning and objectives of supply chain management
- Explain supply chain drivers
- Know the steps involved in SCM frame work
- Understand transportation information and pricing

UNIT-2

Designing the distribution network

Role of distribution - factors influencing distribution - design options - e-business and its impact – distribution networks in practice –network design in the supply chain - role of network -factors affecting the network design decisions modeling for supply chain. Role of transportation - modes and their performance – transportation infrastructure and policies - design options and their trade-offs tailored transportation.

Learning Outcomes:-

After completion of this unit student will

- Understand the different distribution network
- Explain the factors influencing network design in the supply chain

- Know the Role of transportation
- Analyze design options and their trade-offs

UNIT-3

Supply Chain Analysis.

Sourcing - In-house or Outsource - 3rd and 4th PLs - supplier scoring and assessment, selection - design collaboration - Procurement process - Sourcing planning and analysis. Pricing and revenue management for multiple customers, perishable products, seasonal demand, bulk and spot contracts.

Learning Outcomes:-

After completion of this unit student will

- Understand the concept of supply chain Analysis
- Explain design collaboration
- Know procurement process -sourcing planning and analysis
- Understand seasonal demand, bulk and spot contracts

UNIT-4

Dimensions of Logistics

A macro and micro dimension - logistics interfaces with other areas - approach to analyzing logistics systems - logistics and systems analysis - techniques of logistics system analysis - factors affecting the cost and importance of logistics. Demand Management and Customer Service Outbound to customer logistics systems - Demand Management –Traditional Forecasting - CPFRP - customer service - expected cost of stock outs - channels of distribution.

Learning Outcomes:-

After completion of this unit student will

- Understand dimensions of logistics
- Explain logistics interfaces with other areas
- Know techniques of logistics system analysis
- Understand Demand Management

UNIT-5

Recent Trends in Supply Chain Management-Introduction, New Developments in Supply Chain Management, Outsourcing Supply Chain Operations, Co-Maker ship, The Role of E-Commerce in Supply Chain Management, Green Supply Chain Management, Distribution Resource Planning, World Class Supply Chain Management

Learning Outcomes:-

After completion of this unit student will

- Understand the recent trend in supply chain management
- Explain The Role of E-Commerce in Supply Management
- Know Green Supply Chain Management
- Understand Distribution Resource Planning

Course Outcomes:

At the end of the course, students will be able to

- Understand the strategic role of logistic and supply chain management in the cost reduction and offering best service to the customer
- Understand Advantages of SCM in business
- Apply the knowledge of supply chain Analysis
- Analyze reengineered business processes for successful SCM implementation
- Evaluate Recent trend in supply chain management

TEXT BOOKS:

1. Sunil Chopra and Peter Meindl, Supply Chain Management – "Strategy, Planning and Operation", 3rd Edition, Pearson/PHI, 2007.
2. Supply Chain Management by Janat Shah Pearson Publication 2008.

REFERENCE BOOKS:

1. A Logistic approach to Supply Chain Management – Coyle, Bardi, Longley, Cengage Learning, 1/e
2. Donald J Bowersox, Dand J Closs, M Bixby Coluper, "Supply Chain Logistics Management", 2nd edition, TMH, 2008.
3. Wisner, Keong Leong and Keah-Choon Tan, "Principles of Supply Chain Management A Balanced Approach", Cengage Learning, 1/e
4. David Simchi-Levi et al, "Designing and Managing the Supply Chain" – Concepts

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II Sem

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(19A27601P) FOOD AND INDUSTRIAL MICROBIOLOGY LAB

OBJECTIVES

- This lab gives idea about counting microorganisms by various techniques in selected foods and identification of specific microorganisms in different foods

LABORATORY EXPERIMENTS

1. Direct total, viable, and non-viable count of microorganisms in milk.
2. Determination of Standard Plate Count (SPC) in natural and/or processed foods like cereal and cereal products, vegetable and fruits, meat and meat products, fish and other sea foods, Eggs and poultry, milk and milk products; sugar, salts and spices.
3. Microbiological examination of some selected natural and processed foods like cereal and cereal products, vegetable and fruits, meat and meat products, fish and other sea foods, Eggs and poultry, milk and milk products; sugar, salts and spices.
4. Microbiological examination of potable water: Total and coliform count.
5. Enumeration of coliform organism in some selected processed foods like cereal and cereal products, vegetable and fruits, meat and meat products, fish and other sea foods, Eggs and poultry, milk and milk products; sugar, salts and spices.
6. Isolation and screening of citric acid/ amylase/ protease /antibiotic producing microbes
7. Production, purification and estimation of citric acid/Lactic acid/ Acetic acid
8. Isolation, identification of cultures producing bio-colours
9. Production, purification and estimation of beer/ ethanol
10. Starter activity of Baker’s yeast Mushroom production

OUTCOMES

- Students will learn the different techniques for growth of microorganisms and colony counting
- Students will able to identify the specific microorganism present in food by specific procedure.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II Sem **L T P C**

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(19A27603P) PROCESSING OF MEAT & POULTRY PRODUCTS LAB

OBJECTIVES

- To learn the different preservation methods for meat, poultry and fish and preparation of value added products.

LABORATORY EXPERIMENTS

1. Study of post-mortem changes; Meat cutting and handling
2. Preservation of meat by curing and pickling
3. Value added meat products
4. Evaluation of quality and grading of eggs
5. Preservation of shell eggs
6. Preparation of value added poultry meat products
7. Value added egg products
8. Preparation of value added sea products: Cutlets, bullets, wafers
9. Preparation and evaluation of meat sausages
10. Preparation and evaluation of meat/ chicken patties
11. Visit to Abattoir

OUTCOMES

By the end of the course, the students will

- Learn different methods of slaughter, Postmortem changes, preservation techniques and methods of value addition to meat
- Develop practical skills in preservation and processing technology of fish and marine products

B.Tech (FT)– III-II Sem

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(19A27606) SOCIALLY RELEVANT PROJECT

1. **Nutrition**
   Survey on nutrition
   Assessment of malnutrition status in school children
   Nutritive value of assessment locally available Fruit & Vegetables
2. **Waste reduction**
   Minimization of post harvest losses
   Minimization of processed food losses
3. **Hygiene & Safety**
   Improving RO Plant Quality
   Improving Hygiene of Street foods
   Assessment of quality standards of purified water & public supplied water
   Improvement of hygienic conditions of overhead tanks
   Drinking water quality standards & demonstration of water purifying techniques
   Improvement of hygiene & sanitation in rural areas
   Improvement of hygiene & sanitation in urban slums
4. **Labelling**
   Awareness on food labelling
   Comparison of food labels of organized and unorganized sectors
5. **Adulteration of foods**

The above themes are examples. However, the department can explore more.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I Sem **L T P C**

3 0 0 0

(19A99501) MANDATORY COURSE: CONSTITUTION OF INDIA

COURSE OBJECTIVES :

The objective of this course is

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- 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.
- 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,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 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

Course Outcomes:

At the end of the course, students will be able to

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem **L T P C**

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(19A27701T) MASS TRANSFER

PREAMBLE

This course deals with principles of mass transfer and momentum transfer and their respective applications in the food industry.

OBJECTIVES

- Basic concepts of mass transfer and mechanism of mass transfer operations like distillation, extraction, leaching, crystallization and drying.

UNIT – I

Mass Transfer Laws: Review of Fick's 1st law for molecular diffusion, molecular diffusion in biological solutions and gels, molecular diffusion in solids, diffusion coefficients in gas, liquid and solid, numerical solution of steady state diffusion, Fick's 2nd law and unsteady state operation, mass transfer coefficients, interphase mass transfer, diffusion of gases in porous solids and capillaries.

Learning Outcomes:

At the end of unit, students will be able to

- Review the Fick's 1st law for molecular diffusion, molecular diffusion in biological solutions and gels, solids
- Understand the diffusion coefficients in gas, liquid and solid; numerical solution of steady state diffusion
- Know the Fick's 2nd law and unsteady state operation, mass transfer coefficients
- Explain the interphase mass transfer, diffusion of gases in porous solids and capillaries

UNIT – II

Physical Chemistry of Mass Transfer Operations in Food Processing: fugacity, activity, water Relation to foods: roles of water and activity in foods; control of water activity by addition of solute and moisture removal; measurement of water activity; different models of sorption isotherms, their limitations and applicability, prediction and moderation of water activity of foods. Drying: types of drying, constant and falling rate, equilibrium moisture content, drying curve and drying time, types of dryers.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the fugacity, activity, water Relation to foods: roles of water and activity in foods
- Know the control of water activity by addition of solute and moisture removal; measurement of water activity
- Explain the different models of sorption isotherms, their limitations and applicability, prediction and moderation of water activity of foods
- Describe the types of drying, constant and falling rate, equilibrium moisture content, drying curve and drying time, types of dryers

UNIT – III

Gas Absorption: Equilibrium solubility of gases in liquids, ideal and non-ideal solutions. Equipment: Gas dispersed- bubble columns, tray towers, liquid dispersed-venturi scrubbers, wetted wall towers, spray tower, packed towers. Concept of NTU, HTU and HEPT. Ideal stage and stage efficiency. Adsorption and Ion Exchange: Types of Adsorption, nature of adsorbents, adsorption equilibrium, adsorption of a single component from a gas mixture/liquid solution. Multistage cross current and counter current adsorption, continuous contact adsorption. Principle of ion exchange, equilibria and rate of ion-exchange.

Learning Outcomes:

At the end of unit, students will be able to

- Study the Equilibrium solubility of gases in liquids, ideal and non-ideal solutions
- Understand the Equipment like Gas dispersed- bubble columns, tray towers, liquid dispersed-venturi scrubbers, wetted wall towers and etc.
- Know the Concept of NTU, HTU and HEPT. Ideal stage and stage efficiency
- Explain the Types of Adsorption, nature of adsorbents, adsorption equilibrium
- Describe the Multistage cross current and counter current adsorption, continuous contact adsorption
- Get knowledge on Principle of ion exchange, equilibria and rate of ion-exchange

UNIT – IV

Distillation: Vapour liquid equlibria, boiling point diagram, relative volatility, enthalpy concentration diagram, flash vapourization, differential distillation, steam distillation, azeotropic distillation and extractive distillation for binary system. Continuous rectification, McCabe Thiele method, bubble cap distillation column. Crystallization-rate of crystallization, crystallization equilibrium. Super saturation – Crystallizers type – batch and continuous. Centrifuge – types.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the Vapour liquid equlibria, boiling point diagram, relative volatility, enthalpy concentration diagram

- Know the Distillation like flash vapourization, differential, steam, azeotropic and extractive distillation for binary system
- Explain the Continuous rectification, McCabe Thiele method, bubble cap distillation column
- Describe the rate of crystallization, crystallization equilibrium.
- Get knowledge on Super saturation – Crystallizers type – batch and continuous. Centrifuge – types.

UNIT – V

Solid-liquid extraction: Countercurrent, co-current, multistage continuous contact operations. Liquid-liquid extraction: Ternary liquid–liquid equilibrium and tie line data, choice of solvents, extraction equipment. Leaching principle and equipment.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the Countercurrent, co-current, multistage continuous contact operations
- Know the Ternary liquid–liquid equilibrium and tie line data, choice of solvents
- Explain the Extraction equipment. Leaching principle and equipment

Course Outcomes:

- Students are exposed to mass transfer laws and concerning unit operations and their principles, equipment used.

TEXT BOOKS

1. F. P. Incropera, and P. W.David, Wiley, "Fundamentals of Heat and Mass Transfer", 3rd Edition, 1990.
2. Robert E. Treybal. "Mass Transfer Operations", 3rd Edition. McGraw-Hill Book Company, Auckland, USA. 1980.

REFERENCES

1. R.C. Sachdeva, "Fundamentals of Heat and Mass Transfer", 3rd Edition,Wiley Eastern Limited, 2001.
2. R.T. Toledo, "Fundamental of Food Process Engineering", CBS publishers, 3rd Edition, 1980.

B.Tech (FT)– IV-I Sem

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(19A27702T) FOOD PACKAGING

PREAMBLE

This course was designed to know about the importance of packaging for foods, different food packaging materials, interactions between food and packaging materials and also novel food packaging techniques.

Course Objectives:

- The need for Optimum Packaging of foods, and
- About different packaging materials, and machinery used to protect food products and increase their shelf life

UNIT – I

Introduction: Importance and Functions of Food Packaging, Type of packaging materials; Selection of packaging material for different foods: Cereals, Meat, Poultry, Fish, Milk, Vegetables, Fruits, Spices and Carbonated Beverages. Selective properties of packaging film; Tests on packaging materials - Mechanical strength (Tension, notch and tearing strengths), Gas and water vapour transmission rates; Methods of packaging and packaging equipment.

Learning Outcomes:

At the end of unit, students will be able to

- Know the Importance and Functions of Food Packaging, Type of packaging materials
- Understand the Selection of packaging material for different foods: Cereals, Meat, Poultry and etc.
- Get knowledge on Selective properties of packaging film
- Explain the Mechanical strength (Tension, notch and tearing strengths), Gas and water vapour transmission rates
- Describe the Methods of packaging and packaging equipment

UNIT – II

Cellulosic and Polymeric packaging materials and forms: Food grade polymeric packaging materials, Rigid plastic packages. Films: Oriented, Co-extruded, Laminates and Metallised; Cellophane, Olefins, Polyamides, Polyesters, PVC, PVDC, PVA, Inomers, Copolymers, Polycarbonates, Phenoxy, Acrylic and Polyurethane. Their mechanical sealing and barrier properties.

Learning Outcomes:

At the end of unit, students will be able to

- Understand the Food grade polymeric packaging materials, Rigid plastic packages

- Explain the Oriented, Co-extruded, Laminates and Metallised; Cellophane, Olefins and etc.
- Know their mechanical sealing and barrier properties.

UNIT – III

Glass and Metal containers: Glass: Composition, Properties, Bottle making and Closures for glass containers. Metal: Bulk containers, Tin-plate containers, Tin free steel containers, Aluminium containers, Latest development in metal cans and protective lacquers. Testing of Packaging Material: Destructive & Non destructive test, testing of rigid, semi rigid and flexible packaging material, Shelf life study etc. Corrosion and toxicity of packaging material.

Learning Outcomes:

At the end of unit, students will be able to

- Know the Composition, Properties, Bottle making and Closures for glass containers
- Describe the Bulk containers, Tin-plate containers, Tin free steel containers, Aluminium containers
- Have knowledge on Latest development in metal cans and protective lacquers
- Understand the Destructive & Non destructive test, testing of rigid, semi rigid and flexible packaging material, Shelf life study etc.
- Explain the Corrosion and toxicity of packaging material.

UNIT – IV

Food product characteristics and package requirement, Interactions between packaging material and foods. Selection of materials, Forms, Machinery and methods for fresh produce

Learning Outcomes:

At the end of unit, students will be able to

- Understand the Food product characteristics and package requirement
- Know the Interactions between packaging material and foods.
- Explain the Selection of materials Forms, Machinery and methods for fresh produce

UNIT – V

Advances in Food Packaging: Smart packaging, Intelligent Packaging, Active Packaging and Antimicrobial packaging, Retortable pouches, biodegradable and edibles packaging materials and films. Package printing, Barcodes & Labelling; Packaging Laws and Regulations, Evaluation of food packaging materials and package performance.

Learning Outcomes:

At the end of unit, students will be able to

- Know the importance of Smart packaging, Intelligent Packaging, Active Packaging and Antimicrobial packaging
- Know the Retortable pouches, biodegradable and edibles packaging materials and films
- Explain the Package printing, Barcodes & Labelling
- Describe the Packaging Laws and Regulations
- Understand the Evaluation of food packaging materials and package performance.

Course Outcomes:

By the end of the course, the students will be able to know

- About different types of paper based packaging material
- About different types of plastic based package material
- About metal and glass based packaging material
- About advanced packaging techniques and packaging machinery

TEXT BOOKS

1. Food Packaging "Principles and Practices". 2nd Edition, G. L. Robertson, Marcell Decker, 2006.
2. J.H. Han (Ed), "Innovation in Food Packaging.", 1st Edition, Elsivier Publications, 2005.

REFERENCES

1. R. Coles, D. McDowell and M. J. Kirwan, "Food Packaging Technology". 1st Edition CRC Press, , 2003.
2. R. Ahvenainen (Ed), "Novel Food Packaging Techniques". 1st Edition,Woodhead Publishing, 2003.
3. K. L. Yam, D.S. Lee and L. Piergiovanni, "Food Packaging Science and Technology". 1st Edition, CRC Press, 2008.
4. Principles of Food Packaging Trends in Food Science & Technology Proceedings of IFCON-1988. S. Saclarow and R.C. Griffin
5. G. L. Robertson, "Food Packaging: Principles and Practices", 2nd Edition, CRC Press, 2005.
6. M. Mahadeviah and R.V. Gowramma "Food Packaging Materials".

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem

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(19A27703a) EXTRUSION TECHNOLOGY
PROFESSIONAL ELECTIVE III

PREAMBLE

This course deals with the significance of extrusion technology over other technologies. Steps involved in extrusion process. Application of this technology in order to produce various food products.

Course Objectives:

- To impart knowledge to the students about extrusion technology, principle of working, classification of extruders according to process and construction, extruded products and their processing.

UNIT – I

Extrusion definition, introduction to extruders and their principles, types of extruders. Extruders in the food industry: History and uses of extruders in the food industry. Single screw extruder: principle of working, net flow, factors affecting extrusion process, co-kneaders.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Extrusion definition, introduction to extruders and their principles, types of extruders.
- History and uses of extruders in the food industry.
- Principle of working of single screw extruder, net flow, factors affecting extrusion process, co-kneaders

UNIT – II

Twin screw extruder: counter rotating and co-rotating twin screw extruder. Process characteristics of the twin screw extruder: feeding, screw design, screw speed, screw configurations, die design. Barrel temperature and heat transfer, adiabatic operation, heat transfer operations and energy balances. Problems associated with twin screw extruder.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Counter rotating and co-rotating twin screw extruder.

- Process characteristics of the twin screw extruder like feeding, screw design, screw speed, screw configurations, die design.
- Barrel temperature and heat transfer, adiabatic operation, heat transfer operations and energy balances.
- Problems associated with twin screw extruder

UNIT – III

Pre-conditioning of raw materials used in extrusion process, Pre-conditioning operations and benefits of pre-conditioning and devolatilization. Interpreted-flight expanders - extruders, dry extruders. Chemical and nutritional changes in food during extrusion. Practical considerations in extrusion processing: pre-extrusion processes, cooker extruder Profiling.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Pre-conditioning of raw materials used in extrusion process
- Pre-conditioning operations and benefits of pre-conditioning and devolatilization.
- Interpreted-flight expanders - extruders, dry extruders.
- Chemical and nutritional changes in food during extrusion.
- Practical considerations in extrusion that are pre-extrusion processes, cooker extruder Profiling

UNIT – IV

Practical considerations in extrusion processing: Addition and substraction of materials, shaping and forming at the die, post extrusion processes. Breakfast cereals: introduction, type of cooking - High shear cooking process, steam cookers, low shear, low pressure cookers and continuous steam pre-cooking, available brands.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Practical considerations in extrusion that are addition and substraction of materials, shaping and forming at the die, post extrusion processes.
- Introduction of breakfast cereals
- Type of cooking - high shear cooking process, steam cookers, low shear, low pressure cookers and continuous steam pre-cooking, available brands

UNIT – V

Breakfast cereal processes: traditional and extrusion methods, classification of breakfast cereals - flaked cereals, oven puffed cereals, gun puffed cereals, shredded products. Texturized vegetable protein: Definition, processing techniques, and foods. Snack food extrusion: Direct expanded (DX) and third generation (3G) Snacks: types, available brands, co- extruded snacks and indirect-expanded products.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Traditional and extrusion methods
- Classification of breakfast cereals - flaked cereals, oven puffed cereals, gun puffed cereals, shredded products
- Definition of Texturized vegetable protein, processing techniques, and foods.
- Direct expanded (DX) and third generation (3G) Snacks: types, available brands, co-extruded snacks and indirect-expanded products

Course Outcomes:

By the end of the course, the students will be able to

- Learn about use of extrusion technology in food industry
- Study about Extrusion cooking, preconditioning of raw material, types of extruders and operating parameters

TEXT BOOKS

1. "Extrusion Cooking, Technologies and Applications". Guy R Wood head Publishing Limited, Abington, Cambridge.
2. Frame N.D. "The Technology of Extrusion Cooking". Blackie Academic & Professional, New York. 1994,

REFERENCES

1. Harper. "Extrusion of Foods. Vol. 1 & 2". J.M. CRC Press, Inc; Boca Raton, Florida1991,.
2. O'Connor C. "Extrusion Technology for the Food Industry". Elsevier Applied Science, New York.
3. Fast R.B. and Caldwell E.F. "Breakfast Cereals" and how they are made. 2000, American Association of Cereal Chemists., St. Paul, Minnesota. 1987,
4. Richardson P. "Thermal Technologies in Food Processing". Wood head Publishers, Cambridge

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem **L T P C**

3 0 0 3

(19A27703b) INSTRUMENTATION AND PROCESS CONTROLS IN FOOD INDUSTRY

PROFESSIONAL ELECTIVE III

PREAMBLE

To impart knowledge to the students on instrumentation and process controls used in food industry**.**

Course Objectives:

- Understand the different instruments used in different operations of food industries.
- Know about working principles of different instruments used in different operations.

UNIT – I

Introduction, definitions, characteristics of instruments, functional elements, performance characteristics of instrumentation systems-static and dynamic characteristics; Temperature and temperature scales; Various types of thermometers; thermocouples, resistance thermometers and pyrometers;

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Introduction, definitions, characteristics of instruments, functional elements
- Performance characteristics of instrumentation systems-static and dynamic characteristics
- Temperature and temperature scales
- Various types of thermometers; thermocouples, resistance thermometers and pyrometers

UNIT – II

Pressure and pressure scales, manometers, pressure elements differential pressure; Liquid level measurement, different methods of liquid level measurement; Flow measurement: Kinds of flow, rate of flow, total flow differential pressure meters, variable area meters, food flow metering; Weight measurement: Mechanical scale, electronic tank scale, conveyor scale;

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Pressure and pressure scales, manometers, pressure elements differential pressure
- Liquid level measurement, different methods of liquid level measurement

- Flow measurement: Kinds of flow, rate of flow, total flow differential pressure meters, variable area meters, food flow metering
- Weight measurement: Mechanical scale, electronic tank scale, conveyor scale

UNIT – III

Measurement of moisture content, specific gravity, measurement of humidity, measurement of viscosity, turbidity, color, measurement of density, brix, pH, enzyme sensors, automatic valves; Transmission: Pneumatic and electrical; Control elements, control actions, pneumatic and electrical control systems;

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Measurement of moisture content, specific gravity and humidity
- Measurement of viscosity, turbidity, color
- Measurement of density, brix, pH, enzyme sensors, automatic valves
- Transmission: Pneumatic and electrical; Control elements, control actions, pneumatic and electrical control systems

UNIT – IV

Process control: Definition, simple system analysis, dynamic behaviour of simple process, Laplace transform, process control hardware; Frequency response analysis, frequency response characteristics, Bode diagram and Nyquist plots and stability analysis; Transducers: Classification, self-generating transducers, variable parameter type, digital, actuating and controlling devices;

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Definition of Process control, simple system analysis, dynamic behaviour of simple process, Laplace transform, process control hardware
- Frequency response analysis, frequency response characteristics, Bode diagram and Nyquist plots and stability analysis;
- Transducers: Classification, self-generating transducers, variable parameter type, digital, actuating and controlling devices

UNIT – V

Controllers and indicators: Temperature control, electronic controllers, flow ratio control, atmosphere control, timers and indicators, food sorting and grading control, discrete controllers, adaptive and intelligent controllers; Computer-based monitoring and control: Importance, hardware features of data acquisition and control computer, signal interfacing, examples in food processing.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Temperature control, electronic controllers, flow ratio control, atmosphere control, timers and indicators
- Food sorting and grading control, discrete controllers, adaptive and intelligent controllers
- Computer-based monitoring and control: Importance, hardware features of data acquisition and control computer, signal interfacing, examples in food processing

Course Outcomes:

- The students become familiar with the identification of different instruments and controls used in various operations
- Solutions to tackle the problems encountered in use and operation of different instruments

TEXT BOOKS

1. E O Doeblin and D N Manik, "Measurement Systems: Applications and Design". Tata McGraw Hill, 5th Edition, 2003.
2. Bela G. Liptak. "Instrument Engineer's Handbook, Vol. I and II". 4th Edition. CRC Press, Boca Raton, FL, USA. 2003.

REFERENCES

1. Peter Harriot, "Process Control". Tata McGraw Hill.
2. D. Patranabis, "Industrial Instrumentation", McGraw Hill, 2nd Edition,2001.
3. B C Kuo, "Automatic Control Systems", Prentice Hall, 7th Edition, 2002.
4. D.R. Coughanoowr, "Process system Analysis & Control", McGraw Hill Publication
5. Curtis D. Johnson. "Process Control Instrumentation Technology". 7th Edition. Prentice Hall of India Pvt. Ltd., New Delhi. 2003.
6. D.V.S. Murty. "Transducers and Instrumentation" Prentice-Hall of India Pvt. Ltd. New Delhi. 2004.

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B.Tech (FT)– IV-I Sem **L T P C**

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(19A27703c) EMERGING TECHNOLOGIES IN FOOD SAFETY AND QUALITY PROFESSIONAL ELECTIVE III

PREAMBLE

This course covers all facets of recent innovations related to methods used for determining quality and food safety.

Course Objectives:

- To understand latest technologies used in food safety and quality like Gas- liquid chromatography, HPLC, PAGE and NIR etc.

UNIT – I

Basic Chromatographic Technique: Basic principles of chromatography. Paper Chromatography. Introduction, general principles, procedure, types of paper chromatography, applications. Thin layer chromatography. Introduction, principle, procedure, general application. Column liquid chromatography. Gas- liquid chromatography General procedure, qualitative analysis, separation and resolution, quantitative analysis- immuno affinity chromotography- trouble shooting components and interpretation.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Basic principles of chromatography. Introduction to Paper Chromatography, general principles, procedure and its types, applications.
- Introduction to Thin layer chromatography, principle, procedure, general application.
- Column liquid chromatography. Gas- liquid chromatography General procedure, qualitative analysis, separation and resolution
- Quantitative analysis- immuno affinity chromotography- trouble shooting components and interpretation

UNIT – II

HPLC Analysis of Food: HPLC (High performance liquid chromatography). Introduction, principle of separation, components of an HPLC system. Pump, injector, column (column hardware and column packing materials in brief) detector and different types of detectors, recorder, Application of HPLC- Minimum Response Performance level- operation quotient and performance quotient.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Introduction to hplc, principle of separation, components of an hplc system. Pump, injector
- Column (column hardware and column packing materials in brief) detector and different types of detectors, recorder
- Application of hplc- minimum response performance level- operation quotient and performance quotient.

UNIT – III

Gas Chromatography: Gas chromatography Introduction, sample preparation, principle of separations, components gas supply system, injection port, oven, column and stationary phases, types of columns, detectors different types of detectors, recorder, types of carrier gases used.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Introduction to Gas chromatography, sample preparation, principle of separations, components gas supply system,
- Injection port, oven, column and stationary phases, types of columns,
- Detector and different types, recorder, types of carrier gases used

UNIT – IV

Spectrophotometric Techniques: Spectrophotometry introduction and principles. Ultra violet and visible absorption spectroscopy basis of absorption spectroscopy, deviations from Beer's law, procedural consideration, calibration curves. Instrumentation and instrument design, application. Fluorimetry introduction, principle and techniques, instrumentation and application. Atomic spectro photometry Introduction, principles and techniques.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Introduction and principles of Spectrophotometry
- Ultra violet and visible absorption spectroscopy basis of absorption spectroscopy
- Deviations from Beer's law, procedural consideration, calibration curves.
- Instrumentation and instrument design, application
- Fluorimetry introduction, principle and techniques, instrumentation and application
- Atomic spectro photometry Introduction, principles and techniques

UNIT – V

Modern Analytical Instrumentation: Radiotracer techniques radioactive counters, solid, gas and liquid scintillation. Measurement of enzyme activity. Radio Immuno Assay Electrophoresis, definition, types of electrophoretic methods, free solution electrophoresis, paper or agar gel electrophoresis, PAGE. Principles and applications of NIR, X ray diffraction analysis in food systems. E sensors, e nose, e tongue – instrumentation, application and working principles. Noninvasive non-destructive methods of analysis- MS- FTIR analysis in food.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Radiotracer techniques radioactive counters, solid, gas and liquid scintillation.
- Measurement of enzyme activity.
- Radio Immuno Assay Electrophoresis, definition, types of electrophoretic methods, free solution electrophoresis, paper or agar gel electrophoresis, PAGE.
- Principles and applications of NIR, X ray diffraction analysis in food systems.
- E sensors, e nose, e tongue – instrumentation, application and working principles.
- Noninvasive non-destructive methods of analysis- MS- FTIR analysis in food

Course Outcomes:

By the end of the course, the students will
acquire knowledge on theoretical aspects of emerging technologies like GC, HPLC, Fluorimetry, PAGE, NIR, X ray diffraction, E sensors, e nose, e tongue and FTIR etc.

TEXT BOOKS

1. Nielsen S.S., "Introduction to the Chemical Analysis of Foods". Jones and Bartlett Publishers, Boston, London.2004.
2. Mahindru, S.N. "Food Additives. Characteristic, Detection and Estimation". Tata Mc Graw-Hill Publishing Company Limited, New Delhi.2000.

REFERENCES

1. Pearson, D. Churchill Livingstone, "The Chemical Analysis of Foods", New York. 2002.
2. Sharma, B.K. "Instrumental Methods of Chemical Analysis", Goel Publishing House, New Delhi. 2004.

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(19A27703d) FINANCIAL MANAGEMENT
PROFESSIONAL ELECTIVE III

PREAMBLE

This subject deals with significance of finance and its management by various methods.

OBJECTIVES

- To understand the concept of finance.
- To learn the different used for financial management.

UNIT – I

The Finance function: Goals, Objective and functions of Financial Management, finance functions – Treasury vs. Controller functions, The Logic of Wealth Maximization

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Goals, Objective and functions of Financial Management, finance functions
- Treasury vs. Controller functions, The Logic of Wealth Maximization

UNIT – II

Time Value of Money, Techniques of compounding and Discounting, functions of Chief Financial Officer, investment decisions, financing decisions – dividend decision.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Time value of money, techniques of compounding and discounting
- Functions of chief financial officer, investment decisions
- Financing decisions – dividend decision

UNIT – III

Cost of Capital: Cost of debt, preference and equity capital, cost of retained earnings, weighted average, cost of capital, marginal cost of capital.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Cost of debt, preference and equity capital
- Cost of retained earnings, weighted average
- Cost of capital, marginal cost of capital

UNIT – IV

Capital budgeting process, basic principles of Capital expenditures proposals, various appraisal methods, Average rate of return, payback period, Discounted Cash Flow methods, Net Present Value, Internal Rate of Return and profitability index.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Capital budgeting process, basic principles of Capital expenditures proposals
- Various appraisal methods, Average rate of return, payback period
- Discounted Cash Flow methods, Net Present Value, Internal Rate of Return and profitability index

UNIT – V

Operating and Financial Leverage, Total leverage. Capital Structure - their net income and net operating income approaches- optimal capital structure, factors affecting capital structure, EBIT/EPS and ROI and ROE analysis.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Operating and Financial Leverage, Total leverage
- Capital Structure - their net income and net operating income approaches- optimal capital structure
- factors affecting capital structure, EBIT/EPS and ROI and ROE analysis

Course Outcomes:

By the end of the course, the students will

- acquire knowledge on Time Value of Money, Cost of Capital, Capital budgeting process and Operating and Financial Leverage

TEXT BOOKS:

1. Prasanna Chandra, “Financial Management”, McGraw Hill.
2. I.M. Pandey, “Capital Structure and the Cost of Capital”, Vikas Publishing.

REFERENCES

1. I.M. Pandey, “Financial Management”. Sangam Books Limited.
2. I.M. Pandey, “Management Accounting”, Vikas Publishing
3. I.M. Pandey, “Elements of Financial Management” South Asia Books.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem

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(19A27703e) WASTE AND EFFLUENT MANAGEMENT
PROFESSIONAL ELECTIVE III

PREAMBLE

This text focus on different treatments used for waste water and effluents.

Course Objectives:

- To understand the waste water treatment process.
- To gain knowledge on waste disposal in various ways.
- To know about advances in waste water treatment.

UNIT – I

Waste Water Treatment an Overview: Terminology – Regulations – Health and Environment Concerns in waste water management – Constituents in waste water inorganic – Organic and metallic constituents. Process Analysis and Selection: Components of waste water flows – Analysis of Data – Reactors used in waste water treatment – Mass Balance Analysis – Modeling of ideal and non ideal flow in Reactors – Process Selection

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Waste Water Treatment an Overview: Terminology – Regulations – Health and Environment Concerns in waste water management
- Constituents in waste water inorganic, organic and metallic constituents
- Process Analysis and Selection: Components of waste water flows – Analysis of Data – Reactors used in waste water treatment
- Mass Balance Analysis – Modeling of ideal and non ideal flow in Reactors – Process Selection

UNIT – II

Waste disposal methods – Physical, Chemical & Biological; Economical aspects of waste treatment and disposal. Treatment methods of solid wastes: Biological composting, drying and incineration; Design of Solid Waste Management System: Landfill Digester, Vermicomposting Pit. Introduction: Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry; Fish, Meat & Poultry industry, Sugar industry and Dairy industry

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Waste disposal methods like Physical, Chemical & Biological; Economical aspects of waste treatment and disposal.
- Biological composting, drying and incineration; Design of Solid Waste Management System: Landfill Digester, Vermicomposting Pit.
- Classification and characterization of food industrial wastes from F&V, Beverage, Fish, Meat & Poultry and Dairy industries.

UNIT – III

Chemical Unit Processes: Role of unit processes in waste water treatment chemical coagulation – Chemical precipitation for improved plant performance chemical oxidation – Neutralization – Chemical Storage

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Role of unit processes in waste water treatment chemical coagulation
- Chemical precipitation for improved plant performance chemical oxidation
- Neutralization & Chemical Storage

UNIT – IV

Biological Treatment: Overview of biological Treatment – Microbial metabolism – Bacterial growth and energetics – Aerobic biological oxidation – Anaerobic fermentation and oxidation – Trickling filters – Rotating biological contractors – Combined aerobic processes – Activated sludge film packing.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Overview of biological Treatment, Microbial metabolism
- Bacterial growth and energetics includes Aerobic biological oxidation, Anaerobic fermentation and oxidation
- Trickling filters, Rotating biological contractors, Combined aerobic processes, Activated sludge film packing

UNIT – V

Advanced Waste Water Treatment: Technologies used in advanced treatment – Classification of technologies Removal of Colloids and suspended particles – Depth Filtration – Surface Filtration – Membrane Filtration Absorption – Ion Exchange – Advanced oxidation process.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Technologies used in advanced treatment and Classification of technologies
- Removal of Colloids and suspended particles by Depth Filtration, Surface Filtration, Membrane Filtration Absorption, Ion Exchange & Advanced oxidation process

Course Outcomes:

By the end of the course, the students will

- Acquires knowledge on technologies used for chemical and biological methods of waste water and effluent treatment.

TEXT BOOKS

1. Herzka A & Booth RG; "Food Industry Wastes: Disposal and Recovery"; Applied Science Pub Ltd. 1981,
2. Fair GM, Geyer JC & Okun DA; "Water & Wastewater Engineering"; John Wiley & Sons, Inc. 1986,

REFERENCES

1. Inglett GE; "Symposium: Processing Agricultural & Municipal Wastes"; AVI. 1973,
2. Green JH & Kramer A; "Food Processing Waste Management"; AVI. 1979,
3. Rittmann BE & McCarty PL; "Environmental Biotechnology: Principles and Applications"; Mc-Grow-Hill International editions2001,.
4. Bhattacharyya B C & Banerjee R; "Environmental Biotechnology"; Oxford University Press.
5. Bartlett RE; " Wastewater Treatment; Applied Science" Pub Ltd.
6. G. Tchobanoglous, FI Biston, "Waste water Engineering Treatment and Reuse": Mc Graw Hill, 2002.
7. "Industrial Waste Water Management Treatment and Disposal by Waste Water" 3rd Edition Mc Graw Hill 2008.

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B.Tech (FT)– IV-I

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(19A01704a) AIR POLLUTION AND CONTROL
OPEN ELECTIVE-III

Course Objectives:

- To identify the sources of air pollution
- To know the composition and structure of atmosphere
- To know the pollutants dispersion models
- To understand the working of air pollution control equipments
- To identify the sources of noise pollution and their controlling methods

UNIT I

Introduction: sources, effects on – ecosystems, characterization of atmospheric pollutants, air pollution episodes of environmental importance. Indoor Air Pollution– sources, effects.

Learning Outcomes:
After completing this Unit, students will be able to

- To understand the character of atmospheric pollutants and their effects

UNIT II

Meteorology - composition and structure of the atmosphere, wind circulation, solar radiation, lapse rates, atmospheric stability conditions, wind velocity profile, Maximum Mixing Depth (MMD), Temperature Inversions, Wind rose diagram.

Learning Outcomes:
After completing this Unit, students will be able to

- Understand the composition and structure and structure of atmosphere
- To understand the maximum mixing depth and windrose diagram

UNIT III

General characteristics of stack emissions, plume behaviour, heat island effect. Pollutants dispersion models – description and application of point, line and areal sources. Monitoring of particulate matter and gaseous pollutants –respirable, non-respirable and nano - particulate matter. CO, CO2, Hydrocarbons (HC), SOX and NOX, photochemical oxidants.

Learning Outcomes:
After completing this Unit, students will be able to

- To know about the general characteristics of stack emissions and their behavior

- To understand the monitoring of particulate matter and gaseous pollutants

UNIT IV

Air Pollution Control equipment for particulate matter & gaseous pollutants– gravity settling chambers, centrifugal collectors, wet collectors, fabric filters, electrostatic precipitator (ESP). – Adsorption, Absorption, Scrubbers, Condensation and Combustion.

Learning Outcomes:
After completing this Unit, students will be able to

- To know about the various air pollution control equipments

UNIT V

Noise - sources, measurements, effects and occupational hazards. Standards, Noise mapping, Noise attenuation equations and methods, prediction equations, control measures, Legal aspects of noise.

Learning Outcomes:
After completing this Unit, students will be able to

- To know about the noise sources, mapping, prediction equations etc.,

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

- Identify the sources of air pollution
- Understand the composition and structure and structure of atmosphere.
- Know about the general characteristics of stack emissions and their behavior
- Know about the general characteristics of stake emission and their behavior
- Know about the noise sources, mapping, prediction equations etc.,

REFERENCES:

1. WarkK ., Warner C.F., and Davis W.T., “Air Pollution - Its Origin and Control”, Harper & Row Publishers, New York.
2. Lee C.C., and Lin S.D., “Handbook of Environmental Engineering Calculations”, McGraw Hill, New York.
3. Perkins H.C., “Air Pollution”, McGraw Hill.
4. Crawford M., “Air Pollution Control Theory”, TATA McGraw Hill.
5. Stern A.C., “Air Pollution”, Vol I, II, III.
6. Seinfeld N.J.,, “Air Pollution”, McGraw Hill.
7. Stern A.C. Vol. V, “Air Quality Management”.
8. M N Rao and HVN Rao, Air Pollution” Tata McGraw Hill publication

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I

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(19A01704b) BASICS OF CIVIL ENGINEERING
OPEN ELECTIVE-III

Course Objectives:

- To identify the traditional materials that are used for building constructions
- To know the principles of building planning
- To know the causes of dampness in structures and its preventive measures
- To know about the low cost housing techniques
- To know the basic principles of surveying

UNIT I

Traditional materials: Stones- Types of stone masonry -Brick-types of brick masonry- lime Cement – Timber – Seasoning of timber - their uses in building works

Learning Outcomes:

After completing this Unit, students will be able to

- To understand the characteristics of different building materials.

UNIT II

Elements of building planning- basic requirements-orientation-planning for energy efficiency-planning based on utility-other requirements.

Learning Outcomes:

After completing this Unit, students will be able to

- To understand the principles of planning in buildings

UNIT III

Dampness and its prevention: Causes of dampness- ill effects of dampness-requirements of an ideal material for damp proofing-materials for damp proofing –methods of damp proofing.

Learning Outcomes:

After completing this Unit, students will be able to

- To know about the causes of dampness in buildings and its ill effects
- To know about the general characteristics of ideal material for damp proofing

UNIT IV

Cost effective construction techniques in mass housing schemes: Minimum standards –

Approach to cost effective mass housing schemes- cost effective construction techniques.

Learning Outcomes:
After completing this Unit, students will be able to

- To know about the various cost effective techniques in mass housing schemes.

UNIT V

Introduction to Surveying: Object and uses of surveying- Primary divisions in surveying- Fundamental principles of surveying- Classification of surveying-plans and maps-scales-types of graphical scales- units and measurements

Learning Outcomes:
After completing this Unit, students will be able to

- To know about the objects of surveying and its classification.

Course Outcomes:

Upon the successful completion of this course, the students will be able to:
- Identify the traditional building materials that are used in building construction.
- Plan the buildings based on principles of planning.
- Identify the sources of dampness and its ill effects on buildings and its prevention.
- Know the cost effective construction in mass housing schemes.
- Know the importance of surveying in planning of the buildings.

Text books:

1. S.S.Bhavikatti, “Basic civil engineering”, New age international publishers.
2. S.S.Bhavikatti, “Building Construction:, Vikas Publishing house, New Delhi.
3. G.C.Sahu and Joygopal jena, “Building materials and Construction”, McGraw Hill Education.

Reference books:

1. N.Subramanian, “Building Materials testing and sustainability”, Oxford university press.

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B.Tech (FT)– IV-I Sem

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(19A02704a) RENEWABLE ENERGY SYSTEMS

OPEN ELECTIVE-III

Course Objectives:

At the end of the course the student will be able to

- Identify various sources of Energy and the need of Renewable Energy Systems.
- Understand the concepts of Solar Radiation, Wind energy and its applications.
- Distinguish between solar thermal and solar PV systems
- Interpret the concept of geo thermal energy and its applications.
- Understand the use of biomass energy and the concept of Ocean energy and fuel cells.

UNIT -I

Solar Energy

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.

Learning Outcomes:

At the end of the course the student will be able to

- To understand about solar thermal parameters
- To distinguish between flat plate and concentrated solar collectors
- To know about thermal storage requirements
- To know about measurement of solar radiation

UNIT – II

PV Energy Systems

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.

Learning Outcomes:

After completing this Unit, students will be able to

- Understand the concept of PV effect in crystalline silicon and their characteristics
- Understand other PV technologies
- To know about electrical characteristics of PV cells & modules
- To know about grid connected PV systems

UNIT - III

Wind Energy

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.

Learning Outcomes:
After completing this Unit, students will be able to

- To understand basics of wind energy conversion and system
- To distinguish between VAWT and HAWT systems
- To understand about design considerations
- To know about site selection considerations of WECS

UNIT - IV

Geothermal Energy

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.

Learning Outcomes:
After completing this Unit, students will be able to

- Understand the Geothermal energy and its mechanism of production and its applications
- Analyze the concept of producing Geothermal energies
- To learn about disadvantages and advantages of Geo Thermal Energy Systems
- To know about various applications of GTES

UNIT -V

Miscellaneous Energy Technologies

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.

Learning Outcomes:
After completing this Unit, students will be able to

- Analyze the operation of tidal energy
- Analyze the operation of wave energy
- Analyze the operation of bio mass energy
- Understand the principle, working and performance of fuel cell technology

- Apply these technologies to generate power for usage at remote centres

Course Outcomes:

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

- To distinguish between various alternate sources of energy for different suitable application requirements
- To differentiate between solar thermal and PV system energy generation strategies
- To understand about wind energy system
- To get exposed to the basics of Geo Thermal Energy Systems
- To know about various diversified energy scenarios of ocean, biomass and fuel cells

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.

References:

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.

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B.Tech (FT) – IV-I Sem

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(19A02704b) ELECTRIC VEHICLE ENGINEERING
OPEN ELECTIVE-III

Course Objectives:

After completing this Unit, students will be able to

- To get exposed to new technologies of battery electric vehicles, fuel cell electric vehicles
- To get exposed to EV system configuration and parameters
- To know about electro mobility and environmental issues of EVs
- To understand about basic EV propulsion and dynamics
- To understand about fuel cell technologies for EV and HVEs
- To know about basic battery charging and control strategies used in electric vehicles

UNIT-I

Introduction to EV Systems and Parameters

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.

Learning Outcomes:

After completing this Unit, students will be able to

- To know about past, present and latest technologies of EV
- To understand about configurations of EV systems
- To distinguish between EV parameters and performance parameters of EV systems
- To distinguish between single and multiple motor drive EVs
- To understand about in-wheel EV

UNIT-II

EV and Energy Sources

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

Learning Outcomes:

After completing this Unit, students will be able to

- To know about various types of EV sources
- To understand about e-mobility
- To know about environmental aspects of EV
- To distinguish between conventional and recent technology developments in EV systems

UNIT-III
EV Propulsion and Dynamics

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.

Learning Outcomes:
After completing this Unit, students will be able to

- To know about what is meant by propulsion system
- To understand about single and multi motor EV configurations
- To get exposed to current and recent applications of EV
- To understand about load factors in vehicle dynamics
- To know what is meant acceleration in EV

UNIT-IV
Fuel Cells

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

Learning Outcomes:

After completing this Unit, students will be able to

- To know about fuel cell technology of EV
- To know about basic operation of FCEV
- To know about characteristics and sizing of EV with suitable example
- To get exposed to concept of Hybrid Electric Vehicle using fuel cells
- To know about the comparison of various hybrid EV systems

UNIT-V
Battery Charging and Control

Battery charging: Basic requirements, charger architecture, charger functions, wireless charging, power factor correction.
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

Learning Outcomes:

After completing this Unit, students will be able to

- To understand about basic requirements of battery charging and its architecture
- To know about charger functions
- To get exposed to wireless charging principle
- To understand about block diagram, modelling of electro mechanical systems of EV
- To be able to design various compensation requirements

Course Outcomes:

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

- To understand and differentiate between conventional and latest trends in Electric Vehicles
- To know about various configurations in parameters of EV system
- To know about propulsion and dynamic aspects of EV
- To understand about fuel cell technologies in EV and HEV systems
- To understand about battery charging and controls required of EVs

TEXT BOOKS:

1. C.C Chan, K.T Chau: "Modern Electric Vehicle Technology", Oxford University Press Inc., New York 2001.
2. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Wiley, 2003.

REFERENCE BOOKS:

1. Iqbal Husain,, "Electric and Hybrid Vehicles Design Fundamentals", CRC Press 2005.
2. Ali Emadi, "Advanced Electric Drive Vehicles", CRC Press, 2015.

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B.Tech (FT)– IV-I Sem

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(19A03704a) FINITE ELEMENT METHODS
OPEN ELECTIVE-III

Course Objectives:

- Familiarize basic principles of finite element analysis procedure.
- Explain theory and characteristics of finite elements that represent engineering structures.
- Apply finite element solutions to structural, thermal, dynamic problem.
- Learn to model complex geometry problems and solution techniques.

UNIT – I

Introduction to finite element methods for solving field problems, Stress and equilibrium, Boundary conditions, Strain-Displacement relations, Stress- strain relations for 2D and 3D Elastic problems.Potential energy and equilibrium, The Rayleigh-Ritz method, Formulation of Finite Element Equations.

One dimensional problems: Finite element modeling coordinates and shape functions. Assembly of global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand the concept of nodes and elements.(l2)
- Understand the general steps of finite element methods.(l2)
- Understand the role and significance of shape functions in finite element formulations (l2)
- Formulate and solve axially loaded bar problems. (l6)

UNIT - II

Analysis of trusses: Stiffness Matrix for plane truss element. Stress Calculations and Problems.

Analysis of beams: Element Stiffness Matrix for two noded, two degrees of freedom per node beam element and simple problems.

Learning Outcomes:

At the end of the unit, the student will be able to

- Explain the use of the basic finite elements for structural applications using truss and beam. (l2)
- Formulate and analyze truss and beam problems. (l6)

UNIT - III

Finite element modeling of two dimensional stress analysis - constant strain triangles-quadrilateral element-treatment of boundary conditions. Estimation of load Vector, Stresses.Finite element modeling of Axi-symmetric solids subjected to axi-symmetric loading with triangular elements.Two dimensional four nodedIsoparametric elements and problems.

Learning Outcomes:

At the end of the unit, the student will be able to

- Explain the formulation of two – dimensional elements (Triangular and Quadrilateral Elements). (L2)
- Apply the formulation techniques to solve two – dimensional problems using triangle and quadrilateral elements. (L3)
- Formulate and solve axisymmetric problems.(L6)

UNIT - IV

Steady state heat transfer analysis: One dimensional analysis of slab and fin, two dimensional analysis of thin plate.
Analysis of a uniform shaft subjected to torsion loading.

Learning Outcomes:

At the end of the unit, the student will be able to

- Explain the application and use of the Finite Element Methods for heat transfer problems. (L2)
- Formulate and solve heat transfer problems. (L6)
- Analyse the

UNIT V

Dynamic analysis: Formulation of finite element model,element –mass matrices,evaluation of Eigen values and Eigen vectors for a stepped bar truss.
3D Problems: Finite Element formulation- Tetrahedron element-Stiffness matrix.

Learning Outcomes:

At the end of the unit, the student will be able to

- Understand problems involving dynamics using Finite Element Methods.
- Evaluate the Eigen values and Eigen Vectors for steeped bar.
- Develop the stiffness matrix for tetrahedron element.

Course Outcomes:

Upon successful completion of this course you should be able to

- Understand the concepts behind variational methods and weighted residual methods in FEM.
- Identify the application and characteristics of FEA elements such as bars, beams, and isoparametric elements, and 3-D element.
- Develop element characteristic equation procedure and generation of global stiffness equation will be applied.
- Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.
- Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer and fluid flow.

TEXT BOOKS

1. Chandraputla, Ashok &Belegundu, "Introduction to Finite Element in Engineering", Prentice Hall.
2. S.S.Rao, "The Finite Element Methods in Engineering", 2nd Edition, Elsevier Butterworth - Heinemann 2011.

REFERENCE BOOKS

1. J N Reddy, "An introduction to the Finite Element Method", McGraw – Hill, New York, 1993.
2. R D Cook, D S Malkus and M E Plesha, "Concepts and Applications of Finite Element Analysis", 3rd Edition, John Wiley, New York, 1989.
3. K J Bathe, "Finite Element Procedures in Engineering Analysis", Prentice-Hall, Englewood Cliffs,1982.
4. T J R Hughes, "the Finite Element Method, Prentice", Hall, Englewood Cliffs, NJ, 1986.
5. C Zienkiewicz and R L Taylor, "the Finite Element Method", 3rd Edition. McGraw-Hill, 1989.

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(19A03704b) PRODUCT MARKETING
OPEN ELECTIVE-III

Course Objectives:

- Introduce the basic concepts of Product marketing.
- Familiarize with market information systems and research
- Understand the nature and importance of industrial market
- Discuss the major stages in new product development
- Identify the factors affecting pricing decisions

UNIT I:

Introduction (7 Hours)

Historical development of marketing management, Definition of Marketing, Core marketing concepts, Marketing Management philosophies, Micro and Macro Environment, Characteristics affecting Consumer behaviour, Types of buying decisions, buying decision process, Classification of consumer products, Market Segmentation Concept of Marketing Myopia. Importance of marketing in the Indian Socio economic system.

Learning Outcomes:

At the end of this student, the student will be able to

- Define Marketing. (L1)
- Discuss marketing philosophies. (L2)
- Sketch the buying decision process. (L3)
- Understand the importance of marketing in the Indian socio economic system. (L2)

UNIT II:

Marketing of Industrial Products (6 Hours)

Components of marketing information system–benefits & uses marketing research system, marketing research procedure, Demand Estimation research, Test marketing, Segmentation Research - Cluster analysis, Discriminate analysis. Sales forecasting: objective and subjective methods. Nature and importance of the Industrial market, classification of industrial products, participants in the industrial buying process, major factors influencing industrial buying behavior, characteristics of industrial market demand. Determinants of industrial market demand Buying power of Industrial users, buying motives of Industrials users, the industrial buying process, buying patterns of industrial users.

Learning Outcomes:

At the end of this student, the student will be able to

- Identify the components of marketing information system. (L2)
- List the advantages and uses of marketing research system. (L1)
- Demonstrate sales forecasting. (L3)
- Explain the major factors influencing industrial buying behaviour. (L2)

UNIT III:

Product Management And Branding (7 Hours)

The concept of a product, features of a product, classification of products, product policies – product planning and development, product line, product mix – factors influencing change in product mix, product mix strategies, meaning of "New – product; major stages in new – product development product life cycle. Branding: Reasons for branding, functions of branding features of types of brands, kinds of brand name.

Learning Outcomes:

At the end of this student, the student will be able to

- Indentify the factors influencing change in product mix. (L2)
- Sketch various stages in product life cycle. (L2)
- Recall the features of a product and product policies. (L1)
- Demonstrate on features, functions and reasons of branding. (L3)

UNIT IV:

Pricing And Pacakaging (7Hours)

Importance of Price, pricing objectives, factors affecting pricing decisions, procedure for price determination, kinds of pricing, pricing strategies and decisions Labeling: Types, functions advantages and disadvantages, Packaging**:** Meaning, growth of packaging, function of packaging, kinds of packaging.

Learning Outcomes:

At the end of this student, the student will be able to

- List the factors affecting pricing decisions. (L1)
- Explain the procedure for price determination. (L2)
- Employ Pricing strategies and decisions. (L3)
- Understand the functions of labelling and packaging. (L2)

UNIT V:

Product Promotion (6Hours)

Importance of Price, pricing objectives, factors affecting pricing decisions, procedure for price determination, kinds of pricing, pricing strategies and decisions. Advertising and sales promotion**:** Objectives of advertisement function of advertising, classification of advertisement

copy, advertisement media – kinds of media, advantages of advertising. Objectives of sales promotion, advantages sales promotion. Personal Selling **:** Objectives of personal selling, qualities of good salesman, types of salesman, major steps in effective selling

Learning Outcomes:

At the end of this student, the student will be able to

- Discuss the procedures for price determination. (L2)
- Explain the objectives of advertisement function of advertising. (L2)
- List the advantages and disadvantages of advertising. (L1)
- Describe the major steps in effecting selling. (L2)

Course Outcomes:

At the end of the course, the student will be able to

- Understand basic marketing management concepts and their relevance to business development. (L2)
- Prepare a questionnaire for market research. (L5)
- Design marketing research plan for business organizations. (L5)
- Optimize marketing mix to get competitive advantage. (L4)

Text Books:

1. Philip Kotler, "Principles of Marketing", Prentice – Hall.
2. Philip Kotler, "Marketing Management", Prentice – Hall.

Reference Books:

1. Wiliam J Stanton, "Fundamentals of Marketing", McGraw Hill
2. R.S.N. Pillai and Mrs.Bagavathi, "Marketing", S. Chand & Co. Ltd
3. Rajagopal, "Marketing Management Text & Cases", Vikas Publishing House

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(19A04704a) INTRODUCTION TO 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.

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. (L1)
- Analyze interface required memory of RAM & ROM. (L3)

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. (L1)
- Develop the 8051 Assembly level programs using 8051 instruction set. (L3)

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. (L1)
- Design Timer /counters using of 8051. (L4)

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. (L1)
- Develop an ALP to generate an external interrupt using a switch. (L3)

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. (L2)
- Design Stepper Motor and f motor interfacing of 8051. (L4)

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.

TEXT BOOKS:

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, ISBN: 978-93-329-0125-4.
2. Raj Kamal, “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Pearson Education, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) – IV-I Sem

L	T	P	C
3	0	0	3

(19A04704b) PRINCIPLES OF DIGITAL SIGNAL PROCESSING

OPEN ELECTIVE-III

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.

UNIT- I:

INTRODUCTION TO SIGNALS

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, Unit parabolic, Impulse, Sinusoidal function, Exponential function, Gate function, Triangular function, Sinc function and Signum function.

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. (L1)
- Understand various basic operations on signals (L1)

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. (L1)
- Understand various basic operations on signals (L1)

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 (L1)
- Apply the transform techniques to solve the problems (L2)

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 (L1)
- Analyze the Decimation in time and frequency algorithms (L3)

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: Linear phase and Lattice structures.

Learning Outcomes:

At the end of this student, the student will be able to

- Understand the importance of IIR and FIR digital Filters (L1)
- Realize IIR filters and analyze various windowing techniques in FIR filters (L2)
- Design IIR and FIR filters (L4)

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.

TEXT BOOKS:

1. B. P. Lathi, "Signals, Systems and Communications", BS Publications, 2008.
2. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications" , 4th edition , Pearson Education/PHI, 2007.
3. A.V. Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing", 2nd edition., PHI.

REFERENCES:

1. A.V. Oppenheim, A.S. Will sky and S.H. Nawab, "Signals and Systems", PHI, 2nd Edition, 2013.
2. A. Anand Kumar, "Signals and Systems", PHI Publications, Third Edition, 2013
3. P. Ramesh Babu. "Digital Signal Processing".
4. Andreas Antoniou, "Digital signal processing", Tata McGraw Hill, 2006.
5. R S Kaler, M Kulkarni,, Umesh Gupta, "A Text book on Digital Signal processing" –I K International Publishing House Pvt. Ltd.
6. M H Hayes, Schaum's Outlines, "Digital Signal Processing", Tata Mc-Graw Hill, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem

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(19A05704a) FUNDAMENTALS OF GAME DEVELOPMENT

(Common to CSE & IT)

Course Objectives:

This course is designed to:

- Get familiarized with the various components in a game and game engine.
- Explore the leading open source game engine components.
- Elaborate on game physics.
- Introduce to the game animation.
- Expose to network-based gaming issues.

Unit – 1: Introduction to Game

What is a Game? The Birth of Games, The Rise of Arcade Games, The Crash and Recovery, The Console Wars, Online Games and Beyond.

The Game Industry: Game Industry Overview, Game Concept Basics, Pitch Documentation, pitching a Game to a Publisher, Managing the developer-Publisher Relationship, Legal Agreements, Licenses, Console Manufacturers Approval.

Roles on the Team: Production, Art, Engineering, Design, Quality Assurance Testing, Team Organization, Corporate.

Learning Outcomes:

After completing this Unit, students will be able to

- Demonstrate online games and beyond. [L2]
- Outline the process carried out in the Game Industry [L2]
- Inspect the roles on the Team[L4]

Unit – 2: Teams

Project Leadership, Picking Leads, Team Building, Team Buy-in and Motivation.

Effective Communication: Written Communication, Oral Communication, Nonverbal Communication, Establishing Communication Norms, Communication Challenges.

Game Production Overview: Production Cycle, Preproduction, Production, Testing, Postproduction.

Learning Outcomes:

After completing this Unit, students will be able to

- Build a team and pick a leader. [L6]
- Develop Effective communication. [L3]
- Outline the Game Production cycle [L2]

Unit – 3: Game Concept

Introduction, Beginning the Process, Defining the Concept, Game Programming Basics, Prototyping, Risk Analysis, Pitch Idea, Project Kickoff.

Characters, setting, and Story: Story Development, Gameplay, Characters, Setting, Dialogue, Cinematics, Story Documentation.

Game Requirements: Define Game Features, Define Milestones and Deliverables, Evaluate Technology, Define Tools and Pipeline, Documentation, Approval, Game Requirements Outline

Learning Outcomes:

After completing this Unit, students will be able to

- Design a game. [L6]
- Demonstrate the game play. [L2]
- Identify the Game requirements [L3]

Unit – 4 : Game Plan

Dependencies, Schedules, Budgets, Staffing, Outsourcing, Middleware, Game Plan Outline.
Production Cycle: Design Production Cycle, Art Production Cycle, Engineering Production Cycle, Working Together.
Voiceover and Music: Planning for Voiceover, choosing a Sound Studio, Casting Actors, Recording Voiceover, Voiceover Checklist, Planning for Music, Working with a Composer, Licensing Music.

Learning Outcomes:

After completing this Unit, students will be able to

- Outline the Game plan. [L2]
- Define the production cycle. [L1]
- Make use of voiceover and music in game development. [L3]

Unit – 5 :Localization

Creating International Content, Localization-Friendly Code, Level of Localization, Localization Plan, Testing, Localization Checklist.

Testing and Code Releasing: Testing Schedule, Test Plans, Testing Pipeline, Testing Cycle, External Testing, Determining Code Release, Code Release Checklist, Gold Masters, Postmortems.

Marketing and Public Relations: Software Age Ratings, Working with Marketing, Packaging, Demos, Marketing Assets, Game Builds, Working with Public Relations, Asset Deliverable Checklist.

Learning Outcomes:

After completing this Unit, students will be able to

- Explain the importance of localization. [L2]
- Summarize Testing and code releasing [L2]
- Illustrate Marketing and public relations. [L2]

Course Outcomes:
Upon completion of the course, the students should be able to:

- Design games for commercialization (L6)
- Predict the trends in game development (L5)
- Design Game Plan and production cycle (L6)
- Dramatize the game playing environment (L4)

Text Book:

1. Heather Maxwell Chandler, and Rafael Chandler, "Fundamentals of Game Development", Jones& Bartlett Learning, 2011.

References:

1. Flint Dille and John Zuur Platten, The Ultimate guide to Video Game Writing, Loan Eagle publisher, 2008.
2. Adams, Fundamentals of Game Design, 3rd edition, Pearson Education India, 2015.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem **L T P C**

3 0 0 3

(19A05704b) CYBER SECURITY
(Common to CSE & IT)

Course Objectives:

This course is designed to:

- Understand essential building blocks and basic concepts of cyber security
- Explore Web security and Network security
- Explain the measures for securing the networks and cloud
- Understand privacy principles and policies
- Describe the legal issues and ethics in computer security

UNIT I

Introduction: Introduction to Computer Security, Threats, Harm, Vulnerabilities, Controls, Authentication, Access Control, and Cryptography, Authentication, Access Control, Cryptography.

Programs and Programming: Unintentional (Non-malicious) Programming Oversights, Malicious Code—Malware, Countermeasures.

Learning Outcomes:

After completing this Unit, students will be able to

- Explain Vulnerabilities, threats and. Counter measures for computer security[L2]
- Interpret the design of the malicious code [L2]

UNIT II

Web Security: User Side, Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks.

Operating Systems Security: Security in Operating Systems, Security in the Design of Operating Systems, Rootkit.

Learning Outcomes:

After completing this Unit, students will be able to

- Outline the attacks on browser, Web and email. [L2]
- Explain the security aspects of Operating Systems. [L3]

UNIT III

Network Security: Network Concepts, Threats to Network Communications, Wireless Network Security, Denial of Service, Distributed Denial-of-Service Strategic Defenses: Security Countermeasures, Cryptography in Network Security, Firewalls, Intrusion Detection and Prevention Systems, Network Management .

Cloud Computing and Security: Cloud Computing Concepts, Moving to the Cloud, Cloud Security Tools and Techniques, Cloud Identity Management, Securing IaaS.

Learning Outcomes:

After completing this Unit, students will be able to

- Identify the network security threats and attacks. [L3]
- Design the Counter measures to defend the network security attacks. [L6]
- Analyze the security tools and techniques for Cloud computing [L4]

UNIT IV

Privacy: Privacy Concepts, Privacy Principles and Policies, Authentication and Privacy, Data Mining, Privacy on the Web, Email Security, Privacy Impacts of Emerging Technologies, Where the Field Is Headed.

Management and Incidents: Security Planning, Business Continuity Planning, Handling Incidents, Risk Analysis, Dealing with Disaster.

Learning Outcomes:

After completing this Unit, students will be able to

- Interpret the need for Privacy and its impacts of Emerging Technologies. [L2]
- Explain how to handle incidents and deal with Disaster. [L2]

UNIT V

Legal Issues and Ethics: Protecting Programs and Data, Information and the Law, Rights of Employees and Employers, Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security, Incident Analysis with Ethics, Emerging Topics: The Internet of Things, Economics, Computerized Elections, Cyber Warfare.

Learning Outcomes:

After completing this Unit, students will be able to

- Adapt legal issues and ethics in computer security. [L6]
- Elaborate on the Emerging topics. [L6]

Course Outcomes:

Upon completion of the course, the students should be able to:

- Illustrate the broad set of technical, social & political aspects of Cyber Security and security management methods to maintain security protection (L2)
- Assess the vulnerabilities and threats posed by criminals, terrorist and nation states to national infrastructure (L5)
- Identify the nature of secure software development and operating systems (L3)

- Demonstrate the role security management in cyber security defense (l2)
- Adapt the legal and social issues at play in developing solutions.(L6)

Text Books:

1) Pfleeger, C.P., Security in Computing, Prentice Hall, 2010, 5th edition.
2) Schneier, Bruce. Applied Cryptography, Second Edition, John Wiley & Sons, 1996

Reference Books:

1) Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, Information Security Management: Concepts and Practice, McGraw-Hill, 2013.
2) Whitman, Michael E. and Herbert J. Mattord. Roadmap to Information Security for IT and Infosec Managers. Boston, MA: Course Technology, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem

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3	0	0	3

(19A27704a) CORPORATE GOVERNANCE IN FOOD INDUSTRIES
OPEN ELECTIVE III

PREAMBLE

This text focuses on corporate governance, business ethics and emerging trends in food industries.

Course Objectives

- To understand the concepts of corporate governance in view of food industry

UNIT – I

Corporate Governance- A Conceptual Foundation: Concept, nature, issues and importance of corporate governance, origin and development of corporate governance, concept of corporate management, Different models of corporate governance, corporate governance in family business, corporate governance failure with examples.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Concept, nature, issues and importance of corporate governance
- origin and development of corporate governance, concept of corporate management
- Different models of corporate governance
- corporate governance in family business, corporate governance failure with examples

UNIT – II

Role Players: Role of various players viz. Role of shareholders their rights and responsibilities, Role of board of directors in corporate governance- executive and non executive directors, independent and nominee directors, Role of Auditors, audit committee, media.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Role of shareholders their rights and responsibilities
- Role of board of directors in corporate governance- executive and non executive directors, independent and nominee directors
- Role of Auditors, audit committee, media.

UNIT – III

Corporate governance in India and the Global Scenario: Corporate Governance practices /codes in India, UK, Japan, USA. Contributions of CII-recommendations on corporate governance by different committees in India, SEBI guidelines, Kumar Manglam Birla Committee, Naresh Chandra committee Report, OECD Principles, Cadbury Committee

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Corporate Governance practices /codes in India, UK, Japan, USA.
- Contributions of CII-recommendations on corporate governance by different committees in India, SEBI guidelines,
- Have detail study of committees like Kumar Manglam Birla Committee, Naresh Chandra committee Report, OECD Principles, Cadbury Committee

UNIT – IV

Emerging trends: Emerging Trends and latest developments in Corporate Governance. Corporate Governance initiative in India and Abroad, Corporate Governance Rating- Role of rating agencies in corporate governance. ICRA Corporate governance rating method for examining the quality and effectiveness of corporate governance.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Emerging Trends and latest developments in Corporate Governance.
- Corporate Governance initiative in India and Abroad,
- Corporate Governance Rating- Role of rating agencies in corporate governance
- ICRA Corporate governance rating method for examining the quality and effectiveness of corporate governance.

UNIT – V

Business ethics and corporate governance. Social responsibility and corporate governance. Corporate governance and value creation. Political economy of corporate governance.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Business ethics and corporate governance.
- Social responsibility and corporate governance.
- Corporate governance and value creation.
- Political economy of corporate governance.

Course Outcomes:

By the end of the course, the students will

- Attain knowledge on system of corporate governance in food industries.
- Get to know about business ethics and values.

TEXT BOOKS

1. Subhash Chandra Das, “Corporate Governance in India”, PHI Pvt. Ltd., New Delhi(2008),
2. Dennis Campbell, “Susan Woodley Trends and Developments In Corporate Governance”. (2004)

REFERENCES

1. Jayati Sarkar. “Corporate Governance in India”. Sage Publications, New Delhi,2012.
2. Vasudha, Joshi “Corporate Governance The Indian Scenario”. Foundations Books Pvt. Ltd. New Delhi. 2012,

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem **L T P C**

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(19A27704b) PROCESS TECHNOLOGY FOR CONVENIENCE & RTE FOODS OPEN ELECTIVE III

PREAMBLE

This text focuses on various aspects and technologies involved in processing of convenience and Read-to-eat foods.

Course Objectives:

- To understand the importance and demand for convenience foods in present day scenario
- To learn the various technical aspects of convenience and Read-to-eat foods.

UNIT – I

Overview of grain-based snacks: whole grains – roasted, toasted, puffed, popped and flakes Coated grains-salted, spiced and sweetened Flour based snack– batter and dough based products; savoury and farsans; formulated chips and wafers, papads.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Role of cereal based ingredients in snacks industries.
- Various technologies and equipments involved in Snacks industries

UNIT – II

Technology for fruit and vegetable based snacks: chips, wafers, papads etc. Technology of ready to eat fruits and vegetable based food products like, sauces, fruit bars, glazed candy etc. Technology of ready to eat canned value added fruits/vegetables and mixes and ready to serve beverages etc.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Role of Fruits and vegetables in convenience products.
- Processing of various Fruit and vegetable based products.

UNIT – III

Technology of ready- to- eat baked food products, drying, toasting roasting and flaking, coating, chipping. Extruded snack foods: Formulation and processing technology, colouring, flavouring and packaging. Technology for coated nuts – salted, spiced and sweetened products- chikkis, Sing bhujia.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Various methods involved in processing of ready to eat baked products
- Various methods involved in processing of extruded snack foods
- Technology involved in processing different coated nuts

UNIT IV

Technology for ready-to-cook food products- different puddings and curried vegetables etc. Technology for ready-to-cook and ready to eat meat and meat food products. Technology for preparation of instant cooked rice, carrot and other cereals based food products.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Technology involved in processing different ready to cook food products
- Technology involved in processing different ready to cook and ready to eat meat and meat products
- Technology involved in processing different instant cooked cereal products

UNIT – V

Technology of ready to eat instant premixes based on cereals, pulses etc. Technology for RTE puffed snack- sand puffing, hot air puffing, explosion puffing, gun puffing etc. Technology for preparation of traditional Indian dairy products.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Technology involved in processing different ready to eat instant premixes based on cereals and pulses and etc.
- Technology involved in processing different RTE puffed snacks
- Technology involved in processing different traditional dairy products

Course Outcomes:

By end of the course students will understand

- Technology for processing ready to eat and ready cook different products and equipment used for manufacturing of RTE products

TEXT BOOKS

1. Edmund WL. “Snack Foods Processing”. AVI Publ.
2. Kamaliya M.K and Kamaliya K.B. 2001. Vol.1 and 2, “Baking Science and Industries”, M.K.Kamaliya Publisher, Anand.

REFERENCES

1. Frame ND . “Technology of Extrusion Cooking”. Blackie Academic1994. .
2. Gordon BR. “Snack Food”, AVI Publ, 1997.
3. Samuel AM. “Snack Food Technology”, AVI Publ. 1976.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I

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(19A54704a) NUMERICAL METHODS FOR ENGINEERS
OPEN ELECTIVE-III
(ECE , CSE, IT & CIVIL)

Course objectives:

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.

UNIT-I:

Solution of Algebraic & Transcendental Equations:

Introduction-Bisection method-Iterative method-Regula falsi method-Newton Raphson method. System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.

Learning Outcomes:

Students will be able to

- Calculate the roots of equation using Bisection method and Iterative method.
- Calculate the roots of equation using Regula falsi method and Newton Raphson method.
- Solve the system of algebraic equations using Gauss Jordan method and Gauss Siedal method.

UNIT-II:

Curve Fitting

Principle of Least squares- Fitting of curves- Fitting of linear, quadratic and exponential curves.

Learning Outcomes:

Students will be able to

- understand curve fitting
- understand fitting of several types of curves

UNIT-III:

Interpolation

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

Learning Outcomes:

Students will be able to

- Understand the concept of interpolation.
- Derive interpolating polynomial using newton's forward and backward formulae.
- Derive interpolating polynomial using lagrange's formulae.
- Derive interpolating polynomial using gauss forward and backward formulae.

UNIT-IV:

Numerical Integration

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule

Learning Outcomes:

Students will be able to

- Solve integral equations using Simson's 1/3 and Simson's 3/8 rule.
- Solve integral equations using Trapezoidal rule.

UNIT-V:

Solution of Initial value problems to Ordinary differential equations

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

Learning Outcomes:

Students will be able to

- Solve initial value problems to ordinary differential equations using Taylor's method.
- Solve initial value problems to ordinary differential equations using Euler's method and Runge Kutta methods.

Course Outcomes:

After the completion of course, students will be able to

- 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.

Text Books:

1. B.S.Grewal, "Higher Engineering Mathematics", Khanna publishers.
2. Ronald E. "Probability and Statistics for Engineers and Scientists", Walpole,PNIE.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India

Reference Books:

1. B.V.Ramana, “Higher Engineering Mathematics”, Mc Graw Hill publishers.
2. Alan Jeffrey, “Advanced Engineering Mathematics”, Elsevier.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I

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(19A51704a) CHEMISTRY OF NANOMATERIALS AND APPLICATIONS

Course Objectives:

- To understand synthetic principles of Nanomaterials by various methods
- And also characterisae the synthetic nanomaterials by various instrumental methods
- To enumerate the applications of nanomaterials in engineering

Unit I:

Introduction**:** Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nano materials.

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.

Learning Outcomes:

At the end of this unit, the students will be able to

- Classify the nanostructure materials (L2)
- Describe scope of nano science and technology (L2)
- Explain different synthetic methods of nano materials (L2)
- Identify the synthetic methods of nanomaterial which is suitable for preparation of particular material (L3)

UNIT-II

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.

Learning Outcomes:

At the end of this unit, the students will be able to

- Describe the top down approach (L2)
- Explain aerosol synthesis and plasma arc technique (L2)
- Differentiate chemical vapour deposition method and electrodeposition method (L2)
- Discuss about high energy ball milling (L3)

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.

Learning Outcomes:

At the end of this unit, the students will be able to

- Discuss different technique for characterization of nanomaterial (L3)
- Explain electron microscopy techniques for characterization of nanomaterial (L3)
- Describe BET method for surface area analysis (L2)
- Apply different spectroscopic techniques for characterization (L3)

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, liquid crystals.

Learning Outcomes:

At the end of this unit, the students will be able to

- Explain synthesis and properties and applications of nanaomaterials (L2)
- Discuss about fullerenes and carbon nanotubes (L3)
- Differentiate nanomagnetic materials and thermoelectric materials (L2)
- Describe liquid crystals (L2)

UNIT.V

Engineering Applications of Nanomaterials

Learning Outcomes:

At the end of this unit, the students will be able to

- Illustrate applications of nanaomaterials (L2)
- Discuss the magnetic applications of nanomaterials (L3)
- list the applications of non-linear optical materials (L1)
- Describe the applications fullerenes, carbon nanotubes (L2)

Course Outcome

At the end of the course, the student will be able to:

- Understand the state of art synthesis of nano materials

- Characterize nano materials using ion beam, scanning probe methodologies, position sensitive atom probe and spectroscopic ellipsometry.
- Analyze nanoscale structure in metals, polymers and ceramics
- Analyze structure-property relationship in coarser scale structures
- Understand structures of carbon nano tubes

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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I **L T P C**

3 0 0 3

HUMANITIES ELECTIVE-II

(19A52701a) ORGANISATIONAL BEHAVIOUR

Course Objectives :

The objectives of this course are

- To make the student understand about the organizational behavior
- To enable them to develop self motivation, leadership and management
- To facilitate them to become powerful leaders
- Impart knowledge about group dynamics
- To make them understand the importance of change and development

Syllabus

UNIT-I

Organizational Behavior - Introduction to OB - Meaning and definition, scope - Organizing Process – Making organizing effective - Understanding Individual Behavior – Attitude - Perception - Learning - Personality Types

Learning Outcomes:

After completion of this unit student will

- Understand the concept of Organizational Behavior
- Contrast and compare Individual & Group Behavior and attitude
- Analyze Perceptions
- Evaluate personality types

UNIT-II

Motivation and Leading - Theories of Motivation - Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Leading - Leading Vs Managing

Learning Outcomes:

After completion of this unit student will

- Understand the concept of Motivation
- Understand the Theories of motivation
- Explain how employees are motivated according to Maslow's Needs Hierarchy
- Compare and contrast leading and managing

UNIT-III

Leadership and Organizational Culture and 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

- Know the concept of Leadership
- Contrast and compare Traits theory and Managerial Grid
- Know the difference between Transactional and Transformational Leadership
- Evaluate the qualities of good leaders
- Emerge as the good leader

UNIT – IV

Group Dynamics - Types of groups - Determinants of group behavior - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decision making - Team building - Conflict in the organization – Conflict resolution

Learning Outcomes:

After completion of this unit student will

- Know the concept of Group Dynamics
- Contrast and compare Group behavior and group development
- Analyze Group decision making
- Know how to resolve conflicts in the organization

UNIT - V

Organizational Change and Development - 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
- Know the importance of organizational change and development
- Apply change management in the organization
- Analyze work stress management
- Evaluate Managerial implications of organization

Course outcomes:

At the end of the course, students will be able to

- Understand the nature and concept of Organizational behavior
- Apply theories of motivation to analyze the performance problems

- Analyze the different theories of leadership
- Evaluate group dynamics
- Develop as powerful leader

TEXT BOOKS:

1. Luthans, Fred, "Organisational Behaviour" , McGraw-Hill, 12 Th edition 2011 2. P Subba Rao, Organisational Behaviour, Himalya Publishing House 2017

REFERENCES BOOKS:

1. McShane, "Organizational Behaviour", TMH 2009
2. Nelson, "Organisational Behaviour", Thomson, 2009.
3. Robbins, P.Stephen, Timothy A. Judge, "Organisational Behaviour", Pearson 2009.
4. Aswathappa, "Organisational Behaviour", Himalaya, 2009

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I **L T P C**

3 0 0 3

(19A52701b) MANAGEMENT SCIENCE

Course objectives :

The objectives of this course are

- 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

Syllabus

UNIT- I

NTRODUCTION 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 - **Organisational 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

- Understand the concept of management and organization
- Apply the concepts & principles of management in real life industry.
- Analyze the organization chart & structure for an enterprise.
- 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. **Material 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

- Understand the core concepts of Management Science and Operations Management
- Apply the knowledge of Quality Control, Work-study principles in real life industry.
- Evaluate Materials departments & Determine EOQ
- Analyze Marketing Mix Strategies for an enterprise.
- Create and design advertising and sales promotion

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

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
- Analyze the need of training
- Evaluate performance appraisal
- Design the basic structure of salaries and wages

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).

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) - 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

- Understand modern management techniques
- Apply Knowledge in Understanding in modern
- Analyze CRM, MRP, TQM
- Evaluate Six Sigma concept and SCM

Course Outcomes:

At the end of the course, students will be able to

- 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
- Analyze 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 analyze the business through SWOT.
- Create Modern technology in management science.

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”, 6th edition, 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”, 9th edition, PHI, 2005

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I **L T P C**

3 0 0 3

(19A52701c) BUSINESS ENVIRONMENT

Course Objectives :

The objectives of this course are

- 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
- Impart knowledge about the functioning and role of WTO
- Encourage the student in knowing the structure of stock markets

Syllabus

UNIT – I

An Overview of Business Environment – Types of Environment - Internal & External - Micro and Macro environment - Competitive structure of industries - Environmental analysis - Scope of business - Characteristics of business - Process & limitations of environmental analysis.

Learning Outcomes:

After completion of this unit student will

- Understand the concept of Business environment
- Explain various types of business environment
- Know about the environmental analysis of business
- Understand the business process

UNIT – II

FISCAL POLICY - Public Revenues - Public Expenditure - Public debt - Development activities financed by public expenditure - Evaluation of recent fiscal policy of Government of India - 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
- Explain 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 - 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 - Nature and Scope - 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 - 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.

Course Outcomes:

At the end of the course, students will be able to

- Understand various types of business environment.
- Understand the role of WTO
- Apply the knowledge of Money markets in future investment
- Analyze India's Trade Policy
- Evaluate fiscal and monitory policy
- Develop a personal synthesis and approach for identifying business opportunities

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

B.Tech (FT) – IV-I **L T P C**

3 0 0 3

(19A52701d) STRATEGIC MANAGEMENT

Course objectives :

The objectives of this course are

- To introduce the concepts of strategic management and understand its nature in
- competitive and organizational landscape
- To provide an understanding of internal and external analysis of a firm/individual
- To provide understanding of strategy formulation process and frame work
- Impart knowledge of Corporate culture
- Encourage the student in understanding SWOT analysis BCG Matrix

Syllabus

UNIT: I

Introduction of Strategic Management: meaning, nature, importance and relevance. The Strategic Management Process: – Corporate, Business and Functional Levels of strategy. Vision, mission and purpose –Business definition, objectives and goals – Stakeholders in business and their roles in strategic management. Balance scorecard.

Learning Outcomes:

After completion of this unit student will

- Understand the meaning and importance of strategic management
- Explain Strategic Management Process and Corporate, Business
- Know about the Business definition, objectives and goals
- Understand Stakeholders their roles in strategic management

UNIT: II

External and Internal Analysis: The Strategically relevant components of a Company's External Environment Analysis, Industry Analysis - Porter's Five Forces model – Industry diving forces – Key Success Factors. Analyzing a company's resources and competitive position

Learning Outcomes:

After completion of this unit student will

- Understand the components of a Company's environment
- Explain External Environment Analysis, Industry Analysis
- Know how to analyze industry competition through the Porter's Five Forces model

- Analyze Key Success Factors in a company's competitive position

UNIT: III

Competitive Strategies: Generic Competitive Strategies: Low cost, Differentiation, Focus. Grand Strategies: Stability, Growth (Diversification Strategies, Vertical Integration Strategies, Mergers, Acquisition & Takeover Strategies, Strategic Alliances & Collaborative Partnerships), Retrenchment, Outsourcing Strategies. Tailoring strategy to fit specific industry – Life Cycle Analysis - Emerging, Growing, Mature & Declining Industries.

Learning Outcomes:

After completion of this unit student will

- Understand the Competitive Strategies
- Explain Stability, Growth Mergers, Acquisition & Takeover Strategies
- Know about the Retrenchment, Outsourcing Strategies
- Differentiate Life Cycle Analysis, Mature & Declining Industries

UNIT: IV

Strategy Implementation and control - Strategy implementation; Organization Structure – Matching structure and strategy. Behavioral issues in implementation – Corporate culture – Mc Kinsey's 7s Framework. Functional issues – Functional plans and policies – Financial, Marketing, Operations, Personnel, IT.

Learning Outcomes:

After completion of this unit student will

- Understand the Organization Structure
- Explain Matching structure and strategy
- Know about the Corporate culture
- Analyze Functional plans and policies

Unit: V

Strategy Evaluation: Strategy Evaluation – Operations Control and Strategic Control- Relationship between a Company's Strategy and its Business Model.- SWOT analysis – Value Chain Analysis –Benchmarking- Portfolio Analysis: BCG Matrix – GE 9 Cell Model.

Learning Outcomes:

After completion of this unit student will

- Understand the Operations Control and Strategic Control
- Explain Company's Strategy and its Business Model
- Know about the SWOT analysis
- Analyze BCG Matrix and GE 9 Cell Model

Course Outcomes:

At the end of the course, students will be able to

- Understand the relevance and importance of strategic management
- Explain industry driving forces
- Analyze the competitive strategy

- Evaluate strategy implementation and control
- Create SWOT Analysis

Suggested Text Books and References

TEXT BOOKS:

1. Arthur A. Thompson Jr., AJ Strickland III, John E Gamble, "Crafting and Executing Strategy", 18th edition, Tata McGraw Hill, 2012.
2. Subba Rao P, "Business Policy and Strategic Management" –HPH

REFERENCES:

1. Robert A. Pitts & David Lei, "Strategic Management: Building and Sustaining Competitive Advantage" 4th edition, Cengage Learning.
2. Hunger, J. David, "Essentials of Strategic Management" 5th edition, Pearson.
3. Ashwathappa, "Business Environment for Strategic Management", HPH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I **L T P C**

3 0 0 3

(19A52701e) E-BUSINESS

Course Objectives:

- To provide knowledge on emerging concept on E-Business related aspect.
- To understand various electronic markets models which are trending in India
- To give detailed information about electronic payment systems net banking.
- To exact awareness on internet advertising, market research strategies and supply chain management.
- To understand about various internet protocols-security related concept.

SYLLABUS

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

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

Course Outcomes:

- They will be able to identify the priority of E-Commerce in the present globalised world.
- Will be able to understand E-market-Models which are practicing by the organization
- Will be able to recognize various E-payment systems & importance of net banking.
- By knowing E-advertisement, market research strategies, they can identify the importance of customer role.
- By understanding about E-security, they can ensure better access control to secure the information.

TEXT BOOKS:

1. C.S.V Murthy "E-Commerce", Himalaya publication house, 2002.
2. P.T.S Joseph, "E-Commerce" , 4th Edition, Prentice Hall of India 2011

REFERENCES:

1. KamaleshKBajaj,DebjaniNa, **"**E-Commerce", 2nd Edition TataMcGrwHills 2005
2. Dave Chaffey – "E-Commerce E-Management", 2nd Edition, Pearson, 2012.
3. Henry Chan, "E-Commerce Fundamentals and Application", Raymond Lee,Tharm Wiley India 2007
4. S. Jaiswall **"**E-Commerce", Galgotia Publication Pvt Ltd 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem

L	T	P	C
0	0	3	1.5

(19A27701P) MASS TRANSFER LAB

Course Objectives:

- To learn the separation factor for all mass transfer operations like distillation, absorption, solid-liquid and liquid-liquid extraction.

LABORATORY EXPERIMENTS

1. Determination of water activity of different foods.
2. Determination of depression of freezing point
3. Determination of Boiling point elevation and solute concentration
4. Studies on Humidification/ Dehumidification columns.
5. Psychrometric chart and psychrometers.
6. Studies on Bubble cap/ tray/ fractional column
7. Studies on extraction column.
8. Separation factors of the experiments with differential distillation.
9. Separation factors of the experiments with flash vaporization.
10. Separation factors of the experiments with vapour liquid equilibrium.
11. Separation factors of the experiments with liquid – liquid extraction.
12. Separation factors of the experiments with solid –liquid extraction.
13. Separation factors of the experiments with ion exchange.
14. Separation factors of the experiments with membrane separation.
15. Studies on Bubble cap/ tray/ fractional column.
16. Studies on Absorption columns.
17. Studies on crystallization and adsorption.

Course Outcomes:

- Students will understand the separation techniques, significance of water activity, working principle of various mass transfer equipment.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem

L	T	P	C
0	0	3	1.5

(19A27702P) FOOD PACKAGING LAB

Course Objectives:

- To study the various properties for packaging materials and measurements for their quality tests.

LABORATORY EXPERIMENTS

1. Classification of various packages based on material and rigidity
2. Measurement of thickness of paper, paper boards
3. Measurement of basic weight and grammage of paper and paperboards
4. Measurement of water absorption of paper, paper boards
5. Measurement of bursting strength of paper, paper boards
6. Measurement of tear resistance of papers
7. Measurement of puncture resistance of paper and paperboard
8. Measurement of tensile strength of paper, paper boards
9. Measurement of grease resistance of papers
10. Determination of gas and water transmission rate of package films
11. Determination of laquer integrity test; Drop test, Box compression test
12. Identification of plastic films; Determination of seal integrity, ink adhesion
13. Packaging practices followed for packing fruits and vegetables
14. Shelf life calculations for food products; Head space analysis of packaged food
15. Study of vacuum packaging machine, bottle filling machine and form-fill-seal machine.

Course Outcomes:

Students will be able to understand

- Measurements of various properties for different packaging materials
- Determination of quality tests for different packaging materials
- Packaging practices followed for packing fruits and vegetables
- Shelf life calculations for food products

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-II Sem

L	T	P	C
3	0	0	3

(19A27801a) CONFECTIONERY TECHNOLOGY
PROFESSIONAL ELECTIVE IV

PREAMBLE

This course was designed to know the status of confectionery industry. Study of various raw materials, processing of confectionery products, quality standards.

Course Objectives:

- To train the students in Confectionery and to impart knowledge about different raw materials used and their role.
- To impart knowledge on different equipment, processing of different Products and their packaging & Quality maintenance.

UNIT – I

Introduction: Raw Materials for Confectionery Manufacture, Comprehensive understanding of raw materials used in the confectionery manufacturing and processing industry, including quality control methods. cocoa, Sugar, Dried milk products, Special fats, Emulsifiers, Nut kernels, Alcoholic ingredients, The production of cocoa liquor from the cocoa bean, Dark, milk and white chocolate, manufacturing processes.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Comprehensive understanding of raw materials used in the confectionery processing, including quality control methods
- Role of various raw materials like cocoa, Sugar, Dried milk products, Special fats
- Production of cocoa liquor from the cocoa bean, Dark, milk and white chocolate, manufacturing processes

UNIT – II

Chocolate: Production of chocolate mass. Chocolate Processing Technology, Tempering and fat crystallization effects on chocolate quality, fat bloom formation and development in chocolate process. Enrobing technology, Compound Coatings, Chocolate hollow figures, Chocolate shells, Manufacture of candy bars, Presentation and application of vegetable fats.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Production of chocolate mass

- Various steps in Chocolate Processing Technology and its effects on chocolate quality
- Enrobing technology, Compound Coatings and etc.
- Presentation and application of vegetable fats

UNIT – III

Sugar Confectionery: General technical aspects of industrial sugar confectionery manufacture, Manufacture of high boiled sweets– Ingredients, Methods of manufacture–Types–Center–filled, lollipops, coextruded products. Manufacture of gums and jellies–Quality aspects.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- General technical aspects of industrial sugar confectionery manufacture
- Manufacture of high boiled sweets and Ingredients used
- Various Methods of manufacture and Types, ex: Center–filled, lollipops and etc.
- Manufacture of gums and jellies and its Quality aspects

UNIT – IV

Miscellaneous Products: Caramel, Toffee and fudge– Liquorices paste and aerated confectionery, Lozenges, sugar panning and Chewing gum, Count lines Quality aspects, fruit confections.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Caramel, Toffee and fudge– Liquorices paste and aerated confectionery
- Lozenges, sugar panning and Chewing gum, fruit confections
- Quality aspects of above mentioned products

UNIT – V

Flour confectionery: Ingredients and flour specification-Types of dough– Developed dough, short dough, semi-sweet, enzyme modified dough and batters- importance of the consistency of the dough. Indian flour confections manufacture–Flour specification–ingredients–manufacturing process–types of chemically aerated goods.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Role of Ingredients and flour specification
- Different Types of dough and importance of the consistency of the dough
- Indian flour confections manufacture and process involved
- Types of chemically aerated goods

Course Outcomes:

By the end of the course, the students will have

- Knowledge in the all areas of Confectionery and their processing methods, equipment used and operating procedure and etc.

TEXT BOOKS

1. Emmanuel Ohene Afoakwa, "Chocolate Science and Technology". 1st Edition. John Wiley & Sons. 2011,
2. Steve T. Beckett, "Industrial Chocolate manufacture and use". 4th Edition, John Wiley & Sons. 2011,

REFERENCES

1. Junk WR & Pancost HM. "Hand Book of Sugars for Processors". Chemists and Technologists. AVI Publications. 1973,
2. Manley DJR. "Technology of Biscuits", Crackers, and Cookies. Ellis Horwood 1983,.
3. Matz SA. "Bakery Technology and Engineering". 3rd Edition, Chapman & Hall. 1992,
4. Pomeranz Y. "Modern Cereal Science and Technology". MVCH Publications1987,.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-II Sem

L	T	P	C
3	0	0	3

(19A27801b) NON THERMAL TECHNOLOGIES IN FOOD PROCESSING PROFESSIONAL ELECTIVE IV

PREAMBLE

This subject encompasses all technologies related to non thermal processes and their advantages and disadvantages

Course Objectives

- To study the non thermal technologies like food irradiation, packaging techniques, minimal processing and membrane technology
- To get knowledge on recent advances in non thermal processing

UNIT – I

Food Irradiation: Introduction, type and sources of radiation, dosimetry, mode of action of ionizing radiation – direct and indirect effect, radiation effect on food constituents, dose requirement for different products and regulations.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Introduction, type and sources of radiation, dosimetry
- Mode of action of ionizing radiation
- Direct and indirect effects of radiation
- Radiation effect on food constituents, dose requirement for different products and regulations

UNIT – II

Emerging Storage and Packaging Methods: Controlled atmosphere storage- modified atmosphere storage- Diffusion channel controlled atmosphere packaging, modified atmosphere packaging, vacuum packaging - need of modifying atmospheric gas composition – types of scrubbers

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Storage methods like Controlled atmosphere & modified atmosphere storage

- Packaging methods like Diffusion channel controlled atmosphere packaging, modified atmosphere packaging, vacuum packaging
- Need of modifying atmospheric gas composition and knowledge on types of scrubbers

UNIT – III

Minimal processing – hurdle technology – various parameters which inhibits the growth of microorganism. Ozone – its role in food industry – generation – application. Intermediate moisture foods – formulation – preparation

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Hurdle technology along with various parameters which inhibits the growth of microorganism
- Ozone and its role in food industry, ozone generation & application
- Formulation & preparation of Intermediate moisture foods

UNIT – IV

Membrane technology – terminologies-types of membrane- types of membrane modules-osmosis- reverse osmosis- ultra filtration- changes during concentration.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Terminologies used for Membrane technology and types of membrane
- Types of membrane modules like osmosis, reverse osmosis & ultra filtration
- Changes during concentration of foods through membrane technology

UNIT – V

Recent Advancement in Food Preservation: Pulsed electrified sterilization - application. High pressure technology – application, Oscillating magnetic field sterilization, Ultra sound, Ohmic heating – application in food industry.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Pulsed electrified sterilization and its applications
- High pressure technology and its applications
- Oscillating magnetic field sterilization and its applications
- Ultra sound, Ohmic heating and their applications in food industry

Course Outcomes:

By end of the course students will acquire knowledge on

- Principle involved, equipment used and suitability.
- Advantages over thermal processing.

TEXT BOOKS

1. Girdarlal and Siddappa. “Fruit and Vegetable Preservation”, ICMR 1986.
2. Manoranjan Kalia and Sangita. “Food Preservation and Processing”. Kalyani Publishers. Ludhiana. 1996,

REFERENCES

1. Fellows, P.J, “Food Processing Technology”. 2001.
2. Leninger, H.A. and Beverlod, W.A. D. “Food Process Engineering”, Reicle Publications.
3. Srivastha R.P. and Sanjeev kumar, “Fruit and Vegetable Preservation” 1998.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-II Sem **L T P C**

3 0 0 3

(19A27801c) FOOD SAFETY AND STANDARD ACT & REGULATIONS IN INDIA PROFESSIONAL ELECTIVE IV

PREAMBLE

This text covers in detail about Food Safety and standard act and regulations in India.

Course Objectives:

- To study the Salient features of food safety and standards Act.
- To get knowledge on Food safety standards of licensing and registration of food Business regulations.
- To know about Food safety standards of packaging and labeling regulations.
- To learn about Food safety standards of food product standards and food additives regulations.
- To understand Food safety standards of prohibition and restriction sales regulations.

UNIT – I

Food Safety and Standards Act: Salient features of food safety and standards Act, 2006, administration at central and state level, functions, duties and responsibilities of food safety regulators, implementation of food regulation –FSS act, 2006 including licensing and registration, inspection and reports, improvement notices and prohibition Orders.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Salient features of food safety and standards Act, 2006
- Administration at central and state level, functions, duties and responsibilities of food safety regulators
- Implementation of food regulation - FSS act, 2006 including licensing and registration and prohibition Orders

UNIT – II

Food safety standards of licensing and registration of food Business regulations, 2011: short title, commencement, definitions, licensing and registration of food business, schedule I, II, III, IV. general requirements of hygienic and sanitary practices to be followed by all food business operators applying license, specific hygienic and sanitary practices to be followed by food business operator engaged in manufacturing, processing, storage and selling of milk and milk products, meat and meat products, specific hygienic and sanitary practices to be followed by food business operators engaged in catering/ food service management.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Licensing and registration of food Business regulations, 2011: short title, commencement, definitions, schedule I, II, III, IV
- Know general requirements of hygienic and sanitary practices, specific hygienic and sanitary practices are mandatory for license to various food business sectors and catering

UNIT – III

Food safety standards of packaging and labeling regulations, 2011-Short title and commencement, definition, registration. packaging - general requirements, product specific requirements. labeling - manner of declaration, specific requirements and restriction on manner of labeling, restriction on advertisement, exemption from labeling requirement, notice of addition, admixture or deficiency in food.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Packaging and labeling regulations, 2011-Short title and commencement, definition, registration
- Packaging - general requirements, product specific requirements
- Labeling - manner of declaration, specific requirements and restriction on manner of labeling
- Labeling - restriction on advertisement, exemption from labeling requirement, notice of addition, admixture or deficiency in food

UNIT – IV

Food safety standards of food product standards and food additives regulations 2011-Short title, commencement, definition and regulation of dairy products and analogues, fats, oils and fat emulsions ,fruits and vegetable products, nuts and raisins, cereal and cereal products, bakery products, meat and meat products, fish and fish products, sweet and confectionery, sweetening agents, salt , spices , condiments and related products, common salt, beverages- alcoholic and non alcoholic, irradiation of foods, food additives and other food products.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Know the necessity of food product standards and food additives regulations 2011-Short title, commencement, definition and regulation for various products like dairy products, fruits and vegetables, meat products, cereals, spices and etc.

UNIT – V

Food safety standards of prohibition and restriction sales regulations 2011- title, commencement, definitions, prohibition and restriction of sales – sale of certain admixtures prohibited, restriction on the use of certain ingredients, prohibition and restriction on sale of certain products.
Food safety and standards of contaminants, toxins and residues regulation 2011-short title, commencement and definition of metal contaminants, crop contaminates and naturally occurring toxic substances, residues, antibiotic another pharmacologically active substances.
Food safety standards of laboratory and sample analysis, 2011- short title, commencement and definition of notified laboratories to import, referral laboratories, procedure for sampling.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Know complete details of Food safety standards of prohibition and restriction sales regulations 2011
- Know complete details of Food safety and standards of contaminants, toxins and residues regulation 2011
- Know complete details of Food safety standards of laboratory and sample analysis, 2011

Course Outcomes

By end of the course students are exposed to know about

- To study the Salient features of food safety and standards Act,

TEXT BOOKS

1. Gazette of Food Safety and Standards Act, (2006) Food Safety regulations and food safety management. Food Safety and Standards Authority of India. New Delhi.

REFERENCES

1. The training manual for Food Safety Regulators. (2011) Vol.III, Food Safety regulations and food safety management. Food Safety and Standards Authority of India. New Delhi.
2. To get knowledge on licensing and registration of food Business regulations & packaging and labeling regulations
3. To learn about Food product standards and food additives regulations & prohibition and restriction sales regulations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-II Sem **L T P C**

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(19A27801d) FOOD SUPPLY CHAIN MANAGEMENT
PROFESSIONAL ELECTIVE IV

PREAMBLE

This subject totally deals with supply chain management, food supply chains, Inbound and outbound logistics.

Course Objectives:

- To study about introduction to food supply chain.
- To get knowledge on management inventories and coordination.
- To understand Strategic Alliances and outbound logistics.

UNIT – I

Introduction and overview of supply chain management, food supply chains, Inbound and outbound logistics, Supply chain as a source of competitive advantage.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Introduction and overview of supply chain management
- Food supply chains, Inbound and outbound logistics
- Supply chain as a source of competitive advantage

UNIT – II

Managing Inventories and Coordination: Inventory Management, EOQ and its derivative models, Managing Uncertainty, Method for Coping with Bullwhip Effect, Supply Chain Integration, Push vs. Pull Systems.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Inventory Management, EOQ and its derivative models, Managing Uncertainty
- Method for Coping with Bullwhip Effect, Supply Chain Integration, Push vs. Pull Systems

UNIT – III

Strategic Alliances: 3rd/4th Party Logistics (3PL/4PL), Retailer-Supplier Partnerships, Buyer Vendor Coordination.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Study of Strategic Alliance like 3rd/4th Party Logistics (3PL/4PL), Retailer-Supplier Partnerships, Buyer Vendor Coordination

UNIT – IV

Outbound logistics: Designing Supply Chain Network, management of transportation, inter model transportation and third party transportation services, characteristics of different transportation services
Distribution strategies, Procurement & Outsourcing Strategies: Buy-Make Decision, Procurement Strategy, Framework of e-Procurement.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Designing Supply Chain Network, management of transportation,
- Inter model transportation and third party transportation services, characteristics of different transportation services
- Buy-Make Decision, Procurement Strategy, Framework of e-Procurement

UNIT – V

Strategic considerations for supply chain, Porter's industry analysis and value-chain models.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Understand the Strategic considerations for supply chain, Porter's industry analysis and value-chain models.

Course Outcomes

By end of the course, students will understand the following

- About introduction to food supply chain.
- Management inventories and coordination.
- Strategic Alliances and outbound logistics.
- Strategic considerations for supply chain

TEXT BOOKS

1. Strategy. Chopra, S, and P. Meindl, "Supply Chain Management –Planning and Operation", Pearson Education.

2. Cases and Concepts. Raghuram, G. and N. Rangaraj, “Logistics and Supply Chain Management”: Macmillan, New Delhi.

REFERENCES

1. Simchi-Levi, D., P. Kaminski and E. Simchi “Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies”; -Levi, Irwin, McGraw-Hill.
2. Shapiro, J., “Modelling the Supply Chain”; Duxbury Thomson Learning.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-II Sem

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(19A27801e) FOOD PLANT SANITATION AND HYGIENE
PROFESSIONAL ELECTIVE IV

PREAMBLE

This subject deals with importance of food plant sanitation hygiene, principles of sanitation and hygiene.

Course Objectives

- To explore the knowledge on types of sanitizers and methods to eradicate the pests and good hygienic practices by individual and organization.

UNIT – I

Sanitation and food industry Sanitation, importance of sanitation in food plants, sanitation laws and guidelines, establishment of sanitary practices. Food contamination sources, Sources of contamination, contamination of foods, protection against contamination.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Importance of sanitation in food plants, sanitation laws and guidelines.
- Establishment of sanitary practices.
- Food contamination sources, Sources of contamination, contamination of foods, protection against contamination

UNIT – II

Cleaning compounds and sanitizers Classification, selection of cleaning compounds, handling and storage, precautions, sanitizing methods – thermal, steam, hot water, radiation, HHP, Vaccum/Steam/Vaccum, chemical sanitizers – chlorine, iodine, bromine, quaternary ammonium compound, acid sanitizers, detergent formulations, iodophores.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Classification of Cleaning compounds and sanitizers.
- Selection of cleaning compounds, handling and storage, precautions.
- Methods of sanitation

UNIT – III

Pest and Rodent Control Insect infestation, cockroaches, rodents, birds, use of pesticides, integrated pest management. Sanitary design and construction for food processing plant. Site selection, site preparation, building construction considerations, pest control design, construction materials.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Pest and Rodent Control, Insect infestation, use of pesticides, integrated pest management.
- Sanitary design and construction for food processing plant.
- Site selection, site preparation, building construction considerations,

UNIT – IV

Water quality and treatment Characteristics of drinking water – physical (temperature, colour, turbidity, taste and odour), chemical (pH, hardness, alkalinity), microbiological (total plate count, E.Coli, Streptococcus faecalis), waste disposal – industrial waste, influent, effluent, biological oxygen demand, chemical oxygen demand, tolerance limits for industrial effluent discharged into surface water, water treatment – primary (screening, sedimentation, floatation), secondary (trickling filters, activated sludge method, lagoons), tertiary (chemical coagulation and flocculation process), utilization of waste from food processing industry.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Water quality and treatment
- Characteristics of drinking water – physical, chemical, microbiological.
- Waste disposal – industrial waste, influent, effluent,
- Waste water treatment – primary, secondary, tertiary.
- Utilization of waste from food processing industry.

UNIT – V

Personal hygiene and sanitary food handling Personal hygiene, employee hygiene, sanitary food handling, role of employee supervision, employee responsibility. Role of HACCP in sanitation HACCP, HACCP development, interface with GMP and SSOPs, HACCP principles, organization, implementation and maintenance.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Personal hygiene and sanitary food handling.
- Role of HACCP in sanitation HACCP, HACCP principles.

Course Outcomes

- Students are exposed to different sanitizers for cleaning the equipment and methods of hygienic practices.

TEXT BOOKS

1. S. Roday, "Food Hygiene and Sanitation". Tata McGraw Hill, 1st Edition, 1998.
2. N. G. Marriott, "Principles of Food Sanitation. Springer", 5th Edition, 2006.
3. Jim Mclauchlin and Christine Little (Eds), "Hobbs Food Poisoning and Food Hygiene". 7th Edition, 2007.

REFERENCES

1. Bernard L Bruinsma, "Food Plant Sanitation", Marcell Dekker Inc J Richard Gorham
2. John Troller, "Sanitation in Food Processing", 2nd Edition. Academic Press, 1993.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-II

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(19A01802a) DISASTER MANGEMENT

OPEN ELECTIVE-IV

Course Objectives:

The objective of this course is to:

- Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities.
- Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phases of each are parallel and how they differ.
- Understand the 'relief system' and the 'disaster victim.'
- Describe the three planning strategies useful in mitigation.
- Identify the regulatory controls used in hazard management.
- Describe public awareness and economic incentive possibilities.
- Understand the tools of post-disaster management.

SYLLABUS

UNIT-I:

Natural Hazards And Disaster Management: Introduction of DM – Inter disciplinary -nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: floods, draughts – Earthquakes – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast – landslides.

Learning Outcomes:

After completing this Unit, students will be able to

- To know about the natural hazards and its management
- To understand about the global warming, cyclones and tsunamis

UNIT-II:

Man Made Disaster And Their Management Along With Case Study Methods Of The Following: Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrotirism -threat in mega cities, rail and air craft's accidents, and Emerging infectious diseases & Aids and their management.

Learning Outcomes:

After completing this Unit, students will be able to

- To know about the fire hazards and solid waste management

- To understand about the emerging infectious diseases and aids their management.

UNIT-III:

Risk and Vulnerability: Building codes and land use planning – social vulnerability – environmental vulnerability – Macroeconomic management and sustainable development, climate change risk rendition – financial management of disaster – related losses.

Learning Outcomes:

After completing this Unit, students will be able to

- To know about the regulations of building codes and land use planning related to risk and vulnerability.
- To understand about the financial management of disaster and related losses

UNIT-IV:

Role Of Technology In Disaster Managements: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations- roads and bridges- mitigation programme for earth quakes –flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training- transformable indigenous knowledge in disaster reduction.

Learning Outcomes:

After completing this Unit, students will be able to

- To know about the technological aspects of disaster management
- To understand about the factors for disaster reduction

UNIT-V:

Education and Community Preparedness: Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building community capacity for action.

Learning Outcomes:

After completing this Unit, students will be able to

- To impart the education related to risk reduction in schools and communities

Course Outcomes:

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

- Affirm the usefulness of integrating management principles in disaster mitigation work

- Distinguish between the different approaches needed to manage pre- during and post-disaster periods
- Explain the process of risk management
- Relate to risk transfer

TEXT BOOKS

1. Rajib shah & R R Krishnamurthy "Disaster Management" – Global Challenges and Local Solutions' Universities press. (2009),
2. Tushar Bhattacharya, "Disaster Science & Management" Tata McGraw Hill Education Pvt. Ltd., New Delhi.
3. Jagbir Singh "Disaster Management" – Future Challenges and Opportunities' I K International Publishing House Pvt. Ltd. (2007),

REFERENCE BOOKS

1. Harsh. K . Gupta "Disaster Management edited", Universities press, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-II

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(19A01802b) GLOBAL WARMING AND CLIMATE CHANGES

OPEN ELECTIVE-IV

Course Objectives:

The objective of this course is to:

- To know the basics, importance of global warming.
- To know the concepts of mitigation measures against global warming
- To know the impacts of climate changes

UNIT I

EARTH'S CLIMATE SYSTEM:

Introduction to environment, Ozone, ozone layer and its functions, Ozone depletion and ozone hole, Vienna convention and Montreal protocol, Green house gases and green house effect, Hydrological cycle and Carbon cycle, Global warming and its impacts

Learning Outcomes:

After completing this Unit, students will be able to

- To identity the importance of Ozone and effect of green house gases
- To know the effect of global warming

UNIT II

ATMOSPHERE & ITS COMPONENTS: Atmosphere and its layers-Characteristics of Atmosphere - Structure of Atmosphere - Composition of Atmosphere - Atmospheric stability - Temperature profile of the atmosphere - Temperature inversion and effects of inversion on pollution dispersion.

Learning Outcomes:

After completing this Unit, students will be able to

- To know about the layers of atmosphere and their characteristics

UNIT III

IMPACTS OF CLIMATE CHANGE : Causes of Climate change - Change of Temperature in the environment - Melting of ice and sea level rise - Impacts of Climate Change on various sectors - Projected impacts for different regions, uncertainties in the projected impacts and risk of irreversible changes.

Learning Outcomes:

After completing this Unit, students will be able to

- To know about the causes of climate change and its effects on various sectors.

UNIT IV

OBSERVED CHANGES AND ITS CAUSES: Climate change and Carbon credits-Clean Development Mechanism (CDM), CDM in India - Kyoto Protocol - Intergovernmental Panel on Climate Change (IPCC) - Climate Sensitivity - Montreal Protocol - United Nations Framework Convention on Climate Change (UNFCCC) - Global change in temperature and climate and changes within India

Learning Outcomes:

After completing this Unit, students will be able to

- To know about the causes of climate change and carbon credits, effect of change in temperature and climate on india.

UNIT V

CLIMATE CHANGE AND MITIGATION MEASURES: CDM and Carbon Trading - Clean Technology, biodiesel, compost, biodegradable plastics - Renewable energy usage as an alternative - Mitigation Technologies and Practices within India and around the world - Non-renewable energy supply to all sectors - Carbon sequestration - International and regional cooperation for waste disposalbiomedical wastes, hazardous wastes, e-wastes, industrial wastes, etc.,

Learning Outcomes:

After completing this Unit, students will be able to

- To know about the clean technology, use of renewable energy, mitigation technologies and their practices.

Course Outcomes

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

- An ability to apply knowledge of mathematics, science, and engineering
- Design a system, component or process to meet desired needs with in realistic constraints such as economic ,environmental ,social ,political ,ethical ,health and safety , manufacturability and sustainability
- An ability to identify, formulate, and solve engineering problems

REFERENCE BOOKS

1. Dash Sushil Kumar, “Climate Change – An Indian Perspective”, Cambridge University Press India Private limited 2007.
2. Adaptation and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press ,Cambridge,2006.

3. Atmospheric Science, J.M. Wallace and P.V. Hobbs, Elsevier / Academic Press 2006.
4. Jan C. van Dam, Impacts of "Climate Change and Climate Variability on ydrological Regimes", Cambridge university press ,2003.
5. David Archer, Global Warming: Understanding the Forecast, 2 nd ed. (Wiley, 2011
6. John Houghton, Global Warming: The Complete Briefing, 5th Edition, 2015, Cambridge Univ. Press. Useful

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-II Sem

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(19A02802a) IoT APPLICATIONS IN ELECTRICAL ENGINEERING

(OE-IV)

Course Objectives:

- To learn about a few applications of Internet of Things
- To distinguish between motion less and motion detectors as IoT applications
- To know about Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process
- To understand about applications of IoT in smart grid
- To introduce the new concept of Internet of Energy for various applications

UNIT-I:

Sensors

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

Learning Outcomes:

After completing this Unit, students will be able to

- To know about basic principles of sensors and their classification
- To learn about various motion less sensors
- To understand about Piezoelectric sensor applications to detect temperature, pressure etc.
- To understand about Capacitive sensors to detect temperature, force and pressure etc.
- To know about concepts of tactile sensors, for a few applications

UNIT-II:

Occupancy and Motion detectors

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

Learning Outcomes:

After completing this Unit, students will be able to

- To know about Capacitive occupancy
- To understand about Motion detectors

- To distinguish between Potentiometric, inductive and capacitive sensors for a few applications
- To learn about a few velocity and acceleration sensors
- To know about various flow sensors

UNIT-III:

MEMS

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

Learning Outcomes:

After completing this Unit, students will be able to

- To understand about the basic concept of MEMS
- To know about electrostatic actuation
- To learn about process design of MEMS based sensors
- To learn about process design of MEMS based actuators
- To distinguish between RF switches with respect to electric and magnetic sensors

UNIT-IV:

IoT for Smart grid

Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home

Learning Outcomes:

After completing this Unit, students will be able to

- To get exposure fundamental applications of IoT to Smart grid
- To learn about driving factors of IoT in Generation level
- To learn about driving factors of IoT in Transmission level
- To learn about driving factors of IoT in Distribution level
- To distinguish between metering level and monitoring applications
- To get introduced to the concept of Smart home

UNIT-V:

IoE: 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

Learning Outcomes:

After completing this Unit, students will be able to

- To get exposed the new concept of internet of energy
- To learn about architecture of IoE
- To know about energy routines
- To learn about information sensing and processing issues
- To understand the use of energy internet as smart grid

Course Outcomes:

- To get exposed to recent trends in few applications of IoT in Electrical Engineering
- To understand about usage of various types of motionless sensors
- To understand about usage of various types of motion detectors
- To get exposed to various applications of IoT in smart grid
- To get exposed to future working environment with Energy internet

TEXT BOOKS:

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. Ersan Kabalci and Yasin Kabalci, "From Smart grid to Internet of Energy", 1st Edition, Academic Press, 2019

REFERENCE BOOKS:

1. Raj Kumar Buyya and Amir Vahid Dastjerdi, "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 Sundaram Shriram, K. Vasudevan and Abhishek S. Nagarajan, "Internet of Things", Wiley, 2019

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B.Tech (FT)– IV-II Sem

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(19A02802b) SMART ELECTRIC GRID

(OE-IV)

Course Objectives:

- To learn about recent trends in grids as smart grid
- To understand about smart grid architecture and technologies
- To know about smart substations
- To learn about smart transmission systems
- To learn about smart distribution systems

UNIT-I:

Introduction to Smart Grid

Working definitions of Smart Grid and Associated Concepts – Smart Grid Functions – Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid

Smart Grid Architecture: Components and Architecture of Smart Grid Design – Review of the proposed architectures for Smart Grid. The fundamental components of Smart Grid designs – Transmission Automation – Distribution Automation – Renewable Integration

Learning Outcomes:

After completing this Unit, students will be able to

- To understand basic definitions and architecture of Smart grid
- To learn about new technologies for smart grid
- To know about fundamental components of smart grid
- To understand key challenges of smart grid
- To understand the need for integration of Renewable energy sources

UNIT-II:

Smart grid Technologies

Characteristics of Smart grid, Micro grids, Definitions, Drives, benefits, types of Micro grid, building blocks, Renewable energy resources, needs in smart grid, integration impact, integration standards, Load frequency control, reactive power control, case studies and test beds

Learning Outcomes:

After completing this Unit, students will be able to

- To know about basic characteristic features of smart grid technologies
- To understand about definition, types, building blocks of Microgrids

- To know about integration requirements, standards of renewable energy sources in Microgrids
- To understand Load frequency and reactive power control of Microgrid
- To understand about Microgrid through a case study

UNIT-III:

Smart Substations

Protection, Monitoring and control devices, sensors, SCADA, Master stations, Remote terminal unit, interoperability and IEC 61850, Process level, Bay level, Station level, Benefits, role of substations in smart grid, Volt/VAR control equipment inside substation

Learning Outcomes:

After completing this Unit, students will be able to

- To know about protection, monitor and control devices in Smart substations
- To know about the importance of SCADA in substations
- To understand about interoperability and IEC 61850
- To know about role of substations in Smart grid
- To understand about Volt/VAR control equipment inside substation

UNIT-IV:

Smart Transmission

Energy Management systems, History, current technology, EMS for the smart grid, Wide Area Monitoring Systems (WAMS), protection & Control (WAMPC), needs in smart grid, Role of WAMPC smart grid, Drivers and benefits, Role of transmission systems in smart grid, Synchro Phasor Measurement Units (PMUs)

Learning Outcomes:

After completing this Unit, students will be able to

- To know about Energy Management Systems in smart transmission systems
- To understand about WAMPC
- To know about role of transmission systems in Smart grid
- To know about Synchro Phasor Measurement units

UNIT-V:

Smart Distribution Systems

DMS, DSCADA, trends in DSCADA and control, current and advanced DMSs, Voltage fluctuations, effect of voltage on customer load, Drivers, objectives and benefits, voltage-VAR control, VAR control equipment on distribution feeders, implementation and optimization, FDIR - Fault Detection Isolation and Service restoration (FDIR),faults, objectives and benefits, equipment, implementation

Learning Outcomes:

After completing this Unit, students will be able to

- To know about DSCADA in Smart Distribution Systems
- To distinguish between current and advanced DMSs
- To know about occurrence of voltage fluctuations
- To understand about VAR control and equipment on distribution feeders
- To know about FDIR objectives and benefits

Course Outcomes:

- To be able to understand trends in Smart grids
- To understand the needs and roles of Smart substations
- To understand the needs and roles of Smart Transmission systems
- To understand the needs and roles of Smart Distribution systems
- To distinguish between SCADA and DSCADA systems in practical working environment

Text Books:

1. Stuart Borlase, "Smart Grids - Infrastructure, Technology and Solutions", 1st edition,CRC Press, 2013
2. Gil Masters, "Renewable and Efficient Electric Power System", 2nd edition, Wiley–IEEE Press, 2013.

Reference Books:

1. A.G. Phadke and J.S. Thorp, "Synchronized Phasor Measurements and their Applications", Springer Edition, 2e, 2017.
2. T. Ackermann, "Wind Power in Power Systems", Hoboken, NJ, USA, John Wiley, 2e, 2012.

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B.Tech (FT) – IV-II Sem

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(19A03802a) ENERGY CONSERVATION AND MANAGEMENT
OPEN ELECTIVE-IV

Course Objective:

- Familiarize present energy scenario, and energy auditing methods.
- Explain components of electrical systems, lighting systems and improvements in performance.
- Demonstrate different thermal systems, efficiency analysis, and energy conservation methods.
- Train on energy conservation in major utilities.
- Instruct principles of energy management and energy pricing.

UNIT I

Introduction: Energy – Power – Past & Present Scenario Of World; National Energy Consumption Data – Environmental Aspects Associated With Energy Utilization –Energy Auditing: Need, Types, Methodology And Barriers. Role Of Energy Managers. Instruments For Energy Auditing.

Learning Outcomes

At the end of this unit, the student will be able to

- Infer energy consumption patterns and environmental aspects of energy utilization. (l2)
- Outline energy auditing requirements, tools and methods. (l2)
- Identify the function of energy manager. (l3)

UNIT II

Electrical Systems: Components Of EB Billing – HT And LT Supply, Transformers, Cable Sizing, Concept Of Capacitors, Power Factor Improvement, Harmonics, Electric Motors – Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types Of Lighting, Efficacy, LED Lighting And Scope Of Economy In Illumination.

Learning Outcomes

At the end of this unit, the student will be able to

- Outline components of electricity billing, transmission and distribution. (l2)
- Analyze performance characteristics of transformers, capacitors, and electric motors. (l4)
- Examine power factor improvements, and electric motor efficiency. (l4)
- Evaluate lighting systems. (L4)

UNIT III

Thermal Systems: Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency Computation and Encon Measures. Steam: Distribution & Usage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories.

Learning Outcomes

At the end of this unit, the student will be able to

- Determine efficiency of boilers, furnaces and other thermal systems. (l5)
- Recommend energy conservation measures in thermal systems. (l5)
- Justify steam systems in energy conservation. (l4)

UNIT IV

Energy Conservation In Major Utilities: Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration And Air Conditioning Systems – Cooling Towers – D.G. Sets.

Learning Outcomes

At the end of this unit, the student will be able to

- Explain energy conservation measures in major utilities. (l2)
- Apply performance test criteria for fans, pumps, compressors, hvac systems. (l3)
- Assess energy conservation in cooling towers and d.g. sets. (l5)

UNIT V

Energy Management: Principles of Energy Management, Energy demand estimation, Organising and Managing Energy Management Programs, Energy pricing.

Learning Outcomes

At the end of this unit, the student will be able to

- Describe principles of energy management. (l2)
- Assess energy demand and forecast. (l5)
- Organize energy management programs. (l6)
- Design elements of energy pricing. (l6)

Course Outcomes:

At the end of this course, the student will be able to:

- Explain energy utilization and energy auditing methods.(l2)
- Analyze electrical systems performance of electric motors and lighting systems.(l4)
- Examine energy conservation methods in thermal systems.(l4)
- Estimate efficiency of major utilities such as fans, pumps, compressed air systems, hvac and d.g. Sets. (l4)
- Elaborate principles of energy management, programs, energy demand and energy pricing. (l6)

TEXT BOOKS:

1. Energy Manager Training Manual (4 Volumes) Available At www.energymanagertraining.com, A Website Administered By Bureau Of Energy Efficiency (BEE), A Statutory Body Under Ministry Of Power, Government Of India, 2004.

REFERENCES:

1. Witte. L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation" Hemisphere Publ, Washington, 1988.
2. Callaghn, P.W. "Design And Management For Energy Conservation", Pergamon Press, Oxford, 1981.
3. Dryden. I.G.C., "The Efficient Use Of Energy" Butterworths, London, 1982
4. Murphy. W.R. And G. Mc KAY, "Energy Management", Butterworths, London 1987.
5. Turner, W. C., Doty, S. and Truner, W. C., "Energy Management Hand book", 7th edition, Fairmont Press, 2009.
6. De, B. K., "Energy Management audit & Conservation", 2nd Edition, Vrinda Publication, 2010.
7. Smith, C. B., "Energy Management Principles", Pergamon Press, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-II Sem

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(19A03802b) NON-DESTRUCTIVE TESTING

OPEN ELECTIVE-IV

Course Objectives

- Introduce basic concepts of non destructive testing.
- Familiarize with characteristics of ultrasonic test, transducers, rejection and effectiveness.
- Describe concept of liquid Penetrant, eddy current and magnetic particle tests, its applications and limitations.
- Explain the principles of infrared and thermal testing, applications and honey comb and sandwich structures case studies.
- Impart NDE and its applications in pressure vessels, casting and welded constructions.

UNIT I

Introduction to non-destructive testing: Radiographic test**,** Sources of X and Gamma Rays and their interaction with Matter, Radiographic equipment, Radiographic Techniques, Safety Aspects of Industrial Radiography.

Learning outcomes:

At the end of this unit, the student will be able to

- Explain non destructive testing techniques (L2)
- Summarize the basic concepts of Radiographic test (L2)
- Outline the concepts of sources of X and Gamma Rays (L2)
- Explain the radiographic techniques (L2)
- Discuss the safety aspects of industrial radiography. (L4)

UNIT II

Ultrasonic test: Principle of Wave Propagation, Reflection, Refraction, Diffraction, Mode Conversion and Attenuation, Sound Field, Piezo-electric Effect , Ultrasonic Transducers and their Characteristics, Ultrasonic Equipment and Variables Affecting Ultrasonic Test, Ultrasonic Testing, Interpretations and Guidelines for Acceptance, Rejection - Effectiveness and Limitations of Ultrasonic Testing.

Learning outcomes:

At the end of this unit, the student will be able to

- Explain the principle of ultrasonic test. (l2)
- Analyze the performance of wave propagation, reflection, refraction, diffraction and sound field in ultrasonic test. (l4)

- Discuss the characteristics of ultrasonic transducers. (l4)
- Outline the limitations of ultrasonic testing. (l2)

UNIT III

Liquid Penetrant Test: Liquid Penetrant Test, Basic Concepts, Liquid Penetrant System, Test Procedure, Effectiveness and Limitations of Liquid Penetrant Testing**.**
Eddy Current Test: Principle of Eddy Current, Eddy Current Test System, Applications of Eddy Current-Testing Effectiveness of Eddy Current Testing.
Magnetic Particle Test: Magnetic Materials, Magnetization of Materials, Demagnetization of Materials, Principle of Magnetic Particle Test, Magnetic Particle Test Equipment, Magnetic Particle Test Procedure, Standardization and Calibration, Interpretation and Evaluation, Effective Applications and Limitations of the Magnetic Particle Test.

Learning Outcomes:

At the end of this unit, the student will be able to

- Illustrate the procedure of Liquid Penetrant, eddy current and magnetic particle tests.(L2)
- Outline the limitations of Penetrant, eddy current and magnetic particle tests. (L2)
- Explain the effectiveness of Penetrant, eddy current and magnetic particle tests. (L2)
- Apply the applications of Magnetic particle test. (L3)

UNIT IV

Infrared And Thermal Testing: Introduction and fundamentals to infrared and thermal testing–Heat transfer –Active and passive techniques –Lock in and pulse thermography–Contact and non contact thermal inspection methods–Heat sensitive paints –Heat sensitive papers –- thermally quenched phosphors liquid crystals –techniques for applying liquid crystals –other temperature sensitive coatings –Inspection methods –Infrared radiation and infrared detectors– thermo mechanical behavior of materials–IR imaging in aerospace applications, electronic components, Honey comb and sandwich structures–Case studies.

Learning Outcomes:

At the end of this unit, the student will be able to

- Discuss the fundamentals of thermal testing. (l6)
- Explain the techniques of liquid crystals, active and passive. (l2)
- Illustrate thermal inspection methods. (l2)
- Outline the limitations of thermal testing. (l2)
- Explain the applications of honey comb and sandwich structures. (l2)

UNIT V

Industrial Applications of NDE: Span of NDE Activities Railways, Nuclear, Non-nuclear and Chemical Industries, Aircraft and Aerospace Industries, Automotive Industries, Offshore Gas and Petroleum Projects, Coal Mining Industry, NDE of pressure vessels, castings, welded constructions

Learning Outcomes:

At the end of this unit, the student will be able to

- Illustrate applications of NDE. (L2)
- Explain the applications of Railways, Nuclear and chemical industries. (L2)
- Outline the limitations and disadvantages of NDE. (L2)
- Explain the applications of NDA of pressure vessels, casting and welding constructions (L2)

Course Outcomes

At the end of the course, student will be able to

- Explain various methods of non-destructive testing. (l3)
- Apply relevant non-destructive testing method different applications. (l3)
- Explain the applications of railways, nuclear and chemical industries. (l2)
- Outline the limitations and disadvantages of nde. (l2)
- Explain the applications of nda of pressure vessels, casting and welding constructions (l2)

TEXT BOOKS:

1. J Prasad, GCK Nair , "Non destructive test and evaluation of Materials", Tata mcgraw-Hill Education Publishers, 2008.
2. Josef Krautkrämer, Herbert Krautkrämer, "Ultrasonic testing of materials", 3rd edition, Springer-Verlag, 1983.
3. X. P. V. Maldague, "Non destructive evaluation of materials by infrared thermography", 1st edition, Springer-Verlag, 1993.

REFERENCES:

1. Gary L. Workman, Patrick O. Moore, Doron Kishoni, "Non-destructive, Hand Book, Ultrasonic Testing", 3rd edition, Amer Society for Nondestructive, 2007.
2. ASTM Standards, Vol 3.01, Metals and alloys

Social Relevant Projects

1. Solid waste conversion into energy (Gasification)
2. Plastic waste into fuel.
3. Bio-gas digester.
4. Development of mechanisms for farmers.
5. Smart irrigation for saving water.
6. Mechanized water segregation.
7. Applications of solar technologies for rural purpose.

8. Power generation from wind turbine.
9. Applications of drones for agriculture.
10. Solar drying.

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B.Tech (FT)– IV-II Sem

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(19A04802a) INTRODUCTION TO IMAGE PROCESSING

OPEN ELECTIVE-IV

Course Objectives:

- To interpret fundamental concepts of digital image processing.
- To exemplify image enhancement.
- To interpret fundamental concepts of color image processing.
- To assess image compression techniques for digital images.
- To summarize segmentation for digital images.

UNIT-I:

INTRODUCTION TO DIGITAL IMAGE PROCESSING

Introduction: Digital image representation, Fundamental steps in image processing, Elements of digital image processing, Elements of visual perception, Simple image model, Sampling and Quantization, Basic relationships between pixels, Image transformations.
Applications: Medical imaging, Robot vision, Character recognition, Remote sensing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the fundamental concepts of image processing, Sampling process and basis relationships between pixels (L1)
- Explain the elements of Digital Image Processing (L2)

UNIT–II:

IMAGE ENHANCEMENT

Need for image enhancement, Point processing, Histogram processing, Spatial filtering-Smoothing and Sharpening.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the need for enhancement process (L1)
- Explain the terminology involved in enhancement process (L2)

UNIT-III:

COLOR IMAGE PROCESSING

Colour fundamentals, Colour models, Color transformations, Pseudo colour image processing, Full colour image processing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the need for enhancement process (L1)
- Explain the terminology involved in enhancement process (L2)

UNIT–IV:

IMAGE COMPRESSION

Redundancies, Fidelity criteria, Image compression model, Lossless compression: Huffman coding, Arithmetic coding. Lossy compression: Lossy Predictive Coding, JPEG Compression Standard.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the need for image compression (L1)
- Explain the image compression and various types of compression techniques (L2)

UNIT–V:

IMAGE SEGMENTATION

Detection of discontinuities: point, line and edge detection, Edge linking and Boundary detections: Local Processing, Global processing via Hough transform, Thresholding, Region oriented segmentation: Region growing, Region splitting and merging.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the principle of image segmentation and its importance (L1)
- Explain the image compression and various types of compression techniques (L2)
- Analyze the various terminologies involved in image segmentation like edge, boundary detection etc. (L3)

Course Outcomes:

- Interpret fundamental concepts of digital and color image processing.
- Exemplify image enhancement.
- Analyze the various terminologies involved in image segmentation like edge, boundary detection etc. Assess image compression techniques for digital images.
- Summarize segmentation techniques for digital images.

TEXT BOOKS:

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", 3rd Edition, Pearson Education, 2011.

REFERENCE BOOKS:

1. S Jayaraman, S Esakkirajan and T Veerakumar, "Digital Image Processing", TMH, 2011.
2. S. Sridhar, "Digital Image Processing", 2nd Edition, Oxford Publishers, 2016.

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B.Tech (FT)– IV-II Sem **L T P C**

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(19A04802b) PRINCIPLES OF CELLULAR AND MOBILE COMMUNICATIONS
OPEN ELECTIVE-IV

Course Objectives:

- To understand the concepts and operation of cellular systems.
- To apply the concepts of cellular systems to solve engineering problems.
- To analyse cellular systems for meaningful conclusions.
- To evaluate suitability of a cellular system in real time applications.
- To design cellular patterns based on frequency reuse factor.

UNIT-I:

Introduction to Cellular Mobile Systems

Why cellular mobile communication systems? A basic cellular system, Evolution of mobile radio communications, Performance criteria, Characteristics of mobile radio environment, Operation of cellular systems. Examples for analog and digital cellular systems.

Learning Outcomes:

At the end of the unit, the student should be able to

- Understand the conceptsand operation of cellular systems (L1).
- Analyze the characteristics of mobile radio environment (L3).

UNIT-II:

Cellular Radio System Design

General description of the problem, Concept of frequency reuse channels, Cochannel interference reduction, Desired C/I ratio, Cell splitting and sectoring.

Learning Outcomes:

At the end of the unit, the student should be able to

- Understand the concept of frequency reuse and cochannel interference in cellular systems (L1).
- Apply the concept of cellular systems to solve engineering problems (L2).
- Analyze the design problems of cellular systems (L3).
- Design of cellular patterns based frequency reuse factor (L5).

UNIT-III:

Handoffs and Dropped Calls

Why handoffs and types of handoffs, Initiation of handoff, Delaying a handoff, Forced handoffs, Queuing of handoffs, Power-difference handoffs, Mobile assisted handoff and soft handoff, Cell-site handoff, Intersystem handoff. Introduction to dropped call rate.

Learning Outcomes:

At the end of the unit, the student should be able to

- Understand why handoff is required (L1).
- Apply handoff techniques to solve engineering problems (L2).
- Compare various types of handoffs (L3).

UNIT-IV:

Multiple Access Techniques for Wireless Communications

Introduction, Frequency Division Multiple Access, Time Division Multiple Access, Code Division Multiple Accessand Space Division Multiple Access.

Learning Outcomes:

At the end of the unit, the student should be able to

- Understand various types of multiple access techniques (L1).
- Apply the concept of multiple access to solve engineering problems (L2).
- Compare various types of multiple access techniques (L3).

UNIT-V:

Digital Cellular Systems

Global System for Mobile Systems, Time Division Multiple Access Systems, Code Division Multiple Access Systems. Examples for 2G, 3G and 4G systems. Introduction to 5G system.

Learning Outcomes:

At the end of the unit, the student should be able to

- Understand operation of various types of digital cellular systems (L1).
- Compare various types of digital cellular systems (L3).
- Evaluate suitability of a cellular system in real time applications (L4).

Note: The main emphasis is on qualitative treatment. Complex mathematical treatment may be avoided.

Course Outcomes:

At the end of the course, the student should be able to

- Understand the concepts and operation of cellular systems (L1)
- Apply the concepts of cellular systems to solve engineering problems (L2).
- Analyse cellular systems for meaningful conclusions, Evaluate suitability of a cellular system in real time applications (L3).
- Design cellular patterns based on frequency reuse factor (L4).

TEXT BOOKS:

2. William C. Y. Lee, "Mobile Cellular Telecommunications", 2nd Edition, McGraw-Hill International, 1995.
3. Theodore S. Rappaport, "Wireless Communications – Principles and Practice", 2nd Edition, PHI, 2004.

REFERENCES:

3. Aditya K. Jagannatham "Principles of Modern Wireless Communications Systems – Theory and Practice", McGraw-Hill International, 2015.

Blooms' Learning levels:

L1: Remembering and Understanding
L2: Applying
L3: Analyzing, Evaluating
L4: Designing, Creating

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B.Tech (FT)– IV-II **L T P C**

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(19A04802c) INDUSTRIAL ELECTRONICS
OPEN ELECTIVE-IV

Course Objectives:

This course will enable students to:

- Describe 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
- Describe the Ultrasonics and its application**.**

UNIT I

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

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the importance of Electronics and semiconductor devices in industry, operation of semiconductor devices (L1)
- Describe the working of semiconductor diodes (L1)

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, Lettersymbols 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.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the working of Transistor and its different configurations (L1)
- Describe the working of CE, CC, CB configurations (L1)

UNIT III

AC to DC converters- Introduction, Classification of Rectifiers, Half wave Rectifiers, Fullwave 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, Shortperiod Accuracy of Regulators, Long period .Accuracy of Voltage Regulator, Principle ofautomatic voltage Regulator, Simple D.C. Voltage stabilizer using Zener diode, D.C.Voltage Regulators, Series Voltage Regulators, Complete series voltage regulatorcircuit, Simple series voltage regulator.

UNIT IV

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

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the principle of operation of Resistance welding, Induction heating and Dielectric heating (L1)
- Apply the process of Resistance welding, Induction heating and Dielectric heating in the industry (L2)

UNIT V:

Ultrasonics: Introduction, Generation of Ultrasonic waves, Application of Ultrasonicwaves, Ultrasonic stroboscope, ultrasonic as means of communication, ultrasonic flawdetection, 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, cuttingand machining of hard materials by ultrasonic vibrations, Degassing of liquids byultrasonic waves, Physio-chemical effects of ultrasonics, chemical effects ofultrasonics, Thermal effects of Ultrasonics, soldering and welding by ultrasonics,Ultrasonic Drying

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the principle of operation of Ultrasonics and its applications (L1)
- Analyze the thermal effects of Ultrasonics, soldering and welding by ultrasonics,Ultrasonic Drying in the industry (L3)

Course Outcome:

- Understand the semi-conductor devices and their switching characteristics.
- Apply the Ultrasonic waves with different applications
- Analyze the thermal effects of Ultrasonics, soldering and welding by ultrasonics,Ultrasonic Drying in the industry, Interpret the characteristics of AC to DC converters,
- Develop the practical applications Electronics in industries.

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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)–IV-II

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(19A04802d) 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

UNIT – I

Measurement and Error: Definitions, Accuracy, Precision, Resolution and Significant Figures, Types of Errors, Measurement error combinations. (Text 2)
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. (Text 1)
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. (Text 1)

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the importance of measurement system (L1)
- Examine the characteristics of different Instruments (L2)
- Illustrate different types of errors that may occur in instruments during measurements (L2)

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, (Text 1)
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, (Text 1)

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain working of digital measuring Instruments (L2)
- Compare the various measuring techniques for measuring voltage (L4)

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. (Text 1)
Signal Generators: Introduction, Fixed and Variable AF Oscillator, Standard Signal Generator, Laboratory Type Signal Generator, AF sine and Square Wave Generator, Function Generator, (Text 1)

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe functions of basic building of CRO (L1)
- Measure parameters viz. Amplitude, frequency and time period using CRO (L2)
- Classify signal generators and describe its characteristics (L2)

UNIT – 4

Measuring Instruments: Field Strength Meter,Stroboscope, Phase Meter, Q Meter, Megger. (Text 1)
Bridges: Introduction, Wheatstone‘s bridge, Kelvin‘s Bridge; AC bridges, Capacitance Comparison Bridge, Inductance Comparison Bridge, Maxwell‘s bridge, Wien‘s bridge. (Text 1)

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe function of various measuring Instruments. (L1)
- Describe how unknown capacitance and inductance can be measured using bridges (L1)
- Select appropriate bridge for measuring R, L and C parameters (L2)

UNIT – 5

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. (Text 1)

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the importance of transducer (L1)
- Illustrate different measuring techniques in transducers to measure physical quantities.(L2)
- Select the appropriate transducer for the measurement of physical parameters (L2)

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 (L4)

TEXT BOOKS:

1. H. S. Kalsi, "Electronic Instrumentation", McGraw Hill, 3rd Edition, 2012, ISBN:9780070702066.
2. A. D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measuring Techniques", Pearson, 1st Edition, 2015, ISBN: 9789332556065.

REFERENCE BOOKS:

1. David A. Bell, "Electronic Instrumentation & Measurements", Oxford University Press PHI 2nd Edition, 2006 ISBN 81-203-2360-2.
2. A. K. Sawhney, "Electronics and Electrical Measurements", Dhanpat Rai &Sons. ISBN -81-7700-016-0

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)–IV-II

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(19A05802a) BLOCKCHAIN TECHNOLOGY

Course Objectives:

This course is designed to:

- Understand the philosophy of Blockchain and the cutting edge technology behind its functions
- Illustrate how to setup Ethereum tools
- Explain the key vocabulary and concepts used in Blockchain for Business

UNIT-I

Blockchain concepts: Blockchain, Blockchain application example: Escrow, Blockchain stack, from web 2.0 to the next generation decentralized web, domain specific Blockchain application, Blockchain benefits and challenges.

Blockchain application templates: Blockchain application components, design methodology for Blockchain applications, Blockchain applications templates

Learning Outcomes:

After completing this Unit, students will be able to

- Outline the benefits and challenges of Block chain(L2)
- Design the Blockchain applications(L6)

UNIT-II

Setting up Ethereum development tools: Ethereum clients,Ethereum languages, TestRPC, Mist Ethereumwalle, meta mask, web3 JavaScript API, truffle.

Ethereum Accounts: Ethereum Accounts, keypairs, working with EOA Accounts, working with contract accounts.

Learning Outcomes:

After completing this Unit, students will be able to

- Illustrate the use of Ethereum development tools(L2)
- Create Ethereum accounts and work with them (L6)

UNIT-III

Smart contracts: Smart contract, structure of a contract, setting up and interacting with a contract using Geth client, setting up and interacting with a contract using Mist Wallet

Learning Outcomes:

After completing this Unit, students will be able to

- Make use of of smart contracts(L3)
- Distinguish setting up and interacting with a contract using Geth client and Mist Wallet.(L4)

UNIT-IV

Smart contracts (continued): Smart contract examples, Smart contract patterns.
Decentralized Applications: implementing Dapps, case studies,

Learning Outcomes:

After completing this Unit, students will be able to

- Illustrate the Smart contract examples and patterns(L2)
- Develop Decentralized applications.(L6)

UNIT-V

Mining: Concensus on Blockchain network, mining, Block validation, state storage in Ethereum.

Learning Outcomes:

After completing this Unit, students will be able to

- Define Concensus on Blockchain network(L1)
- Demonstrate State Storage in Ethereum(L2)

Course outcomes:
Upon completion of the course, the students should be able to:

- Create customized blockchain solutions (L6)
- Make use of the specific mechanics of Ethereum(L3)
- Experiment with Smart contracts (L3)
- Develop Enterprise applications using Blockchain(L6)

Text book:

1. Arshadeepbahga, Vijay madisetti, “Blockchain Applications A hands-on approach”, VPT 2017.
2. Chandramouli Subramanian, Asha A George, Abhilash K A and MeenaKarthikeyan, “Blockchain Technology”, Universty Press, 2021

References:

1. Imran Bashir, “Mastering Blockchain” Packt Publishing Ltd, March 2017.
2. Melanie swan, “Blokchain blueprint for a new economy”, O’REILLY

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B.Tech (FT)–IV-II **L T P C**

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(19A05802b) MEAN STACK TECHNOLOGIES

Course Objectives:

This course is designed to:

- Translate user requirements into the overall architecture
- Implement new systems and manage the projects
- Write optimized front end code using HTML and JavaScript
- Monitor the performance of web applications & its infrastructure
- Design and implement Robust and Scalable Front End Applications

UNIT I

Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

Learning Outcomes:

After completing this Unit, students will be able to

- Summarize the protocols related to Internet & WWW(L2)
- Compare and contrast XML and HTML(L5)

UNIT II

JavaScript: The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. Angular Java Script Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.

Learning Outcomes:

After completing this Unit, students will be able to

- Illustrate the importance of JavaScript(L2)
- Develop applications using Angular JS(L6)

UNIT III

Node.js: Introduction, Advantages, Node.js Process Model, Node JS Modules. Express.js: Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing,

Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

Learning Outcomes:

After completing this Unit, students will be able to

- Explain the Node JS modules(L2)
- Make use of MVC in Express(L3)

UNIT IV

RESTful Web Services: Using the Uniform Interface, Designing URIs,
Web Linking, Conditional Requests. React Js: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories.

Learning Outcomes:

After completing this Unit, students will be able to

- Outline the RESTful Web Services(L2)
- Assess the future of React Js(L5)

UNIT V

Mongo DB: Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

Learning Outcomes:

After completing this Unit, students will be able to

- Explain the features and architecture of Mongo DB (L2)
- Create and collect Database in MongDB(L6)

Course Outcomes

After the completion of the course, student will be able to

- List the Basic Concepts of Web & Markup Languages(L1)
- Develop web Applications using Scripting Languages & Frameworks(L6)
- Make use of Express JS and Node JS frameworks(L3)
- Illustrate the uses of web services concepts like restful, react js (L2)
- Deploying applications using Cloud Platforms (L6)

Text Books:

1) Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2) Web Technologies, Uttam K Roy, Oxford
3) Pro Mean Stack Development, ELadElrom, Apress
4) Restful Web Services Cookbook, Subbu Allamraju, O'Reilly
5) JavaScript & jQuery the missing manual, David sawyer mcfarland, O'Reilly
6) Web Hosting for Dummies, Peter Pollock, John Wiley Brand

Reference Books:

1) Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006).
2) Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012).
3) Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
4) An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.
5) Express.JS Guide,The Comprehensive Book on Express.js, Azat Mardan, Lean Publishing.

e-Resources:

1) http://www.upriss.org.uk/perl/PerlCourse.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)–IV-II

L	T	P	C
3	0	0	3

(19A27802a) FOOD PLANT UTILITIES & SERVICES
OPEN ELECTIVE - IV

PREAMBLE

This subject focuses on different utilities like water, steam, electricity and its properties, production of consumption of these sources in the food plant.

OBJECTIVES

- To give brief idea about the utilities that are required/used in food industry and their sources and importance.

UNIT – I

Introduction Classification of various utilities and services in food industry. Water use in Food Processing Industry Water supply system: Pumps of different types, operational aspects, piping system for fresh water, chilled water etc., fittings and control, water requirement for cleaning and processing, water quality, water purification and softening Unit

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Water use in Food Processing Industry
- Water supply system: Pumps of different types, operational aspects, piping system for fresh water, chilled water etc.,
- fittings and control, water requirement for cleaning and processing,
- water quality, water purification and softening Unit

UNIT – II

Water use in food processing: Different types of water requirements in food processing plants, types of water use, waste water sources, water wastage minimization, water loadings per unit mass of raw material. Water conservation: Water and waste water management, economic use of water, water filtration and recirculation.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Different types of water requirements in food processing plants,
- types of water use, waste water sources, water wastage minimization,
- water loadings per unit mass of raw material
- Water and waste water management, economic use of water,
- water filtration and recirculation

UNIT – III

Steam uses in Food Industry Steam uses in food industry: Food processing operations in which steam is used, temperature, pressure and quantity of steam required in various food processing operations Steam generation system: Components of a boiler system, fuels used in boilers, energy analysis for a steam generation system, heat loss from boiler system, boiler design consideration.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Food processing operations in which steam is used
- Temperature, pressure and quantity of steam required in various food processing operations
- Components of a boiler system, fuels used in boilers, energy analysis for a steam generation system
- Heat loss from boiler system, boiler design consideration.

UNIT – IV

Waste-Heat Recovery in Food Processing Facilities Quantity and quality of waste heat in food processing facilities, waste heat utilization, heat exchangers for waste heat recovery, heat pumps for waste heat recovery. Waste Disposal and its Utilization Industrial waste, sewage, influent, effluent, sludge, dissolved oxygen, biological oxygen demand, chemical oxygen demand.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Waste-heat recovery in food processing facilities
- Quantity and quality of waste heat in food processing facilities,
- Waste heat utilization, heat exchangers for waste heat recovery, heat pumps for waste heat recovery.
- Waste disposal and its utilization industrial waste, sewage, influent, effluent, sludge,
- Dissolved oxygen, biological oxygen demand, chemical oxygen demand

UNIT – V

Planning and Design of Service Facilities in Food Industry Estimation of utilities requirements: Lighting, ventilation, drainage, CIP system, dust removal, fire protection etc. Maintenance of facilities: Design and installation of piping system, codes for building, electricity, boiler room, plumbing and pipe colouring, maintenance of the service facilities. Services required in offices, laboratories, locker and toilet facilities, canteen, parking lots and roads, loading docks, garage, repair and maintenance shop, ware houses etc.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Planning and Design of Service Facilities in Food Industry Estimation of utilities requirements: Lighting, ventilation, drainage, etc.
- Maintenance of facilities: Design and installation of piping system, codes for building, electricity, plumbing, maintenance of the service facilities.
- Services required in offices, laboratories, locker and toilet facilities, canteen, parking lots and roads, repair and maintenance shop, ware houses etc

Course Outcomes

By end of the course, students will understand the following

- Various utilities and services used in food industry and its applications in food industry namely water, steam, electricity and etc.

TEXT BOOKS

1. Lijun Wang. “Energy Efficiency and Management in Food Processing Facilities”. CRC Press. 2008,
2. M. E. Casper. “Energy-saving Techniques for the Food Industry”. Noyes Data Corporation. 1977,

REFERENCES

1. P.L. Ballaney, “Thermal Engineering in SI Units”, 23rd Edition, Khanna Publishers, Delhi, 2003.
2. C.P. Arora. “Refrigeration and Air Conditioning”. 3rd Edition, Tata McGraw Hill Publishing Co. Ltd. New Delhi. 2008,
3. W. E. Whitman, “A Survey of Water Use in the Food Industry”, S. D. Holdsworth. Published by British Food Manufacturing Industries Research Association.
4. Chilton's Food Engineering. 1979, Chilton Co Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-II Sem

L	T	P	C
3	0	0	3

(19A27802b) NUTRACEUTICALS AND FUNCTIONAL FOODS

OPEN ELECTIVE – IV

PREAMBLE

This course will cover the classification, brief history and the impact of nutraceuticals and functional foods on health and disease prevention. Nutraceuticals to be covered in the course include isoprenoids, isoflavones, flavanoids, carotenoids, lycopene, garlic, omega 3 fatty acids, sphingolipids, vitamin E and antioxidants, herbal products in foods. Also marketing issues related to functional foods and nutraceuticals as well as stability testing will be reviewed.

Course Objectives:

- To understand the interrelationship between nutraceuticals and health maintenance.
- Cite the evidence supporting the efficacy and safety of nutraceutical and functional food products
- To explain the metabolic consequences of nutraceuticals and functional foods.
- Describe the physiologic and biochemical changes associated with consumption of nutraceuticals

UNIT – I

Introduction, definition, Modification in the definition of nutraceuticals. Classification of nutraceuticals, Nutraceuticals market scenario, formulation considerations. Challenges for Nutraceuticals.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Classification of nutraceuticals,
- Nutraceuticals market scenario and formulation considerations.
- Challenges for Nutraceuticals.

UNIT – II

Nutraceuticals value of spices and seasoning – Turmeric, Mustard, Chilli, Cumin, Fenugreek, Black Cumin, Fennel, Asafoetidia, Garlic, Ginger, Onion, Clove, Cardamom etc., Nutraceuticals from Fruits And Vegetables – Mango, Apple, Grapes, Bel, Banana, Broccoli, Tomato, Bitter Melon, Bitter Orange etc.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Nutraceuticals value of spices and seasoning – Turmeric, Mustard, Chilli, Etc.
- Nutraceuticals from Fruits and Vegetables – Mango, Apple, Grapes, Tomato etc.

UNIT – III

Omega -3 fatty acids from fish- Typical properties, structural formula, functional category. CLA- typical properties, structural formula, functional category. Application in Nutraceuticals. Calcium, chromium, copper, iodine, iron, magnesium, Zn- mechanism of action, bioavailability, uses and deficiency, dietary sources.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Properties of Omega -3 fatty acids from fish and structures
- Application in Nutraceuticals. Calcium, iodine, iron, Zn- mechanism of action, bioavailability, uses and deficiency, dietary sources.

UNIT – IV

Definition, classification – Type of classification (Probiotics, probiotics and synbiotics: Taxonomy and important features of probiotic microorganisms. Health effects of probiotics including mechanism of action. Probiotics in various foods: fermented milk products, non-milk products etc. Prebiotics. Definition, chemistry, sources, metabolism and bioavailability, effect of processing, physiological effects, effects on human health and potential applications in risk reduction of diseases, perspective for food applications for the following: Non-digestible carbohydrates/oligosaccharides: Dietary fibre, Resistant starch, Gums.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Probiotics, probiotics and synbiotics: important features of probiotic microorganisms.
- Non-digestible carbohydrates/oligosaccharides: Dietary fibre and etc.

UNIT – V

Phytosterol, Fatty Acids, Carotenoids, Anthocyanins, Carotenoids, Amino Acids, Water Soluble Vitamins, Free radical biology and antioxidant activity of nutraceuticals. Regulations of Nutraceuticals and Functional Foods in India and rest of the world.

Learning Outcomes:

At the end of unit, students will be able to understand the following

- Phytosterol, Fatty Acids, Carotenoids, Anthocyanins, Free radical biology and antioxidant activity of nutraceuticals.
- Regulations of Nutraceuticals and Functional Foods in India and rest of the world.

Course Outcomes

- Students will get know the nutraceuticals and its active components in different foods, regulations on nutraceuticals in India.

TEXT BOOKS

1. "Handbook of Nutraceuticals and Functional Foods. Yashwant Pathak, Vol. 1. (Ingredients, formulations, and applications)" CRC Press 2005.
2. "Handbook of Nutraceuticals and Functional Foods". Robert Wildman, 2nd Edition. CRC Press 2001.

REFERENCES

1. B. Shrilakshmi, "Dietetics", 5th Edition, New Age International (P) Ltd., New Delhi, 2005.
2. A. E. Bender, "Nutrition and Dietetic Foods", Chem. Pub. Co. New York, 2nd Edition, 2004.
3. P. S. Howe, "Basic Nutrition in Health and Disease", 2nd Edition,W. B. Saunders Company, London, 2003.
4. Kramer, "Nutraceuticals in Health and Disease Prevention", Hoppe and Packer, Marcel Dekker, Inc., NY 2001.
5. Bao and Fenwick, "Phytochemicals in Helath and Disease", Marcel Decker, Inc. NY 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-II **L T P C**

3 0 0 3

(19A54802a) MATHEMATICAL MODELING & SIMULATION

OPEN ELECTIVE-IV

Course Objective:

This course focuses on what is needed to build simulation software environments, and not just building simulations using preexisting packages.

UNIT-I:

Simulation Basics-Handling Stepped and Event-based Time in Simulations-Discrete versus Continuous Modeling-Numerical Techniques-Sources and Propagation of Error

Learning Outcomes:

Students will be able to

- Understand computer simulation technologies and techniques.

UNIT-II

Dynamical, Finite State, and Complex Model Simulations-Graph or Network Transitions Based Simulations-Actor Based Simulations-Mesh Based Simulations-Hybrid Simulations

Learning Outcomes:

Students will be able to

- implement and test a variety of simulation and data analysis.

UNIT-III

Converting to Parallel and Distributed Simulations-Partitioning the Data-Partitioning the Algorithms-Handling Inter-partition Dependencies

Learning Outcomes:

Students will be able to

- Understand concepts of modeling layers of society's critical infrastructure networks.
- Understand partitioning the data.

UNIT-IV

Probability and Statistics for Simulations and Analysis-Introduction to Queues and Random Noise-Random Variates Generation-Sensitivity Analysis

Learning Outcomes:

Students will be able to

- Understand Queues and Random noise.
- Understand sensitivity analysis.

UNIT-V

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

Learning Outcomes:

Students will be able to

- Build tools to view and control simulations and their results.

Course Outcomes:

After the completion of course, student will be able to

- 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.

TEXT BOOKS:

1. JN Kapur, “Mathematical modelling”, Newage publishers
2. Kai Velten, “Mathematical Modeling and Simulation: Introduction for Scientists and Engineers” Wiley Publishers.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-II **L T P C**

3 0 0 3

(19A51802a) GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT

Course Objectives:

- 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.
- Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

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.

Learning Outcomes:

At the end of this unit, the students will be able to

- Apply the Green chemistry Principles for day to day life as well as synthesis (L3)
- Describe the sustainable development and green chemistry (L2)
- Explain economic and un-economic reactions (L2)
- Demonstrate Polymer recycling (L2)

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, Heterogenising the Homogenous catalysts, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide, Bio-catalysis and photo-catalysis with examples.

Learning Outcomes:

At the end of this unit, the students will be able to

- Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries (L2)
- Differentiate Homogeneous and Heterogeneous catalysis (L2)
- Identify the importance of Bio and Photo Catalysis (L3)

- Discuss Transition metal and Phase transfer Catalysis (L3)

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

Learning Outcomes:

At the end of this unit, the students will be able to

- Demonstrate Organic solvents and importance of solvent free systems (L3)
- Discuss Super critical carbondioxide (L2)
- Explain Super critical water and water as a reaction solvent (L2)
- Interpret Ionic Liquids as Catalyst and Solvent (L2)

UNIT 4: EMERGING GREENER TECHNOLOGIES AND ALTERNATIVE ENERGY SOURCES

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 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: Photochemical Reactions: Advantages of 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. 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).

Learning Outcomes:

At the end of this unit, the students will be able to

- Describe importance of Biomass and Solar Power (L2)
- Illustrate Sonochemistry and Green Chemistry ((L2)
- Apply Green Chemistry for Sustainable Development (L3)
- Discuss the importance of Renewable resources (L3)

UNIT 5: GREEN PROCESSES FOR GREEN NANOSCIENCE

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing Green Nanoscience. Green Synthesis of Nanophase Inorganic Materials and Metal Oxide Nanoparticles: Hydrothermal Synthesis, Reflux Synthesis, Microwave-Assisted Synthesis, Other methods for Green synthesis of metal and metal oxide nanoparticles, Green chemistry applications of Inorganic nanomaterials

Learning Outcomes:

At the end of this unit, the students will be able to

- Discuss green Chemistry Principles for practicing Green nano synthesis (L3)
- Illustrate Microwave Assisted Synthesis (L2)
- Differentiate Hydrothermal and Reflux synthesis (L2)
- Demonstrate Green Chemistry applications of Inorganic nanomaterials (L2)

Course Outcomes:

Upon completion of this course the students should recognize and acquire green chemistry concepts and apply these ideas to develop respect for the inter connectedness of our world and an ethic of environmental care and sustainability.

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.

HONOURS

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) **L T P C**

3 1 0 4

(19A27H01) NOVEL TECHNOLOGIES FOR FOOD PROCESSING (Honors)

UNIT 1 : Introduction to food processing, preservation and quality. Basic principles & methods, water activity vs. food stability, structure-function relationship. Chemical changes in food during processing. Browning reactions (enzymatic and non-enzymatic), protein interactions, carbohydrate interactions, Rancidity & reversion.

UNIT 2 High pressure processing and Membrane technologies in food processing. Food irradiation, RF & microwave heating; Super critical-fluid extraction and ultrasonication. Food extrusion technology, RTE snack foods, Textured vegetable protein, Rice and dal analogues. Hurdle technology concept, Natural antimicrobials &bacteriocin; Freeze drying.

UNIT 3: Controlled atmosphere storage of food grains; ozone, microwave treatment for disinfestation of grains. Detection of spoilage in grains.Modifed atmosphere packaging, Active packaging and Edible coating of fruits & vegetables

UNIT 4: Extraction and processing of oil, Mechanical expellers, solvent extraction, refining, hydrogenation, winterization Shelf life extension of oils using natural antioxidants. Concept and, measurement of rancidity. Microencapsulation of bioactive and Technology of oil powder.

UNIT 5 : Functional foods and Nutraceuticals. Ready to eat therapeutic food, micronutrient fortified high energy bar, gluten free bread, lactose free milk, carbonated cereal beverage

Books & references:

- Food Chemistry, Revised and Expanded Edition by Owen R Fennema.
- Modern Food Microbiology by James M Jay.
- Mechanism of Action of Food Preservation Procedures by G W Gould.
- Principles of Food Science (Part II): Physical Principles of Food Preservation by M Karel Owen R Fennema and D B Lund.
- Food Processing Technologies Principles and Practices by P J Fellows.
- Food Processing Principles and Application by Stephanie Clark and others.
- Food Processing and Preservation Techniques by Peter Zeuthen and Leif Bagh,
- Non Thermal Preservation of Foods by Gustavo V Barbosa and others.
- Food Product and Process Innovations (2 volumes) by Hari Niwas Mishra.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) **L T P C**
3 1 0 4

(19A27H02) FOOD STORAGE ENGINEERING
(Honors)

Unit I

Introduction, Need of Food storage Engineering, Different Techniques of Food storage .Different equipments and packaging materials used in storage. Properties of different packaging material slike Paper, paper board, polyethylene, glass, metal cans .

Unit II

Frozen StorageQuality loses in frozen foods- Physical changes, Chemical changes in food components, Nutritional aspects of freezing, Microbiology of frozen products, Glass transitions temperature and stability of frozen foods, Temperature requirements during frozen storage, Shelf-life of frozen foods- shelf-life testing, Modelling loss of quality in frozen foods, Time-Temperature integrators, Packaging of frozen foods, Different types of freezers.

Unit III

Controlled Atmospheric StorageBiochemical considerations of CAS, Gas exchange mechanisms, Mass balance principles, Gas generators, Equipments for producing and regulating controlled atmosphere, Design of controlled atmosphere storage chambers.

Unit IV

Hypobaric Storage History of Hypobaric storage, Experimental errors in hypobaric storage research, Gas and vapor mass transfer at low pressure, Requirements for installation

Unit V

Measurement devices (Relative humidity, Pressure, Air-change rate, Oxygen, Carbon dioxide, Ethyl alcohol, Acetaldehyde, hypobaric acid vapor), Flow control, Humidity control, Effects on food, Effects on microbes.

Text Books:

1. Hypobaric storage in food industry- Advances in technology and theory- Stanley.P.Berg
2. Frozen food science and Technology- Judith.A.Evans
3. Engineering for storage of fruits and vegetables- Chandra Gopala Rao

B.Tech (FT) **L T P C**
3 1 0 4

(19A27H03) TQM IN FOOD INDUSTRY
(Honors)

UNIT I INTRODUCTION

Introduction to quality management - Definition, Scope, Significance and Objectives of Quality management; Dimensions of quality in foods, Food quality evaluation techniques, Quality control Vs Quality assurance.

UNIT II ADULTERATION AND QUALITY CONTROL IN PROCESS

Adulteration - Types of adulterants, Adulterant identification techniques, Quality assurance for raw materials, work in process and finished goods, Safe handling of food product, equipments and machineries; personal hygiene- MPL for adulterants

UNIT III QUALITY MANAGEMENT TOOLS

Seven old and new Quality management tools, Statistical process control – Mean & range chart, P chart and C chart, Seven deadly wastages, PDCA cycle, Quality circle, Quality audit, Internal audit, Continuous improvement of productivity- proficiency testing for product quality- Six Sigma Concept.

UNIT - IV QUALITY MANAGEMENT CERTIFICATIONS AND REGULATIONS FOR FOOD INDUSTRY

Implementation procedure for HACCP (ISO 22000), QMS, ISO 9000, BIS, APEDA and Six sigma certifications; AGMARK and Codex Alimentary Commission regulations; Packaging and labeling regulations for food products; Regulations for food products export and imports.

UNIT V ENVIRONMENTAL QUALITY MANAGEMENT SYSTEM

Environmental quality management system (ISO14000), Effluent treatment plant location and maintenance- Eco friendly food processing system, green plant, packaging methods, Challenges in quality management and green processing system implementation.

REFERENCES

1. Poornimacharantimath, Total quality management, Dorling Kindersley, Publishers South Asia Ltd., 2009.
2. Sohrab, 2001 Integrated ISO 9001 HACCP for food processing industries, allied publishers ltd, Mumbai

3. Krammer, A. and Twigg, B.A. 2006. Quality control for the food industry, Volume 2 .Applications. The AVI Publishing Company. Inc., Westport, Connecticut.
4. Ranganna, S. 1994. Hand book of analysis and Quality control for fruits and vegetable products. Tata McGraw hill. New Delhi.

B.Tech (FT)

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(19A27H04) ENTREPRENEURSHIP DEVELOPMENT FOR FOOD TECHNOLOGISTS (Honors)

Unit I: Entrepreneur and entrepreneurial flair; Classification of small, medium and large scale manufacturing industries; Opportunities offood processing industries in West Bengal .

Unit II: Trade license ,trade marks registrarion and registration marks; Sources of finance; Selection of land and factory sheds.

Unit III: Agencies for promotion of food processing industries; Source of machine and equipment. FSSAI registration and regulations . Patent registraration process.

Unit IV: Preparation of project repor.t; Market feasibility reports; Techno-economic feasibility report on fruits and vegetable processing, bakery and confectionary, mushroom manufacture and soybean processing

UNIT V; Reports on Sea food processing – fish processing, tuna fish processing and canning and prawn processing,

Text books/ References:

1. Entrepreneurial Development by Sarwate (Everest Publication)

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B.Tech (FT) **L T P C**

3 1 0 4

(19A27H05) COMPUTER APPLICATIONS IN FOOD TECHNOLOGY (Honors)

Unit 1.

Introduction to various software for their application in food technology. Application of MS Excel to solve the problems of Food Technology .

UNIT 2 Chemical kinetics in food processing: Determining rate constant of zero order reaction First order rate constant and half life of reactions. Determining energy of activation of vitamin degradation during food storage Rates of Enzymes catalyzed reaction. Microbial distraction in thermal processing of food. Determining decimal reduction time from microbial survival da Thermal resistance factor, Z-values in thermal processing of food.Sampling to ensure that a lot is not contaminated with more than agiven percentag Statistical quality control. Probability of occurrence in normal distribution. Using binomial distribution to determine probability of occurrence. Probability of defective items in a sample obtained from large lot

Unit 3: Sensory evaluation of food Statistical descriptors of a population estimated from sensory data obtained from a sampleAnalysis of variance**.** One factor, completely randomized design For two factor design without replication**.** Use of linear repression in analyzing sensory data. Mechanical transport of liquid food**.**Measuring viscosity of liquid food using a capillary tube viscometer . Solving simultaneous equations in designing multiple effect evaporator.while using matrix algebra available in excel.

Unit 4. Familiarization with the application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants, stating from the receiving of raw material up to the storage & dispatch of finished product.

Unit 5. Basic Introduction to computer aided manufacturing. Application of computers in instrumentation and control of food machinery,inventory control, process control etc.

RECOMMENDED BOOKS

1. Computer Applications in Food Technology : Use of Spreadsheets in Graphical, Statistical and Process Analysis by R. Paul Singh, AP.
2. Manuals of MS Office

Jawaharlal Nehru Technological University Anantapur

(Established by Govt. of A.P., Act. No. 30 of 2008)

Ananthapuramu–515 002 (A.P) India

Four Year B.Tech.

Course Structure and Syllabi under

R20 Regulations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTAPUR – 515 002 (A.P) INDIA

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Semester-0

Induction Program: 3 weeks

(Common for All Branches of Engineering)

S.No	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counselling	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
(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTAPUR – 515 002 (A.P) INDIA

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Food Technology

Semester - 1 (Theory - 5, Lab - 4)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.	20A54101	Linear Algebra and Calculus	BS	3-0-0	3
2.	20A51102T	Fundamental Chemistry	BS	3-0-0	3
3.	20A05201T	C-Programming & Data Structures	ES	3-0-0	3
4.	20A02101T	Basic Electrical & Electronics Engineering	ES	3-0-0	3
5.	20A03202	Engineering Workshop	ES	0-0-3	1.5
6.	20A05202	IT Workshop	ES	0-0-3	1.5
7.	20A51102P	Fundamental Chemistry Lab	BS	0-0-3	1.5
8.	20A05201P	C-Programming & Data Structures Lab	ES	0-0-3	1.5
9.	20A02101P	Basic Electrical & Electronics Engineering Lab	ES	0-0-2	1.5
				Total	**19.5**

Semester – 2 (Theory – 5, Lab – 5)					
S.No	**Course No**	**Course Name**	**Category**	**L-T-P/D**	**Credits**
1.	20A54201	Differential Equations and Vector Calculus	BS	3-0-0	3
2.	20A56101T	Engineering Physics	BS	3-0-0	3
3.	20A52101T	Communicative English	HS	3-0-0	3
4.	20A01101T	Basics of Civil & Mechanical Engineering	ES	3-0-0	3
5.	20A03101T	Engineering Drawing	ES	1-0-0/2	2
6.	20A03101P	Engineering Graphics Lab	ES	0-0-2	1
7.	20A52101P	Communicative English Lab	HS	0-0-3	1.5
8.	20A56101P	Engineering Physics Lab	BS	0-0-3	1.5
9.	20A01101P	Basics of Civil & Mechanical Engineering Lab	ES	0-0-3	1.5
				Total	**19.5**

Semester-III							
S.No.	**Course Code**	**Course Name**	**Category**	**Hours per week**			**Credits**
				L	**T**	**P**	
1.	20A54402	Numerical Methods and Probability Theory	BS	3	0	0	3
2.	20A27301	Food Chemistry	PC	3	0	0	3
3.	20A27302T	Processing of Cereals, Pulses and Oilseeds	PC	3	0	0	3
4.	20A27303T	Fluid Flow in Food Processing	PC	3	0	0	3
5.	20A27304	Principles of Food Engineering	PC	3	0	0	3
6.	20A27305	Food Analysis Lab	PC	0	0	3	1.5
7.	20A27302P	Processing of Cereals, Pulses and Oilseeds Lab	PC	0	0	3	1.5
8.	20A27303P	Fluid Flow in Food Processing Lab	PC	0	0	3	1.5
9.	20A27306	Skill oriented course – I Principles of Food Preservation	SC	1	0	2	2
10.	20A52201	Universal Human Values	MC	3	0	0	3
			Total				**24.5**

Semester-IV							
S.No.	**Course Code**	**Course Name**	**Category**	**Hours per week**			**Credits**
				L	**T**	**P**	
1.	20A27401	Food Biochemistry and Nutrition	BS	3	0	0	3
2.	20A05406T	Introduction to Python Programming	ES	3	0	0	3
3.	20A27402T	Processing of Fruits and Vegetables, Spices and Plantation Crops	PC	3	0	0	3
4.	20A27403T	Heat and Mass Transfer	PC	3	0	0	3
5.	20A52301 20A52302 20A52303	Humanities Elective - I Managerial Economics & Financial Analysis Organizational Behavior Business Environment	HS	3	0	0	3
6.	20A05301P	Python Programming Lab	ES	0	0	3	1.5
7.	20A27402P	Processing of Fruits and Vegetables, Spices and Plantation Crops Lab	PC	0	0	3	1.5
8.	20A27403P	Heat and Mass Transfer Lab	PC	0	0	3	1.5
9.	20A27404	Skill oriented course – I Basic Microbiology	SC	1	0	2	2
10.	20A99401	**Mandatory noncredit course** Design Thinking for Innovation	MC	2	1	0	0
11.	20A99301	NSS/NCC/NSO Activities	-	0	0	2	0
						Total	**21.5**
Community Service Internship/Project(Mandatory) for 6 weeks duration during summer vacation							

Note:

1. Eligible and interested students can register either for Honors or for a Minor in IV Semester as per the guidelines issued by the University
2. Students shall register for NCC/NSS/NSO activities and will be required to participate in an activity for two hours in a week during fourth semester.
3. Lateral entry students shall undergo a bridge course in Mathematics during third semester

4.

Semester–V						
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20A27501T	Milk and Milk Products Processing	3	0	0	3
2.	20A27502	Bakery & Confectionery Products Processing	3	0	0	3
3.	20A27503T	Food Packaging	3	0	0	3
4.	20A27504a 20A27504b 20A27504c	**Professional Elective Course – I** Food Nanotechnology Food Safety Management System Energy Audit Conservation	3	0	0	3
5.		**Open Elective Course – I**	3	0	0	3
6.	20A27501P	Milk and Milk Products Processing Lab	0	0	3	1.5
7.	20A27503P	Food Packaging Lab	0	0	3	1.5
8.	20A52401	**Skill oriented course - III** Soft Skills	1	0	2	2
9.	20A27506	Evaluation of Community Service Project				1.5
10.	20A99201	**Mandatory noncredit course** Environmental Science	3	0	0	0
					Total	**21.5**

5.

6. Open Elective - I

S.No	Course Code	Course Name	Offered by the Dept.
1	20A01505	Building Technology	CE
2	20A02505	Electric Vehicles	EEE
3	20A03505	3D Printing Technology	ME
4	20A04505	Digital Electronics	ECE
5	20A05505a	Java Programming	CSE & Allied/IT
6	20A05502T	Artificial Intelligence	
7	20A12502	Mobile Application Development using Android	
8	20A54501	Optimization Techniques	Mathematics
9	20A56501	Materials Characterization Techniques	Physics
10	20A51501	Chemistry of Energy Materials	Chemistry

7.

8. **Note:**
9. 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.
10. 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.
11. 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.	20A27601T	Food Microbiology	3	0	0	3
2.	20A27602T	Unit Operations in Food Processing	3	0	0	3
3.	20A27603T	Meat, Fish, Poultry and Marine Products processing	3	0	0	3
4.	20A27604a 20A27604b 20A27604c	**Professional Elective Course– II** Food Processing Equipment Design Food Chemistry of Macro and Micro Nutrients Nutraceuticals and functional Foods	3	0	0	3
5.		**Open Elective Course – II**	3	0	0	3
6.	20A27601P	Food Microbiology Lab	0	0	3	1.5
7.	20A27602P	Unit Operations in Food Processing Lab	0	0	3	1.5
8.	20A27603P	Meat, Poultry, Fish and Marine Products Processing Lab	0	0	3	1.5
9.	20A27606	**Skill oriented course - IV** Extrusion Processing	1	0	2	2
10.	20A99601	**Mandatory Non-credit Course** Intellectual Property Rights & Patents	2	0	0	0
Total						**21.5**
Industry Internship (Mandatory) for 6 - 8 weeks duration during summer vacation						

12.

13. Open Elective - II

S.No.	Course Code	Course Name	Offered by the Dept.
1	20A01605	Environmental Economics	CE
2	20A02605	Smart Electric Grid	EEE
3	20A03605	Introduction to Robotics	ME
4	20A04605	Signal Processing	ECE
5	20A04701b	Introduction to Internet of Things	ECE/CSE
6	20A05605a	Principles of Operating Systems	CSE & Allied/IT
7	20A05605b	Foundations of Machine Learning	
8	20A05605c	Data Analytics Using R	
9	20A54701	Wavelet Transforms & its applications	Mathematics
10	20A56701	Physics Of Electronic Materials and Devices	Physics
11	20A51701	Chemistry of Polymers and its Applications	Chemistry

Semester-VII						
S.No.	**Course Code**	**Course Name**	**L**	T	**P**	**Credits**
1.	20A27701a 20A27701b 20A27701c	**Professional Elective Course– III** Food Engineering Food Toxicology Novel Technologies for Food Processing	3	0	0	3
2.	20A27702a 20A27702b 20A27702c	**Professional Elective Course– IV** Brewing Technology Food Additives Thermal Processing of Foods	3	0	0	3
3.	20A27703a 20A27703b 20A27703c	**Professional Elective Course– V** Extrusion Technology Food Safety and Standards Act & Regulations in India Food Plant Sanitation and Hygiene	3	0	0	3
4.	20A52701a 20A52701b 20A52701c	**Humanities Elective – II** Entrepreneurship and Incubation Management Science Enterprise Resource Planning	3	0	0	3
5.		**Open Elective Course – III**	3	0	0	3
6.		**Open Elective Course – IV**	3	0	0	3
7.	20A27706	**Skill oriented course - V** Bakery Products	1	0	2	2
8.	20A27707	Evaluation of Industry Internship				3
					Total	**23**

15. Open Elective - III

S.No	Course Code	Course Name	Offered by the Dept.
1	20A01704	Cost Effective Housing Techniques	CE
2	20A02704	IOT Applications in Electrical Engineering	EEE
3	20A03704	Product Design & Development	ME
4	20A04704	Electronic Sensors	ECE
5	20A05704a	Web Technologies	CSE & Allied/IT
6	20A05704b	VR & AR for Engineers	
7	20A05704c	Software Engineering	
8	20A54702	Numerical Methods for Engineers	Mathematics
9	20A56702	Sensors And Actuators for Engineering Applications	Physics
10	20A51702	Chemistry of Nanomaterials and Applications	Chemistry

16. Open Elective - IV

S.No	CourseCode	Course Name	Offered by the Dept.
1	20A01705	Health, Safety & Environmental management	CE
2	20A02705	Renewable Energy Systems	EEE
3	20A03705	Introduction to Composite Materials	ME
4	20A04705	Microcontrollers and Applications	ECE
5	20A05705a	Cyber Security	CSE & Allied / IT
6	20A05705b	Introduction to Full Stack Development	
7	20A05705c	Industrial IoT	
8	20A54703	Number theory & its Applications	Mathematics
9	20A56703	Smart Materials and Devices	Physics
10	20A51703	Green Chemistry and Catalysis for Sustainable Environment	Chemistry

Semester-VIII							
S.No.	**Course Code**	**Course Name**	**Category**	**L**	T	**P**	**Credits**
1.	20A27801	Full Internship & Project work	PR				12
						Total	**12**

COURSES OFFERED FOR HONOURS DEGREE IN FOOD TECHNOLOGY

S.No.	Course Code	Course Title	Contact Hours per week		Credits
			L	T	
1	20A27H01	Technology of Oils and Fats	3	1	4
2	20A27H02	Food Storage Engineering	3	1	4
3	20A27H03	TQM in Food Industry	3	1	4
4	20A27H04	Entrepreneurship Development	3	1	4
SUGGESTED MOOCs					
5	20A27H05	MOOCIIntroduction to Internet of Things (IIT Kharagpur)			2
6	20A27H06	MOOCII:Novel Technologies for Food Processing & Shelf-life Extension (IIT Kharagpur)			2

17.
LIST OF MINORS OFFERED TO FOOD TECHNOLOGY

S.No.	Minor Title	Department offering the Minor
1.	Construction Technology	Civil Engineering
2.	Environmental Geotechnology	Civil Engineering
3.	Energy Systems	EEE
4.	3D Printing	ME
5.	Industrial Engineering	ME
6.	Internet of Things	ECE
7.	Artificial Intelligence & Data Science	
8.	Virtual & Augmented Reality	CSE & Allied / IT
9.	Cyber Security &Blockchain Technologies	

18.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– I Sem

L	T	P	C
3	0	0	3

(20A54101) LINEAR ALGEBRA & CALCULUS

(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.

UNIT -1

Matrices

Rank of a matrix by echelon form, normal form. Solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigenvectors and their properties, 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, eigen values 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

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

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

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

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, 2011.
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, McGraw 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

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L	T	P	C
3	0	0	3

(20A51102T) FUNDAMENTAL CHEMISTRY

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

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, 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.

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 O_2 and CO molecules (L2)
- Discuss the basic concept of molecular orbital theory (L3).

Unit 2:

Electrochemistry and Applications:

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glasselectrode) electrochemical cell, Nernst equation, cell potential calculations, numerical problems,concept of pH, pH meter and applications of pH metry (acid-base titrations), potentiometry–potentiometrictitrations (redox titrations), concept of conductivity, conductivity cell,conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensorswith examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad),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 3:

Polymer Chemistry:
Introduction to polymers, functionality of monomers, chain growth and step growthpolymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.
Plastics - Thermoplastics and Thermosettings, Preparation, properties and applications of –PVC, Bakelite, Nylon-6,6, carbon fibres.
Elastomers–Buna-S, Buna-N–preparation,properties and applications.
Conducting polymers – polyacetylene, polyaniline, polypyrroles – mechanism of conduction andapplications.

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 PVC, Bakelite, Nylon-66, and carbonfibres (L2)
- Describe the mechanism of conduction in conducting polymers (L2)
- Discuss Buna-S and Buna-N elastomers and their applications (L2)

Unit 4:

Instrumental Methods and Applications (10 hrs)
Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible, IR spectroscopies. Solid-Liquid Chromatography- TLC- Buffer solution-retention time.

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 solid liquid chromatography (L2)
- Explain the different applications of analytical instruments (L2)

Unit 5:

Surface Chemistry and Applications: (10 hrs)
Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation,synthesis of colloids (any two methods with examples), chemical and electrochemical methods(not more than two methods) of preparation of nanometals and metal oxides, stabilization ofcolloids and nanomaterials by stabilizing agents, solid-gas interface, solid-liquid interface, adsorptionisotherm, BET equation (no derivation) applications of colloids andnanomaterials – catalysis, medicine, sensors, etc.

Learning Outcomes:

At the end of this unit, the students will be able to

- Summarize the concept adsorption and its applications (L2)
- Explain the synthesis of colloids with examples (L2)
- Outline the preparationof nanomaterials and metal oxides (L2)

- Identify the application of colloids and nanomaterials in medicine, sensors and catalysis(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. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992.

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, solid liquid chromatography in separation of solids and liquid mixtures (L2)
- Apply the principle of Band diagrams in application of conductors and semiconductors (L3)

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L	T	P	C
3	0	0	3

(20A05201T) C-PROGRAMMING & DATA STRUCTURES

(Common to All Branches of Engineering)

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.

Learning outcomes:

At the end of this unit, the students will 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.

Learning outcomes:

At the end of this unit, the students will 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.

Learning outcomes:

At the end of this unit, the students will 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.

Learning outcomes:

At the end of this unit, the students will 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.

Learning outcomes:

At the end of this unit, the students will 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. Pradip Dey 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:

- Analyse the basicconcepts of C Programming language. (L4)
- Design applications in C, using functions, arrays, pointers and structures. (L6)
- Apply the concepts of Stacks and Queues in solving the problems. (L3)
- Explore various operations on Linked lists. (L5)
- Demonstrate various tree traversals and graph traversal techniques. (L2)
- Design searching and sorting methods (L3)

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B.Tech (FT)– I Sem

L	T	P	C
3	0	0	3

(20A02101T) BASIC ELECTRICAL & ELECTRONICS ENGINEERING

(Civil, Mechanical, CSE, AI & DS,CSE (AI), CSE(IoT), CSE (Data Science), CSE(AI & ML), IT and Food Technology)

Part A: Basic Electrical Engineering

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

UNIT -1

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.

Learning Outcomes

At the end of this unit, the student will be able to

- Recall Kirchoff laws
- Analyze simple electric circuits with DC excitation
- Apply network theorems to simple circuits
- Analyze single phase AC circuits consisting of series RL - RC - RLC combinations

UNIT -2

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]

Learning Outcomes

At the end of this unit, the student will be able to

- Explain principle and operation of DC Generator & Motor.
- Perform speed control of DC Motor
- Explain operation of transformer and induction motor.
- Explain construction & working of induction motor - DC motor

UNIT -3

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.

Learning Outcomes

At the end of this unit, the student will be able to
- Understand working operation of various generating stations
- Explain the types of Transmission and 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.

Course Outcomes:

The student should be able to
- 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

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.

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.

Learning outcomes:

At the end of this unit, the student will be able to

- Remember and understand the basic characteristics of semiconductor diode. (L1)
- Understand principle of operation of Zener diode and other special semiconductor diodes. (L1)
- Analyze BJT based biasing circuits. (L3)
- Design an amplifier using BJT based on the given specifications. (L4)

Unit-2:

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, Non-Inverting, Summing and Difference Amplifiers, Voltage Follower, Comparator, Differentiator, Integrator.

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. (L2)
- Analyze Op-Amp based comparator, differentiator and integrator circuits. (L3)

Unit-3:

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).

Learning outcomes:

At the end of this unit, the student will be able to

- Explain the functionality of logic gates. (L2)
- Apply basic laws and De Morgan's theorems to simplify Boolean expressions. (L3)
- Analyze standard combinational and sequential circuits. (L4)
- Distinguish between 8085 & 8086 microprocessors also summarize features of a microprocessor. (L5)

Text Books:

1. R.L.Boylestad& Louis Nashlesky, Electronic Devices &Circuit Theory, Pearson Education,2007.
2. Ramakanth A. Gayakwad, Op-Amps & Linear ICs, 4thEdition, 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.

Course Outcomes:

After the completion of the course students will able to

- 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– I Sem

L	T	P	C
0	0	3	1.5

(20A03202) ENGINEERING WORKSHOP

(Common to All Branches of Engineering)

Course Objective:

To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

List of Topics

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) Bicycle tire puncture and change of two wheeler tyre

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

Course Outcomes:

After completion of this lab the student will be able to

- Apply wood working skills in real world applications. (l3)
- Build different objects with metal sheets in real world applications. (l3)
- Apply fitting operations in various applications. (l3)
- Apply different types of basic electric circuit connections. (l3)
- Use soldering and brazing techniques. (l2)

Note: In each section a minimum of three exercises are to be carried out.

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B.Tech (FT) – II Sem

L	T	P	C
0	0	3	1.5

(20A05202) IT WORKSHOP

(Common to All Branches of Engineering)

Course Objectives:

- To make the students know about the internal parts of a computer, assembling and dissembling a computer from the parts, preparing a computer for use by installing the operating system
- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations and LAteX
- To learn about Networking of computers and use Internet facility for Browsing and Searching

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

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, Image Manipulation tools.

Task 9:

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.

Task 10:

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

Task 11:

LateX: Introduction to Latex and its installation and different IDEs. Creating first document using Latex, using content into sections using article and book class of LaTeX. Styling Pages: reviewing and customizing different paper sizes and formats. Formatting text (styles, size, alignment, colors and adding bullets and numbered items, inserting mathematical symbols, and images, etc.). Creating basic

tables, adding simple and dashed borders, merging rows and columns. Referencing and Indexing: cross-referencing (refer to sections, table, images), bibliography (references).

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
6. Lamport L. LATEX: a document preparation system: user's guide and reference manual. Addison-wesley; 1994.

Course Outcomes:

- Disassemble and Assemble a Personal Computer and prepare the computer ready to use.
- Prepare the Documents using Word processors and Prepare spread sheets for calculations .using excel and also the documents using LAteX.
- 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.

Note: Use open source tools for implementation of the above exercises.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– I Sem

L	T	P	C
0	0	3	1.5

(19A51102P) FUNDAMENTAL CHEMISTRY LAB

Course Objectives:

- Verify the fundamental concepts with experiments

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method
2. Models of potential energy surfaces
3. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base
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 its properties.
8. Determination of viscosity of polymer solution using survismeter
9. Verify Lambert-Beer's law
10. Thin layer chromatography
11. Identification of simple organic compounds by IR
12. Preparation of nanomaterials by precipitation.
13. Adsorption of acetic acid by charcoal

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 materials (L2)
- Measure the strength of an acid present in secondary batteries (L3)
- Analyse the IR spectra of some organic compounds (L3)

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B.Tech (FT)– I Sem

L	T	P	C
0	0	3	1.5

(20A05201P) C-PROGRAMMING & DATA STRUCTURES LAB

(Common to All Branches of Engineering)

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)

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B.Tech (FT)– I Sem

L	T	P	C
0	0	2	1.5

(20A02101P) BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

(Civil, Mechanical, CSE, AI & DS,CSE (AI), CSE(IoT), CSE (Data Science), CSE(AI & ML), IT and Food Technology)

Part A: Electrical Engineering Lab

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

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.

Course Outcomes:

After completing the course, the student will be able to

- 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

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.

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.

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.

Note: Minimum Six Experiments to be performed in each section.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II Sem

L	T	P	C
3	0	0	3

(20A54201) DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to Civil, EEE, Mechanical, ECE and Food Technology)

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- 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)

Definitions, homogenous and non-homogenous, complimentaryfunction, generalsolution, particular integral,Wronskean, 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

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order equations using Lagrange's method.

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

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)

UNIT-4

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)

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. GargNishu Gupta, Engineering Mathematics Volumes-I &II, Pearson Education
10. B. V. Ramana, Higher Engineering Mathematics, McGraw 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)

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B.Tech (FT)– II Sem **L T P C**

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(20A56101T) ENGINEERING PHYSICS

(Common to Civil, Mechanical and Food Technology)

Course Objectives

- To make a bridge between the physics in school and engineering courses.
- To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications.
- 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
- To open new avenues of knowledge in dielectric and magnetic materials which find potential in the emerging micro device applications.

  Considering the significance of micro miniaturization of electronic devices and significance of low dimensional materials, the basic concepts of nano materials, their properties and applications in modern emerging technologies are elicited.
- To familiarize the concepts of theoretical acoustics to practical use in engineering field. To explain the significance of ultrasound and its application in NDT for diversified engineering application.
- To enlighten the periodic arrangement of atoms in crystals, Bragg's law and to provide fundamentals related to structural analysis through powder diffraction method.

UNIT-I

Wave Optics

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.

Learning Outcomes:

At the end of this unit, the student 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

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 – Propagation Losses (Qualitative) – Applications.

Learning Outcomes:

At the end of this unit, the student 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

Engineering Materials

Dielectric Materials- Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations: Electronic, Ionic and Orientation polarization (Qualitative) – Lorentz internal field – Clausius-Mossotti equation.

Magnetic Materials- Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism (Qualitative) – Hysteresis – Soft and Hard magnetic materials.

Nanomaterials- Introduction – Surface area and quantum confinement – Physical properties: electrical and magnetic properties – Synthesis of nanomaterials: Top-down: Ball Milling – Bottom-up: Chemical Vapour Deposition – Applications of nanomaterials.

Learning Outcomes:

At the end of this unit, the student 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)
- 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).

UNIT-IV

Acoustics and Ultrasonics

Acoustics- Introduction – Requirements of acoustically good hall – Reverberation – Reverberation time – Sabine's formula (Derivation using growth and decay method) – Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedies.

Ultrasonics- Introduction – Properties – Production by magnetostriction and piezoelectric methods – Detection – Acoustic grating – Non Destructive Testing – Pulse echo system through transmission and reflection modes – Applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain how sound is propagated in buildings (L2)
- Analyze acoustic properties of typically used materials in buildings (L4)
- Recognize sound level disruptors and their use in architectural acoustics (L2)
- Identify the use of ultrasonics in different fields (L3)

UNIT-V

Crystallography and X-ray diffraction

Crystallography- Space lattice, Basis, unit cell and lattice parameters – Bravais Lattice – Crystal systems – Packing fraction – Coordination number – Packing fraction of SC, BCC & FCC – Miller indices – Separation between successive (hkl) planes.

X-Ray Diffraction- Bragg's law – Bragg's X-ray diffractometer – Crystal structure determination by Powder method.

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify various crystal systems (L2)
- Identify different planes in the crystal structure (L3)
- Analyze the crystalline structure by Bragg's X-ray diffractometer (L4)
- Apply powder method to measure the crystallinity of a solid (L4)

Text books:

1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering physics – D.K. Battacharya and Poonam Tandon, Oxford University press.

Reference Books:

1. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press
2. Engineering Physics – K. Thyagarajan, McGraw Hill Publishers
3. Engineering Physics – D K Pandey, S. Chaturvedi, Cengage Learning
4. Engineering Physics – M.R. Srinivasan, New Age Publications

Course Outcomes

- Study the different realms of physics and their applications in both scientific and technological systems through physical optics. (L2)
- 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).
- Understands the response of dielectric and magnetic materials to the applied electric and magnetic fields. (L3)
- Elucidates the importance of nano materials along with their engineering applications. (L5)
- Explain the basic concepts of acoustics and ultrasonics. (L2)
- Apply the concept of NDT to material testing. (L3)
- Study the important properties of crystals like the presence of long-range order, periodicity and structure determination using X-ray diffraction technique. (L5)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II Sem **L T P C**

3 0 0 3

(20A52101T) COMMUNICATIVE ENGLISH

(Common to All Branches of Engineering)

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:** 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

UNIT-4

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

Text Book:

1. Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. Oxford Learners Dictionary, 12th Edition, 2011
6. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)
7. Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words by David Butler

Course Outcomes

- Retrieve the knowledge of basic grammatical concepts
- 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

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II Sem **L T P C**

3 0 0 3

(20A01101T) BASIC CIVIL & MECHANICAL ENGINEERING

Course Objectives:

- Impart basic principles of stress, strain, shear force, bending moment and torsion.
- To teach principles of strain measurement using electrical strain gauges
- Describe technical details of power plants, gas turbines, hydro power plants and non-conventional energy sources.
- Teach different types of drives for power transmission
- Impart concepts of CAD, CAM & CIM

PART – A: Civil Engineering

UNIT – I:

Basic Definitions of Force – Stress – Strain – Elasticity. Shear force – Bending Moment – Torsion . Simple problems on Shear force Diagram and Bending moment Diagram for cantilever and simply supported beams.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand principles of Stress and Strain.
- Able to draw SFD & BMD for simply supported beams and cantilever beams.

UNIT – II:

Measurement of Strain - Electrical Capacitance and Resistance Strain gauges – multi channel strain indicators. Rosette analysis – Rectangular and Triangular strain rosettes – Wheatstone bridge.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand basic principles of Strain Measurement.
- Apply the concepts of Strain Rosettes for strain measurement .

UNIT – III:

Characteristics of common building materials – Brick – Types – Testing; Timber – Classification – Seasoning – Defects in Timber ; Glass – Classification – uses; steel and its applications in construction industry.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand common building materials used in construction.
- Analyze charactestics of common building materials .

Text Books:

1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi.
2. Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd.

Reference Books:

1. S.Trymbaka Murthy., "Computer Aided Engineering Drawing" , Universities Press
2. Seetharaman S., "Basic Civil Engineering", Anuradha Agencies.
3. Venugopal K. and Prahu Raja V., "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam.
4. Er. R. Vaishnavi,Basic Civil and Mechanical Engineering, 2/e, S.Chand Publications.

Course Outcomes:

At the end of the course, student is able to

- Draw SFD and BMD for cantilever and Simply supported beams. ***(L.1)***
- Understand the working principles of electrical resistors and capacitors. ***(L.2)***
- Apply concepts of Rosetta analysis for strain measurements. ***(L.3)***

PART – B: Mechanical Engineering

Course Objectives

- Familiarize the sources of energy, power plant economics and environmental aspects.
- Outline the working components of different power plant.
- To teach working principle of hydraulic machinery.
- To familiarize the developments in IC engines.
- To teach combustion process in SI and CI engines.
- Explain the principles of refrigeration and air conditioning.

UNIT – 1

Power Plant Engineering: Introduction – Energy Renewable and Non – Renewable Energy, Sources – Classification of Power Plants based on Sources of Energy – Thermal Power Plant or Steam Power Plant – Hydro Electric Power – Nuclear Fission, Chain Reaction, Layout of Nuclear Power Plant – Diesel Power Plant – Gas Turbine Power Plant – Open Cycle Gas Turbine, Closed Cycle Gas Turbine Power Plant, Comparison of Diesel Power Plant with Gas Turbine Power Plant – Pumps – Classification of Pumps, Centrifugal Pump, Applications of Centrifugal Pump, Priming, Reciprocating Pumps, Single Acting Reciprocating Pump, Working of a Double acting Reciprocating Pump, Comparison of Reciprocating Pump with Centrifugal Pump –Hydraulic Turbine – Classification of Hydraulic Turbines, Impulse Turbine, Reaction Turbine, Difference between Impulse and Reaction Turbine.

Learning Outcomes

At the end of this unit, the student will be able to

- Outline sources of energy, compare and selection of types of power plants (L2).
- Explain working principle and compare types of diesel power plant (L2).
- Explain construction and operation of different pumps (L2).
- Classify pumps based on principle of operation (L1).
- Classify turbines based on principle of operation (L1).

UNIT – 2

I.C Engine: Heat Engine – Types of Heat Engine – External Combustion Engine, IC Engine (Internal Combustion), Classification of I.C. Engine, Two Stroke Petrol Engine, Four Stroke Engine, Valve Timing Diagram, Port Timing Diagram, Comparison of Two Stroke and Four Stroke Engines, Comparison of Petrol Engine and Diesel Engine, Fuel System of a Petrol Engine, Ignition Systems.
Boilers: Classification of Boilers – Simple Vertical Boiler – Cochran Boiler – Babcock and Wilcox Boiler – Benson Boiler – Difference between Fire Tube and Water Tube Boilers – Boiler Mountings – Boiler Accessories – Difference between Boiler Mountings and Accessories.

Learning outcomes:
After completion of this unit, students will be able to
- Understand classification and working of IC engines (L1).
- Compare 2 stroke and 4 stroke, petrol and diesel engines (L3).
- Understand classification and construction of boilers (L1).
- Compare boiler mountings and accessories (L3).

UNIT – 3

Refrigeration and Air Conditioning: Introduction – Terminology of Refrigeration and Air Conditioning – Properties of Refrigerants – List of Commonly used Refrigerants – Types of Refrigerating System – Vapour Compression Refrigeration System – Vapour Absorption Refrigerator – Domestic Refrigerator – Air Conditioning – Application of Air Conditioning – Psychrometry – Window Air Conditioning.

Learning outcomes:

After completion of this unit, students will be able to
1. Analyze the basics cycles of Refrigeration and Air Conditioning Systems (L4).
2. Outline the operation of refrigerators (L2).
3. Identify different refrigerants and applications (L1).

Text Books:

1. Basic Civil and Mechanical Engineering, by Prof.V.Vijayan, Prof.M.Prabhakaran and Er.R.Viashnavi, S.Chand Publication.
2. Elements of Mechanical Engineering Fourth Edition S Trymbaka Murthy, University Press.

Course Outcomes:

At the end of this course, the student will be able to
- Outline sources of energy, power plant economics, and environmental aspects (L2).
- Describe working components of a steam power plant (L2).
- Illustrate the working mechanism of Diesel and Gas turbine power plants (L2).
- Explain different types of pumps and their application (L2).
- Explain working of IC engines with combustion process (L2).
- Possess the knowledge of system components of refrigeration and air conditioning (L3)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) – II Sem

L	T	P/D	C
1	0	0/2	2

(20A03101T) ENGINEERING DRAWING

(Common to All Branches of Engineering)

Course Objectives:

- Bring awareness that Engineering Drawing is the Language of Engineers.
- Familiarize how industry communicates technical information.
- Teach the practices for accuracy and clarity in presenting the technical information.
- Develop the engineering imagination essential for successful design.

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 method only,
b) Cycloid, epicycloids and hypocycloid c) Involutes

Learning Outcomes:

At the end of this unit the student will be able to

- Understand the significance of engineering drawing
- Know the conventions used in the engineering drawing
- Identify the curves obtained in different conic sections
- Draw different curves such as cycloid, involute and hyperbola

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

- Understand the meaning of projection
- Know how to draw the projections of points, lines
- Differentiate between projected length and true length
- Find the true length of the lines

Unit: III

Projections of solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

Learning Outcomes:

At the end of this unit the student will be able to

- Understand the procedure to draw projection of solids
- Differentiate between rotational method and auxillary view method.
- Draw the projection of solid inclined to one plain
- Draw the projection of solids inclined to both the plains

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

- Understand different sectional views of regular solids
- Obtain the true shapes of the sections of prism
- Draw the sectional views of prism, cylinder, pyramid and cone

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

- Understand the meaning of development of surfaces
- Draw the development of regular solids such as prism, cylinder, pyramid and cone
- Obtain the development of sectional parts of regular shapes

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. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
3. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
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

- 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

Youtube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) – I Sem

L	T	P	C
0	0	2	1

(20A03101P) ENGINEERING GRAPHICS LAB

(Common to All Branches of Engineering)

Course Objectives:

- Instruct the utility of drafting & modeling packages in orthographic and isometric drawings.
- Train the usage of 2D and 3D modeling.
- Instruct graphical representation of machine components.

Computer Aided Drafting:

Introduction to AutoCAD: 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. Linkan Sagar, 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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II Sem

L	T	P	C
0	0	3	1.5

(20A52101P) COMMUNICATIVE ENGLISH LAB

(Common to All Branches of Engineering)

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

List of Topics

1. Phonetics
2. Reading comprehension
3. Describing objects/places/persons
4. Role Play or Conversational Practice
5. JAM
6. Etiquettes of Telephonic Communication
7. Information Transfer
8. Note Making and Note Taking
9. E-mail Writing
10. Group Discussions-1
11. Resume Writing
12. Debates
13. Oral Presentations
14. Poster Presentation
15. Interviews Skills-1

Suggested Software

Orel, Walden Infotech, Young India Films

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

Web Links

www.esl-lab.com
www.englishmedialab.com
www.englishinteractive.net

Course Outcomes

After completing the course, the student will be able to

- Listening and repeating the sounds of English Language
- Understand the different aspects of the English language
- proficiency with emphasis on LSRW skills
- Apply communication skills through various language learning activities
- Analyze the English speech sounds, stress, rhythm, intonation and syllable
- Division for better listening and speaking comprehension.
- Evaluate and exhibit acceptable etiquette essential in social and professional settings
- Create awareness on mother tongue influence and neutralize it in order to
- Improve fluency in spoken English.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II Sem

L	T	P	C
0	0	3	1.5

(20A56101P) ENGINEERING PHYSICS LAB

(Common to Civil, Mechanical and Food Technology)

Course Objectives:

- Understand the role of Optical fiber parameters in engineering applications.
- Recognize the significance of laser by studying its characteristics and its application in finding the particle size.
- Illustrates the magnetic and dielectric materials applications.
- Identifies the various sensor applications.

List of Topics

1. Determine the thickness of the wire using wedge shape method
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Determination of dispersive power of prism.
5. Determination of wavelength of LASER light using diffraction grating.
6. Determination of particle size using LASER.
7. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
8. Determination of dielectric constant by charging and discharging method.
9. Magnetic field along the axis of a circular coil carrying current –Stewart Gee's method.
10. Measurement of magnetic susceptibility by Gouy's method
11. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)
12. Determination of ultrasonic velocity in liquid (Acoustic grating)
13. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum)
14. Sonometer: Verification of the three laws of stretched strings
15. Determination of spring constant of springs using Coupled Oscillator

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

Course Outcomes:

After completing the course, the student will be able to

- Operate various optical instruments (L2)
- estimate wavelength of laser and particles size using laser(L2)
- evaluate the acceptance angle of an optical fiber and numerical aperture (L3)
- estimate the susceptibility and related magnetic parameters of magnetic materials (L2)
- plot the intensity of the magnetic field of circular coil carrying current with distance (L3)
- determine magnetic susceptibility of the material and its losses by B-H curve (L3)
- apply the concepts of ultrasonics by acoustic grating (L2)

Note Out of 15 experiments any 12 experiments (minimum 10) must be performed in a semester.

AWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II Sem

L	T	P	C
3	0	0	3

(20A01101P) BASIC CIVIL & MECHANICAL ENGINEERING LAB

Part A: Civil Engineering

Laboratory Experiments:

1. Bending test on (Steel/Wood) Cantilever beam.
2. Bending test on (Steel/Wood) simply supported beam.
3. Use of electrical resistance strain gauges.
4. Compression test on Bricks
5. Water absorption test on Bricks
6. Torsion test.
7. Tests on closed coiled and open coiled helical springs

Part B: Mechanical Engineering

Course Objectives:

- Understand the functioning and performance of I.C. Engines
- To find heat losses in various engines

List of Experiments:

1. Load test on four stroke Diesel Engine with mechanical loading.
2. Load test on four stroke Diesel Engine with DC Generator loading.
3. Heat balance test on Four Stroke Diesel Engine.
4. Load test on two stroke petrol engine.
5. A) Study of Valve & Port diagram.
   B) Study of boilers.
6. Performance test on vapour compression refrigeration system.
7. Performance test on vapour absorption refrigeration system.

Course Outcomes:

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

- Explain different working cycles of engine.
- Illustrate the working of refrigeration systems
- Evaluate heat balance sheet of IC engine.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
3	0	0	3

20A54402Numerical Methods & Probability theory

(Food Technology)

Course Objectives:

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.
- The theory of probability and random variables.

Course Outcomes (CO): Student will be able to

- Apply numerical methods to solve algebraic and transcendental equations
- Derive interpolating polynomials using interpolation formulae
- Solve differential and integral equations numerically
- Apply probability theory to find the chances of happening of events.
- Understand various probability distributions and calculate their statistical constants.

UNIT - I **Solution of Algebraic & Transcendental Equations:** 8 Hrs

Introduction-Bisection method-Iterative method-Regula falsi method-Newton Raphson method

System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.

UNIT - II **Interpolation** 8 Hrs

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

UNIT - III **Numerical Integration & Solution of Initial value problems to Ordinary differential equations** 9 Hrs

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

UNIT - IV **Probability theory:** 9 Hrs

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT - V **Random variables & Distributions:** 9 Hrs

Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties-Uniform distribution-exponential distribution

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:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. nptel.ac.in/courses/117101056/17
3. http://nptel.ac.in/courses/111105090

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
3	0	0	3

20A27301FOOD CHEMISTRY

Course Objectives:

- To impart knowledge to the students on the Techniques in food analysis
- To read them with the Analytical techniques in Quality control laboratory.

Course Outcomes (CO):

- Understand the concepts of Techniques in food analysis,
- Analyse the proximate analysis of foods
- Summarize the biochemical methods and approaches used in Food analysis.

UNIT - I **8 Hrs**

Sampling and sampling techniques. Proximate analysis- Moisture, ash, crude fat, crude fibre, crude protein and carbohydrates by difference. Principles and methods of food analysis.

UNIT - II **12 Hrs**

Basic principles: Refractometry, polarimetry, densitometry, HPLC, GLC, spectrophotometry, electrophoresis, automatic amino acid analyzer.

UNIT - III **8 Hrs**

Determination of starch. Test for unsaturation of fats, rancidity of fats. Quantitative analysis of protein by Biuret method, Ninhydrin method, Lowry's method and Dye-binding method Bioassays for protein quality of grains.

UNIT - IV **10 Hrs**

Chemical, microbiological, flurometric and colorimetric methods of analysis of fat soluble and water soluble vitamins.

UNIT - V **8 Hrs**

Principles and methods for estimation of minerals: Atomic absorption spectroscopy, colorimetric, titrimetric and gravimetric methods Methods for determining physical and rheological properties of food.

Textbooks:

1. Suzanne **Nielsen**, "Food Analysis", Springer Publishers, 5th Edition, 2017.
2. Y. Pomeranz and C.E. Meloan, "Food Analysis", A.V.I Publishing Company, INC West Port, Connecticut, U.S.A.

Reference Books:

1. Plummer, D.T. "An Introduction to Practical Biochemistry", Tata Mc Graw-Hill Publishing Co., New Delhi.2079.
2. Sadasivam, S. and Manickam, A. "Biochemical methods for Agricultural Sciences", New Age International Publisher, New Delhi,2096.
3. ManoRanjanKalia "Food Analysis and Quality Control", 1st Edition, Kalyani Publishers, New Delhi, 2002.
4. Jayaraman, J. "Laboratory Manual in Biochemistry", Wiley Eastern Publishers, New Delhi,2080.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
3	0	0	3

20A27302T PROCESSING OF CEREALS, PULSES & OILSEEDS

Course Objectives:

- To learn about the processing of major cereals and pulses.
- To gain knowledge about grain storage structure and handling devices.

Course Outcomes (CO):

- Students will get information about the classification of various grains
- Students also exposed to various processing methods and machinery used
- Students will learn value added products from all grains

UNIT - I **8 Hrs**

Importance of Cereals Pulses and Oilseeds, Composition, Structure and processing characteristics of Cereal grains, Legumes and Oilseeds, Post-harvest technology, Post processing practices for safe storage. Rice: Structure, types, composition, quality characteristics and physicochemical properties of Rice. Milling and parboiling of paddy, Curing and ageing of paddy and rice. Criteria and assessment of milling, cooking, nutritional and storage qualities of raw & parboiled rice. Processed rice products (flaked, expanded and puffed rice), By-products.

UNIT - II **12 Hrs**

Wheat-Structure, Composition, Types, quality characteristics for milling into flour and Semolina. Flour milling, Turbo grinding and air classification, Blending of flours, Flour grades and their suitability for baking purposes, Milling equipment and milled products (Dalia, Atta, Semolina and flour). Assessment of flour quality and characteristics, Macaroni products. Dough rheology- influence of flour constituents in dough rheology.

Baked products-Ingredients Technology and quality parameters: Bread, Biscuits, Cakes and Crackers.

UNIT - III **8 Hrs**

Other Cereals: Corn- Structure, types and composition. Dry and wet milling of Corn. Starch and conversion products. Processed corn products (popped corn, corn flakes etc.) Structure and composition of Barley, Malting of barley, Bajra, Jowar and other cereal grains and millets. Pearling of millets. Parched and snack products. Breakfast cereals – types and manufacturing methods.

UNIT - IV **10 Hrs**

Pulses: Pulses production, types, chemical composition, anti-nutritional factors, milling of pulses, milling equipment, factors affecting quality, secondary processing of pulses, processed products, fermented products, traditional products, Value addition; effect of processing on nutritive value.

UNIT - V **8 Hrs**

Processing of oil seeds for direct use and consumption, Oil extraction methods- mechanical (Ghani and Expellers) and chemical methods (solvent extraction), Processing of extracted oil: Refining, Hydrogenation, Interesterification. Processing of deoiled cake into protein concentrates and isolates, Texturized vegetable protein, Functional protein preparations. Peanut butter, Margarine and Spread.

Textbooks:

- K. Kulp and J. G. Ponte. Jr., "Hand Book of Cereal Science and Technology", 2nd Edition, CRC, 2000.
- G. Owens, "Cereals Processing Technology", 2nd Edition, Wood head Publishing, 2001.

Reference Books:

1. D.A.V. Dendy and B.J. Dobraszczyk, "Cereals and Cereal products: Chemistry and Technology", Vol. 4, Springer, 1st Edition, 2001.
2. B.O.Juliano, "Rice: Chemistry and Technology", 2nd Edition, AACC,1985.
3. Y.Pomeranz, "Wheat: Chemistry and Technology", 3rd Edition, AACC,1988.

4. A. Karleskind, “Oils and Fats manual”, 1st Edition, Lavoisier Publisher, Paris,2096.
5. R.H. Mathews, Marcel Dekker, “Legumes: Chemistry, Technology and Human Nutrition”, 1st Edition,2089.
6. D. Swer, “Bailey's Industrial Oil & Fat Products”, 5th Edition, John Wiley & Sons, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
3	0	0	3

20A27303T FLUID FLOW IN FOOD PROCESSING

Course Objectives:

- The basic concepts of fluid types and fluid-flow phenomena
- To enable the students to understand the concept and importance of friction factor by using
- To understand the application of friction losses through pipes
- To classify and select the pumps depending on suitability and acquire knowledge on power requirements in pumps

Course Outcomes (CO):

By the end of the course the students will be able to

- Gain knowledge on various types of fluids available and their classification with examples
- Acquires knowledge on different types of flow regimes that fluid can flow
- Know the applications and usage of Bernoulli's theory, Buckingham's Pi theorem, Hagen-Poiseuilli and Rabinowitsch-Mooney equation
- Gain the knowledge on significance of friction factor and their calculations
- Understand frictional losses through pipes and pipe fittings
- Have knowledge on selection of pumps and their performance evaluation

UNIT - I **8 Hrs**

Types of Fluids: Newtonian & Non-Newtonian Fluids-dilantant, pseudoplastic, bingham plastic, bingham pseudoplastic; classification of fluids based on time dependance: Thixotropic and rheopectic classification of fluids based on density Compressible and In compressible fluids.

UNIT - II **12 Hrs**

Fluid Flow: Laminar and turbulent flows, Reynolds Number; Equation of Continuity, Bernoulli's equation, applications of Bernoulli's equation, Cavitation, laminar and turbulent flow in pipes (Concept of Boundary Layer & Entrance Length)

UNIT - III **8 Hrs**

Friction Factor: Definition of Friction Factor; relationship between Friction factor and Reynolds Number by using Dimensionless analysis, Friction Factor: Derivation of friction factor for Laminar Flow by using Hagen-Poiseuille equation; Friction Factor: Turbulent Flow, Moody Chart, Rabinowitsch-Mooney equation: Non- Newtonian Fluids (Power Law Fluids); Generalized Reynolds Number; Friction Chart.

UNIT - IV **10 Hrs**

PressureLosses in Pipes & Flow Measurement: Energy equation for steady flow of fluids: Pressure, Kinetic & Potential Energy. Major Losses: Frictional Losses; Minor losses: Energy Losses due to sudden expansion, contraction & energy losses due to pipe fittings; Measurement of Flow in Pipes: Venturimeter, Pitot tube, Rotameter and others.

UNIT - V **8 Hrs**

Pumps, Pipes & Fittings: Classification of Pumps: Centrifugal pumps, Reciprocating pumps, Rotary Pumps; Pressure Head, Suction Head, Discharge Head, Net Positive Suction Head; Power requirement of Pump; Selection of Pumps & Performance Evaluation. Pipe & Pipe Fittings & their selection.

Textbooks:

1. D. G. Rao, Fundamentals of Food Engineering, Prentice-Hall of India, New Delhi, 2010
2. P.G. Smith, Introduction to Food Process Engineering, 2nd Edition, Lincoln, UK, 2010.

Reference Books:

1. Christie John Geankoplis. 2003. Transport Processes and Separation Process Principles (Includes Unit Operations), 4th Ed. Prentice-Hall, NY, USA.
2. R. Paul Singh and Dennis R. Heldman, Introduction to Food Engineering, 4th Edition, Academic Press, 2009.
3. Z. Berk, Food Process Engineering and Technology, Food Science and Technology, 1st Edition, International Series, Elsevier, 2009.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
3	0	0	3

20A27304 PRINCIPLES OF FOOD ENGINEERING

Course Objectives:

- To familiarize the importance and usage of units.
- To interpret the fundamental laws and principles and its application

Course Outcomes (CO):

- Students will learn the importance of units.
- Students will understand the basic laws and principles and its application in food engineering.

UNIT - I **8 Hrs**

Introduction to Food Engineering: Definition of terms, System of measurements, The S.I System, Conversion of Units. Steam Generation & Utilization: Concept of normal boiling point, Properties of Steam, Forms of Steam. Pressure-Enthalpy diagram, Problems; Boilers: Classification, Types, Criteria for selection, Maintenance & Applications.

UNIT - II **12 Hrs**

Basic principles of Physics & Chemistry: Ideal Gas law, Vander Waal's equation, Amagat's law, Dalton's law, Problems; Kinetic Theory of gases. Thermodynamics: Basic concepts, First law of thermodynamics, Second law of thermodynamics, Zero law of thermodynamics Refrigeration: Basic concepts, Joule-Thomson effect, Refrigerants, Problems, Refrigeration types (VCC, VAC), Applications.

UNIT - III **8 Hrs**

Humidity: Humidity & Relative Humidity, Saturation Humidity, Percentage Humidity, Psychometric chart – Utilization, problems; Humidifiers & Dehumidifiers; Applications.

Material balance and Energy balance in various unit operations – Problems, significance in food processing.

UNIT - IV **10 Hrs**

Dimensional Analysis, Fundamental -derived units. Conversion of Dimensional equations – Uses, Methods (Rayleigh's & Buckingham's) Examples: Nusselts Number, Reynolds number, Prandtl's number, Froude's number. Engineering properties of Food Materials: Mass- volume- area related properties of foods, rheological properties of solid foods, thermal properties of frozen & unfrozen foods, electrical conductivity of foods, dielectric properties of foods.

UNIT - V **8 Hrs**

Measurement & Control of Process Parameters: Various Process Parameters, On-line & Off-line parameters, Critical & non-critical parameters, Measurement of various parameters, controlling methods (Manual, Automatic & Computer control)

Textbooks:

1. R. Paul Singh and Dennis R. Heldman, "Introduction to Food Engineering". Academic Press, 4th Edition, 2009.
2. P.G. Smith, "Introduction to Food Process Engineering". Springer, 2nd Edition, 2011.

Reference Books:

1. J.M. Smith, H.C. Van Ness and M.M. Abbott "Introduction to Chemical Engineering Thermodynamics", 7th Edition, McGraw-Hill, Inc., NY, USA. 2005.
2. Z. Berk, "Food Process Engineering and Technology, Food Science and Technology", 1st Edition, International Series, Elsevier, 2009.
3. D. G. Rao, "Fundamentals of food engineering", Prentice-Hall of India, New Delhi, 2010.
4. R.K. Rajput. "Engineering Thermodynamics", 3rd Edition, Laxmi Publications (P) Ltd., Bangalore, 2007.
5. Warren L. McCabe, "Unit Operations of Chemical Engineering", 7th Edition, Julian Smith, Peter Harriott, McGraw-Hill, Inc., NY, USA, 2004.
6. Christie John Geankoplis "Transport Processes and Separation Process Principles" (Includes Unit Operations), 4th Edition, Prentice-Hall, NY, USA. 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
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20A27305FOOD ANALYSIS LAB

Course Objectives:

- To expertise the students to analyze the proximate composition and other important constituents present in the food.

Course Outcomes (CO):

By the end of the practical exercises, the students will be able to

- Adapt suitable method for food analysis
- Apply the knowledge of Techniques in Food Analysis,
- Differentiate between Qualitative identification and Quantitative estimations

List of Experiments:

1. Sampling plan; Sampling requirements, Sample collection and preparation for analysis procedures and methods
2. Determination of pH
3. Determination of moisture content of foods by oven drying and distillation methods
4. Determination of Total and Acid insoluble ash content in foods
5. Determination of crude fat content by solvent extraction methods in foods
6. Determination of crude Protein by Kjeldhal Lowry method & other methods
7. Determination of reducing and total sugar content in foods
8. Determination of crude fibre content in foods
9. Determination of specific mineral contents in foods such as Calcium, Iron, Phosphorus, Chloride etc.
10. Determination of specific vitamin content of food such as ascorbic acid, carotenes etc.
11. Determination of specific Natural and/ or added Colouring Matters in foods
12. Determination of specific added food Preservatives in foods.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
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20A27302P PROCESSING OF CEREALS, PULSES AND OIL SEEDS LAB

Course Objectives:

- Determination of parameters by qualitative and quantitative methods
- Study on some important unit operations used for some grains
- Preparation of standard food products.

Course Outcomes (CO):

- Students are exposed to learn various parameters determination and quantification
- Students will able to prepare and understand the technology involved in foods from grains
- Students will acquire more knowledge by visiting industries.

List of Experiments:

1. Determination of physical properties (Bulk Density, Porosity, Sphericity, Angle of repose, Test weight, Particle size, Sieve analysis) of different grains.
2. Estimation of Gluten content, sedimentation value, alcoholic acidity, water absorption capacity and Polenske value of wheat flour.
3. Determination of adulterant ($NaHCO_3$) in wheat flour/ Maida.
4. Determination of alkali score and gelatinization temperature of rice.
5. Traditional and improved pre-treatments and their effect on dehusking of some legumes.
6. Removal of anti-nutritional compounds from selected pulses and oilseeds.
7. Study of cooking quality of Dhal.
8. Pearling of millets.
9. Determination of yeast activity.
10. Estimation of different quality parameters of oils.
11. Determination of efficiency of oil extraction techniques (mechanical expelling and solvent extraction).
12. Preparation of Bread.
13. Preparation of Biscuits.
14. Preparation of Cookies.
15. Preparation of Cake.
16. Preparation of Rusk.
17. Preparation of Crackers.
18. Visit to a Bakery, Confectionery Unit
19. Visit to a working modern roller flour mill and FCI godowns.
20. Visit to working rice mill.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
0	0	3	1.5

20A27303P FLUID FLOW IN FOOD PROCESSING LAB

Course Objectives:

- To impart knowledge on coefficient of discharge, friction factor, pressure drop on different fluids.
- Importance of pipe fittings and application of various pumps in food industry.

Course Outcomes (CO):

By the end of the course the students will be able to

- Know the measurement of fluid pressure, measurement of discharge and measurement of time
- Know how to determine the Coefficient of discharge from the pitot tube experiment
- How to measure the water level from 'U' tube manometer.

List of Experiments:

1. To determine the coefficient of discharge of an orifice (or a mouth piece) of a given shape.
2. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number.
3. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
4. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
5. To study the variation of friction factor, 'f' for turbulent flow in smooth and rough commercial pipes.
6. To determine the loss coefficients for the pipe fittings.
7. To verify Bernoulli's equation experimentally.
8. To determine the flow rate and coefficient of discharge using Venturimeter.
9. Determination of discharge through Rotameter.
10. To determine the Reynolds number and types of flow (Laminar or Turbulent), the flow rate and coefficient of discharge using Orifice meter.
11. To determine losses due to pipe fitting, sudden enlargement and contraction.
12. Measurement of viscosity and surface tension of liquids.
13. To determine the characteristics of centrifugal pump and to find out total head, pump efficiency and overall efficiency of pump.
14. Study of various types of pipes and pipe fittings.
15. Study of different types of valves.
16. Study of reciprocating pump.
17. Determination of frictional coefficient of given pipe.

Online Learning Resources/Virtual Labs:

http://ce-iitb.vlabs.ac.in/exp7/Aim.html?domain=%20Chemical%20Engineering&lab=Chemical%20Engineering

https://eerc03-iiith.vlabs.ac.in/exp/reynolds/

https://eerc03-iiith.vlabs.ac.in/exp/bernoullis/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
1	0	2	2

20A27306 PRINCIPLES OF FOOD PRESERVATION

Course Objectives:

- Emphasis on importance of food technology into reduce the spoilage and improve the quality
- To explore the various preservation methods.

Course Outcomes (CO):

Upon completion of this course students should be able to understand

- The changes occurring during various food processing techniques
- Technologies involved in storage and preservation
- The effect of enzymes on spoilage reactions of foods.

UNIT - I **8 Hrs**

Definition and scope of Food Science and Technology, Historical development of food processing and preservation, general principles of food preservation. Degree of perishability of unmodified foods, Causes of quality deterioration and spoilage of perishable foods, intermediate moisture foods, wastage of foods.

UNIT - II **12 Hrs**

Preservation of foods by low temperatures: (A) Chilling temperatures: Consideration relating to storage of foods at chilling temperatures, Chilling injury, Applications and procedures, Controlled and Modified atmospheric storage of foods, Post storage Handling of foods.

(B) Freezing temperatures: Freezing process, Slow and quick freezing of foods; effect on foods, other occurrences associated with freezing of foods. Technological aspects of pre freezing, Actual freezing, Frozen storage and thawing of foods, Individual Quick Freezing.

UNIT - III **8 Hrs**

Preservation of foods by high temperatures: Basic concepts in thermal destruction of microorganisms D, Z and F values. Heat resistance and thermophilic microorganisms. Cooking, blanching, pasteurization and sterilization of foods. Extrusion, baking, roasting, frying, dielectric heating, ohmic, microwave and infrared heating. Assessing efficacy of thermal processing of foods, General process of canning of foods.

UNIT - IV **10 Hrs**

Preservation by water removal: (a) Principles, Technological aspects and application of evaporative concentration process; Freeze concentration and membrane process for food concentrations. (b) Principles, Technological aspects and application of drying and dehydration of foods, Cabinet, tunnel, belt, bin, drum, spray, vacuum, foam mat, fluidized-bed and freeze drying of foods.

UNIT - V **8 Hrs**

Chemical & Natural Preservatives: Classification, Principles, Radiations: Sources of radiations, units and dosages, effect on microorganisms and different nutrients; dose requirements for radiation preservation of foods., safe limits, irradiation mechanism and survival curve, technological aspects; applications of sugar and salt, antimicrobial agents, biological agents, Hurdle technology. Effects of various food processing operations on the nutritive value of foods.

Textbooks:

1. Norman N. Potter and J.H. Hotchkiss, Chapman and Hall, "Food Science", 5th Edition,2098.
2. P. J. Fellows, "Food processing technology: Principles and Practice", 3rd Edition, Taylor and Francis, 2009.

Reference Books:

1. M. Karel, O.R. Fennema and D.B. Lund, "Principles of Food Science-Part-II: Physical Method of Food Preservation", 2nd Edition, Marcel Dekkar Inc., 2001.
2. V. Kyzlink, "Principles of Food Preservation", 2nd Edition, Elsevier Press, 2003.

3. J. M. Jay, D. Van Nostrand, "Modern Food Microbiology", 7th Edition, 2005.

EXPERIMENTS:

1. Demonstration of various perishable food items and degree of spoilage
2. Preservation of food by high concentration of sugar
3. Preservation of food by using salt
4. Blanching of selected food items
5. Preservation of food by heat treatment- pasteurization
6. Demonstration of preserving foods under cold vs. freezing process
7. To study IQF processing of fruits/ vegetable
8. Drying of fruit slices pineapple slices, apple slices in cabinet drier
9. Effect of irradiation on sprouting of potatoes and onions
10. Preservation of food by using acidulants i.e. pickling by acid, vinegar or acetic acid
11. Preservation of food by using chemical preservatives
12. Preservation of bread, cake using mold inhibitors
13. Processing of foods using fermentation technique, i.e. preparation of sauerkraut
14. Study on ohmic heating system
15. Study on effect of high pressure on microbe
16. Visit to food processing industry

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-I Sem

L	T	P	C
3	0	0	3

(20A52201) UNIVERSAL HUMAN VALUES

(Common to all branches)

Course Objective:

The objective of the course is four fold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

COURSE TOPICS:

The course has 28 lectures and 14 practice sessions in 5 modules:

Unit 1:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Unit 2:

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Unit 3:

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): 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.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit 4:

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment 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.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Unit 5:

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Book

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

MOE OF CONDUCT (L-T-P-C 2-1-0-2)

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

OUTCOME OF THECOURSE:

By the end of the course,

- Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability.
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

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20A27401 FOOD BIOCHEMISTRY & NUTRITION

Course Objectives:

- At the end of this course, the student will have an idea about the various constituents of foods, sources, energy and nutritional requirements and their functions.

Course Outcomes (CO):

- Students will able to learn the usefulness of cells and organisms
- Students will understand the metabolic pathways
- Students will get information on types and importance of nutrients

UNIT - I **8 Hrs**

Concepts of food and nutrition: Definition of terms – nutrition, malnutrition (undernutrition, overweight, obesity), health and nutritional status, functions of food, basic food groups – energy yielding, body building and protective, nutrients supplied by food, nutritional needs – requirements and recommended allowances of foods under normal conditions for all age groups. Nutrients: Sources, functions, digestion, absorption, assimilation and transport of carbohydrates, proteins and fats in human beings.

UNIT - II **12 Hrs**

Mechanism of enzyme action Introduction to enzymes, coenzymes, regulation of enzymatic activity, enzyme kinetics, inhibition effects of pH, allosteric enzymes, derivation of Michaelis-Menten Equation. Nucleic acids Definition and composition of RNA and DNA, structure of various components, viz, bases and sugars, hydrolysis of nucleic acids, structure of RNA and double helical structure of DNA

UNIT - III **8 Hrs**

Metabolism of carbohydrates Biological role of carbohydrates, glycolysis and respiration (TCA cycle), production of ATP- a brief description of electron transport chain, oxidative and substrate phosphorylation. Metabolism of lipids Biological role of lipids, breakdown of triglycerides and phospholipids, β-oxidation of long chain fatty acids, ketosis, biosynthesis of fatty acids, triglycerides and phospholipids.

UNIT - IV **10 Hrs**

Metabolism of proteins Breakdown of proteins, transamination, deamination, decarboxylation, nitrogen fixation, urea cycle. Minerals Functions, sources, factors affecting absorption of minerals, absorption promoters – Vit C for Fe, absorption inhibitors – phytates, tannins, oxalates, effect of deficiency – Calcium, phosphorus, iron, zinc, iodine, fluorine and copper.

UNIT - V **8 Hrs**

Vitamins and hormones Classification, functions, sources, effects of deficiency, fat soluble vit (A,D,E,K), water soluble vitamin (thiamine, riboflavin, niacin, cyanocobalamin, folic acid, and ascorbic acid), relationship between vitamins and hormones in terms of their biological role. Physico chemical and nutritional changes during processing Changes during food processing treatment – drying and dehydration, irradiation, freezing, fermentation, canning, restoration, enrichment, fortification and supplementation of foods.

Textbooks:

David L. Nelson and Michael M. Cox. 2012. Lehninger Principles of Biochemisry, 6th Ed. Macmillan Learning, NY, USA.

2. Donald Voet and Judith G. Voet. 2011. Biochemistry, 4th Ed. John Wiley and Sons, Inc., NY, USA.

Reference Books:

1. Carolyn D. Berdanier, Elaine B. Feldman and Johanna Dwyer. 2008. Handbook of Nutrition and Food, 2nd Ed. CRC Press, Boca Raton, FL, USA.

2. Bob B. Buchanan, Wilhelm Gruissem and Russell L. Jones. 2002. Biochemistry & Molecular Biology of Plants. John Wiley and Sons, Inc., NY, USA.

3. Jeremy M. Berg, John L. Tymoczko, LubertStryer and Gregory J. Gatto, Jr. 2002. Biochemisry, 7th Ed. W.H. Freeman and Company, NY, USA.
4. Gaile Moe, Danita Kelley, Jacqueline Berning and Carol Byrd-Bredbenner. 2013. Wardlaw's Perspectives in Nutrition: A Functional Approach. McGraw-Hill, Inc., NY, USA.

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B.Tech (FT)– II-II Sem

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20A05406T INTRODUCTION TO PYTHON PROGRAMMING

Course Objectives:

This course aims at providing the student with the knowledge on

- To learn the fundamentals of Python
- To elucidate problem-solving using a Python programming language
- To introduce a function-oriented programming paradigm through python
- To get training in the development of solutions using modular concepts
- To introduce the programming constructs of python

Course Outcomes (CO):

At the end of the course, student will be able to

- Apply the features of Python language in various real applications.
- Select appropriate data structure of Python for solving a problem.
- Design object oriented programs using Python for solving real-world problems.
- Apply modularity to programs.

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.

UNIT - II

Case study: The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.

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,

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.

Case Study: Reading word lists, Search, Looping with indices.

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.

UNIT - IV

Dictionaries: A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.

Tuples: Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

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:

UNIT - V

Classes and Functions: Time, Pure functions, Modifiers, Prototyping versus Planning

Classes and Methods: Object oriented features, Printing objects, The init method, The strmethod, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation

Inheritance: Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.
The Goodies: Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args,

Textbooks:

1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.

Reference Books:

1. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill,2018.
2. Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE,2015.
3. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press,2019

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

L	T	P	C
3	0	0	3

20A27402T PROCESSING OF FRUIT AND VEGETABLES, SPICES AND PLANTATION CROPS

Course Objectives:

At the end of this course the students get an outline about

- Various methods intended for preserving fruits and vegetables.
- Different operations inferred in processing fruits and vegetables
- Technology behind intermediate moisture and minimally processed fruit and vegetable.

Course Outcomes (CO):

By the end of the course, the students will be able to

- Train the students in the field of Fruit and Vegetable Processing and enable the students learn different preservation techniques to curb post-harvest losses inthe field of agriculture.
- Learn processing of fruits & vegetables - different preservation techniques to improve theshelf life of seasonal fruits.
- Know history of spices, uses of spices, classification of processed spices according to marketing standards, packaging and different grades
- Learn about flavor development during processing, classification of spices according to economic importance, post-harvest technology and treatments, specifications for marketed products.

UNIT - I **8 Hrs**

Fruit and Vegetables Processing: Postharvest field operations including methods to reduce the post-harvest losses, Precooling, In-house packing, cold storage etc., General methods of preservation of fruits and vegetables. Canning of fruits and vegetables: Canning unit operations and machinery - Blanching: Method and its Importance. Precautions in canning, Spoilage of canned foods. Preservation by hurdle technology.

UNIT - II **12 Hrs**

Fruit and Vegetables Products: Jams, Jellies, Marmalades, Fruit beverages, Fruit Bars, Fruit Powders, Candies, Preserves, Crystallized fruit, Pickles, etc. Products from Jamun, Tamarind, Jack fruit, Wood apple, Tomato, Potato and Mushroom. Fruit juice concentrates: Methods of concentration, aroma recovery.

UNIT - III **8 Hrs**

Plantation crops: Primary and secondary processing of Coffee, Tea, Cocoa, Cashew nut, Areca nut & Vanilla, Value added products.

UNIT - IV **10 Hrs**

Spices: Classification of Spices, Primary and secondary processing of spices like Pepper, Ginger, Turmeric, Cardamom, Chilies, Cinnamon Coriander, Saffron etc. Value added products: Spice powders, Curry powders, Sterilized spices, Enriched Spices, Encapsulation, aqueous flavourants. Spice Oils & Oleoresins: Flavor extraction from spices by different methods. Estimation of principle constituents in spices & spice products, residual solvent in spice oleoresins.

UNIT - V **8 Hrs**

Herbs: Classification of herbs, Processing of Coriander, Curry leaves, Rosemary, Sage, Mint, Dill Spearmint, Basil, Borage, Thyme, etc and their health benefits. **Natural Colors:** Extraction techniques and color estimation from plant materials like Red beet, Safflower, blue grapes, Red chilies, Turmeric, Annatto etc. Food application and Stability studies of flavourant& colorants.

Textbooks:

1. A.K. Thompson., Fruit and Vegetables: Harvesting, Handling and Storage, Blackwell publishing, 2003.
2. Dauthy, M. E., Fruit and Vegetable Processing. FAO Agricultural Service Bulletin, 1st

Edition, International Book Distributing Co. Lucknow, India, 1997.
3. J. S. Pruthi, Spices & Condiments National Book Trust, 5th Edition, New Delhi, 2001.
4. R.P. Srivastava&Sanjeev Kumar., Fruit and Vegetable Preservation, 3rd revised & enlarged edition, IBDC, 2010.

Reference Books:

1. D.K. Salunkhe& S.S. Kadam., Handbook of Fruit Science and Technology: Production, Composition, Storage and Processing, 1st Edition, CRC Press, 2013.
2. J. W. Parry.,Spices: Morphology, History, Chemistry, Volume II, 2nd Edition, Chemical Publishing Co., New York 1969.
3. VijayaKhader, Preservation of Fruits and vegetables, 2nd Edition, Kalyani Publications, 2000.
4. W.V. Cruess, Commercial Fruit and Vegetable Products, 3rd Edition, AGROBIOS, India, 2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

L	T	P	C
3	0	0	3

20A27403T HEAT AND MASS TRANSFER

Course Objectives:

- To impart knowledge to students on different modes of heat transfer through extended surfaces, study of heat exchanges and evaporators. Basic concepts of mass transfer and mechanism of mass transfer operations like distillation, extraction, leaching, crystallization and drying.

Course Outcomes (CO):

- Students acquire knowledge from different modes of heat transfer, extended surfaces, boiling and condensation process and principles of heat exchangers which are very essential in dairy and food industries.
- Students are exposed to mass transfer laws and concerning unit operations and their principles, equipment used.

UNIT - I **8 Hrs**

Introduction to heat transfer and general concepts of heat transfer by conduction, convection and radiation. Conduction:through plane walls, cylindrical and spherical surfaces, composite layers, etc. steady state and unsteady state heat transfer.Insulation materials, critical and optimum insulation thickness. Extended surfaces, fins and their practical applications. Convection: Fundamentals of convection, Basic concepts and definitions, natural and forced convection.

UNIT - II **12 Hrs**

Radiation: Basic laws of heat transfer by radiation, black body and gray body concepts, view factors, Kirchoff's law, solar radiations, combined heat transfer coefficients by convection and radiation. Heat Transfer Equipment: Classification, principles and design criteria, types of exchangers, viz., double pipe, shell and tube, plate type, extended surface, Furnaces and their classification and application.

UNIT - III **8 Hrs**

Evaporation: Elementary principles, parts of evaporator, types of evaporators. Single and multiple effect evaporators and their area calculations, boiling point elevation, selection, types of energy use, thermo vapour recompression, mechanical vapor recompression. Fouling prevention, cleaning and hygiene. Applications in food processing.Mass Transfer Laws: Introduction, Fick's law, diffusion coefficients in gas, liquid and solid, numerical solution of steady state diffusion, Fick's 2nd law and unsteady state operation, mass transfer coefficients, interphase mass transfer, diffusion of gases in porous solids and capillaries. fugacity & water activity.

UNIT - IV **10 Hrs**

Drying: types of drying, constant and falling rate, equilibrium moisture content, drying curve and drying time, types of dryers. Solid-liquid extraction: Countercurrent, co-current, multistage continuous contact operations. Liquid-liquid extraction: Ternary liquid–liquid equilibrium and tie line data, choice of solvents, extraction equipment. Leaching principle and equipment.Gas Absorption: Equilibrium solubility of gases in liquids, ideal and non-ideal solutions. Equipment. Concept of NTU, HTU and HEPT. Ideal stage and stage efficiency.

UNIT - V **8 Hrs**

Distillation: Vapour liquid equlibria, boiling point diagram, relative volatility, enthalpy concentration diagram, flash vapourization, differential distillation, steam distillation, azeotropic distillation and extractive distillation for binary system. Continuous rectification, McCabe Thiele method, bubble cap distillation column. Crystallization-rate of crystallization, crystallization equilibrium. Super saturation – Crystallizers type – batch and continuous. Adsorption and Ion Exchange: Types of Adsorption, nature of adsorbents, adsorption equilibrium, adsorption of a single component from a gas mixture/liquid solution. Principle of ion exchange, equilibria and rate of ion-exchange.

Textbooks:

1. Coulson, J.M. & Richardson, J.F. “Chemical Engineering: Vol-1”, 6th ed. Butterworth-Heinemann (1999)
2. Holman, J.P.: “Heat Transfer” 9 th ed. McGraw Hill (1989).

Reference Books:

1. McAdams W.H. “Heat Transmission”, 3rd ed., McGraw-Hill, (1954)
2. Kern D.Q. “Process Heat Transfer” McGraw Hill Book (1950)
3. Badger W.L. &Bancharo J.T.,” Introduction to chemical engineering” Tata McGraw Hill

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

L	T	P	C
3	0	0	3

20A52301 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to All branches of Engineering)

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 structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements

Course Outcomes (CO):

- Define the concepts related to Managerial Economics, financial accounting and management.
- Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
- Apply the Concept of Production cost and revenues for effective Business decision
- Analyze how to invest their capital and maximize returns
- Evaluate the capital budgeting techniques
- Develop the accounting statements and evaluate the financial performance of business entity.

UNIT - I **Managerial Economics**

Introduction – Nature, meaning, significance, functions and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT - II **Production and Cost Analysis**

Introduction – Nature, meaning, significance, functions and advantages. 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 **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

UNIT - IV **Capital Budgeting**

Introduction – Nature, meaning, significance, functions and advantages. Types of 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)

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.

Textbooks:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

Reference Books:

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.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt

https://www.slideshare.net/rossanz/production-and-cost-45827016

https://www.slideshare.net/darkyla/business-organizations-19917607

https://www.slideshare.net/balarajbl/market-and-classification-of-market

https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396

https://www.slideshare.net/ashu1983/financial-accounting

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

L	T	P	C
3	0	0	3

(20A52302) ORGANISATIONAL BEHAVIOUR
(Humanities Elective-I)

Course Objectives:

- To enable student's comprehension of organizational behavior
- 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 :

- 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 to Organizational Behavior

Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective -Understanding Individual Behaviour –Attitude -Perception - Learning – Personality.

UNIT II Motivation and Leading

Theories of Motivation- Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theory of expectancy – Mc Cleland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory – Locke's goal setting theory– Alderfer's ERG theory .

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.

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 decision making - Team building - Conflict in the organization– Conflict resolution

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

Textbooks:

1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12 Th edition 2011
2. P Subba Ran, Organisational Behaviour, Himalya Publishing House 2017

Reference Books:

1. McShane, Organizational Behaviour, TMH 2009
2. Nelson, Organisational Behaviour, Thomson, 2009.
3. Robbins, P. Stephen, Timothy A. Judge, Organisational Behaviour, Pearson 2009.
4. Aswathappa, Organisational Behaviour, Himalaya, 2009

Online Learning Resources:

httphttps://www.slideshare.net/Knight1040/organizational-culture-9608857s://www.slideshare.net/AbhayRajpoot3/motivation-165556714
https://www.slideshare.net/harshrastogi1/group-dynamics-159412405
https://www.slideshare.net/vanyasingla1/organizational-change-development-26565951

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

L	T	P	C
3	0	0	3

20A52303Business Environment

(Common to All branches of Engineering)

Course Objectives:

- To make the student to 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 Outcomes (CO):

- 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.

UNIT - II **Fiscal & Monetary Policy**

Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - 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.

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.

UNIT - IV **World Trade Organization**

Introduction – Nature, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - GATT -Agreements in the Uruguay Round –TRIPS, TRIMS - Disputes Settlement Mechanism - 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, Introduction to international finance.

Textbooks:

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.

Online Learning Resources:

https://www.slideshare.net/ShompaDhali/business-environment-53111245

https://www.slideshare.net/rbalsells/fiscal-policy-ppt

https://www.slideshare.net/aguness/monetary-policy-presentationppt

https://www.slideshare.net/DaudRizwan/monetary-policy-of-india-69561982

https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt

https://www.slideshare.net/viking2690/wto-ppt-60260883

https://www.slideshare.net/prateeknepal3/ppt-mo

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

L	T	P	C
0	0	3	1.5

20A05406P PYTHON PROGRAMMING LABORATORY

Course Objectives:

- To train the students in solving computational problems
- To elucidate solving mathematical problems using Python programming language
- To understand the fundamentals of Python programming concepts and its applications.
- To understand the object-oriented concepts using Python in problem solving.

Course Outcomes (CO):

By the end of the course the students will be able to

- Design solutions to mathematical problems.
- Organize the data for solving the problem.
- Develop Python programs for numerical and text based problems.
- Select appropriate programming construct for solving the problem.
- Illustrate object oriented concepts.

List of 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. Using turtles concept draw a wheel of your choice
5. Write a program that draws Archimedean Spiral
6. The letters of the alphabet can be constructed from a moderate number of basic elements,

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.

7. 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.

8. 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.
9. Write a program that evaluates Ackermann function
10. The mathematician Srinivasa Ramanujan found an infinite series that can be used to generate a numerical approximation of $1/\pi$:
    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.

11. 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.
12. Given a text of characters, Write a program which counts number of vowels, consonants and special characters.
13. 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.
14. Given rows of text, write it in the form of columns.
15. Given a page of text. Count the number of occurrences of each latter (Assume case insensitivity and don't consider special characters). Draw a histogram to represent the same
16. 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

18. Write a program that reads a file, breaks each line into words, strips whitespace and punctuation from the words, and converts them to lowercase.
19. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of-copyright book in plain text format. Read the book you downloaded, skip over the header information at the beginning of the file, and process the rest of the words as before. Then modify the program to count the total number of words in the book, and the number of times each word is used. Print the number of different words used in the book. Compare different books by different authors, written in different eras.
20. Go to Project Gutenberg (http://gutenberg.org) and download your favorite out-of-copyright book in plain text format. Write a program that allows you to replace words, insert words and delete words from the file.
21. 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.
22. Consider turtle object. Write functions to draw triangle, rectangle, polygon, circle and sphere. Use object oriented approach.
23. Write a program illustrating the object oriented features supported by Python.
24. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorising them into distinction, first class, second class, third class and failed.
25. 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.
26. 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)

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. Dainel Y.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

L	T	P	C
0	0	3	1.5

20A27402P PROCESSING OF FRUIT AND VEGETABLES, SPICES AND PLANTATION CROPS LAB

Course Objectives:

- Estimation of preservatives like benzoic acid and SO_2, different processed products from fruit and vegetables and each operation importance.

Course Outcomes (CO):

By the end of the course the students will be able to

- Know how to find out heat transfer coefficient, emissivity, conductivity, heat flux etc.
- Know how to find out steam economy in evaporators
- Students will understand the separation techniques, significance of water activity, working principle of various mass transfer equipment.

List of Experiments:

1. Estimation of benzoic acid & SO_2
2. Pectin determination in fruits and vegetable products.
3. Preparation fruit juices e.g. carambola, orange, pineapple, mango etc.
4. Canning of fruits and vegetables
5. Extraction of Pectin (identification pectin rich foods, chemistry and interaction of pectin with other components)
6. Preparation of jams and jellies, marmalade, crystallized & glazed fruit, preserves and candies (knowledge on selection of fruits)
7. Preparation of Syrup, Squash, Crush
8. Preparation of tutti-frutti
9. Preparation of pickles, chutneys
10. Preparation of tomato products
11. Extraction of Papain
12. Drying of fruit and vegetables (Soup powders, dried products)
13. Visit to a Canning Plant
14. Visit to Fruits and Vegetable processing industries; processing of Mushrooms.

Online Learning Resources/Virtual Labs:

1. http://vmt-iitg.vlabs.ac.in/Binary_vapour_liquid_equilibrum(theory).html
2. http://vmt-iitg.vlabs.ac.in/Rotary_dryer(theory).html
3. http://vmt-iitg.vlabs.ac.in/Forced_draft_tray_dryer(theory).html
4. http://ce-iitb.vlabs.ac.in/exp8/Aim.html?domain=Chemical%20Engineering&lab=Chemical%20Engineering%20Lab
5. https://vlab.amrita.edu/?sub=1&brch=194&sim=802&cnt=1

https://vlab.amrita.edu/?sub=1&brch=194&sim=354&cnt=1

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

L	T	P	C
0	0	3	1.5

20A27403P HEAT AND MASS TRANSFER LAB

Course Objectives:

- This course enables the students to under the heat transfer operations that takes place in food industry in better way. It also helps to study the mass transfer operations and their principles in more realistic approach.

Course Outcomes (CO):

By the end of the course the students will be able to

- Know how to find out heat transfer coefficient, emissivity, conductivity, heat flux etc.
- Know how to find out steam economy in evaporators
- Students will understand the separation techniques, significance of water activity, working principle of various mass transfer equipment.

List of Experiments:

1. To find the thermal conductivity of metallic rod at different temperature and draw the temperature profile for steady and unsteady state conduction.
2. To find out the thermal conductivity of insulating powder.
3. To find the emissivity of grey plate with respect to black plate
4. To find the heat transfer coefficient for parallel and counter current flow condition for a Double pipe heat exchanger
5. To study the shell & Tube heat exchanger and find the heat duty and over all heat transfer coefficient for parallel flow condition.
6. To study the shell & Tube heat exchanger and find the heat duty and over all heat transfer coefficient for counter flow condition.
7. Psychrometric chart and psychrometers.
8. Determination of depression of freezing point
9. Determination of Boiling point elevation and solute concentration
10. Determination of overall mass transfer coefficient based on continuous and dispersed phase
11. Studies on steam distillation
12. Separation factors of the experiments with liquid – liquid extraction.
13. Separation factors of the experiments with solid –liquid extraction.
14. Separation factors of the experiments with ion exchange.
15. Studies on Bubble cap/ tray/ fractional column

Online Learning Resources/Virtual Labs:

1. Binary vapor liquid equilibriumhttp://vmt-iitg.vlabs.ac.in/Binary_vapour_liquid_equilibrum(theory).html
2. Rotary Dryerhttp://vmt-iitg.vlabs.ac.in/Rotary_dryer(theory).html
3. Forced draft tray dryerhttp://vmt-iitg.vlabs.ac.in/Forced_draft_tray_dryer(theory).html
4. Heat transfer in a double pipe heat exchangerhttp://ce-iitb.vlabs.ac.in/exp8/Aim.html?domain=Chemical%20Engineering&lab=Chemical%20Engineering%20Lab
5. Heat Transfer by Radiationhttps://vlab.amrita.edu/?sub=1&brch=194&sim=802&cnt=1
6. Newton's Law of Coolinghttps://vlab.amrita.edu/?sub=1&brch=194&sim=354&cnt=1

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

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20A27404 BASIC MICROBIOLOGY

Course Objectives:

- To learn the basic microbiological classification and microbial techniques.
- To enable students to gain knowledge on various microbial cultures and their growth factors.

Course Outcomes (CO):

By the end of the course, students will learn

- Significance and importance of microbiology
- Morphology of various microorganisms
- Methods used for Control of microorganisms and preservation of pure cultures

UNIT - I **8 Hrs**

Evolution and scope of microbiology; History of microbiology; Classification of microorganisms, Applied areas of microbiology; Microscopy – Optical & Electron- Optical: Bright field, dark field, ultraviolet, phase contrast, fluorescent; Electron- Scanning electron microscopy, Transmission electron microscopy; Morphology, general characteristics & Reproduction of algae; Morphology general characteristics and reproduction of fungi and molds.

UNIT - II **12 Hrs**

Morphology general, characteristics, structure, classification, identification, reproduction, nutrition and growth of bacteria, bacteria genetics; bacteria recombination; Bacterial conjugation, transduction; Bacterial transformation.

UNIT - III **8 Hrs**

Mutations: Types of mutations, mutagenesis; Mutation rate, repair of mutations; Phenotypes of bacterial mutants; Designation of bacterial mutants.

UNIT - IV **10 Hrs**

Viruses – Structure, shape classification based on nucleic acid; replication and multiplication; food borne viruses.

UNIT - V **8 Hrs**

Factors affecting growth of microorganism, Intrinsic factors and Extrinsic factors; Identification of bacteria-bacteria straining, estimating members cell counts, viable , plate counts; Pure culture: Definition, methods of isolation, preservation techniques; control of microorganisms by physical, chemical, antibiotic and other chemotherapeutic agents.

Textbooks:

1. M.J., Pelczar, E.C.S. Chan and N.R. Krieg. “Microbiology”. McGraw-Hill New York 1993.
2. W.C Frazier,. and D.C Westhoff,. “Food Microbiology”. 4th Edition. Tata McGraw Hill Publishing Co. Ltd., New Delhi 2008.

Reference Books:

1. RY Stainier, JL ML Ingraham, Wheelis&PR.Painter “General Microbiology”. MacMillan, 2003.
2. George J Banwart, “Basic Food Microbiology”. 2nd Edition, International Thomson Publishing, 1989.
3. S S Purohit “Microbiology Fundamentals and Applications”. 7th Edition, Agro Botanical Publishers, 1998.
4. M R Adams & M O Moss “Food Microbiology”. 2nd Edition, Athenaeum Press Ltd, 2006.

5. James M Jay "Modern Food Microbiology". 4th Edition, CBS Publishers and Distributors, 2005.

BASIC MICROBIOLOGY LAB:

1. Methods of Sterilization
2. Media Preparation-Broth, deep, slant and plate
3. Pure Culture techniques- introduction and Streaking (Continuous and quadrant)
4. Cultural Characteristics in broth and solid media
5. Microscopy- introduction
6. Motility determination-soft agar deeps and Hanging drop method
7. Staining techniques- Simple staining
8. Negative Staining
9. Gram staining
10. Endospore Staining

Online Learning Resources/Virtual Labs:

https://vlab.amrita.edu/?sub=3&brch=73&sim=213&cnt=1

https://vlab.amrita.edu/?sub=3&brch=73&sim=697&cnt=1

https://vlab.amrita.edu/?sub=3&brch=73&sim=1338&cnt=1

https://vlab.amrita.edu/?sub=3&brch=73&sim=208&cnt=1

https://vlab.amrita.edu/?sub=3&brch=73&sim=1105&cnt=1

https://vlab.amrita.edu/?sub=3&brch=73&sim=1338&cnt=1

https://vlab.amrita.edu/?sub=3&brch=73&sim=212&cnt=1

https://vlab.amrita.edu/?sub=3&brch=76&sim=1109&cnt=1

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– II-II Sem

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20A99401Design Thinking for Innovation
(Common to All branches of Engineering)

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, Reliability 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

COMMUNITY SERVICE PROJECT

……Experiential learning through community engagement

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in a 6 weeksfor the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty incharge.
- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
    - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
    - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
        - Agriculture
        - Health
        - Marketing and Cooperation
        - Animal Husbandry
        - Horticulture
        - Fisheries
        - Sericulture
        - Revenue and Survey
        - Natural Disaster Management
        - Irrigation
        - Law & Order
        - Excise and Prohibition
        - Mines and Geology
        - Energy
        - Internet
        - Free Electricity
        - Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals
- New energy, enthusiasm and perspectives applied to community work
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students

1. **Water facilities and drinking water availability**
2. **Health and hygiene**
3. **Stress levels and coping mechanisms**
4. **Health intervention programmes**
5. **Horticulture**
6. **Herbal plants**
7. **Botanical survey**
8. **Zoological survey**
9. **Marine products**
10. **Aqua culture**
11. **Inland fisheries**
12. **Animals and species**
13. **Nutrition**

14. **Traditional health care methods**
15. **Food habits**
16. **Air pollution**
17. **Water pollution**
18. **Plantation**
19. **Soil protection**
20. **Renewable energy**
21. **Plant diseases**
22. **Yoga awareness and practice**
23. **Health care awareness programmes and their impact**
24. **Use of chemicals on fruits and vegetables**
25. **Organic farming**
26. **Crop rotation**
27. **Floury culture**
28. **Access to safe drinking water**
29. **Geographical survey**
30. **Geological survey**
31. **Sericulture**
32. **Study of species**
33. **Food adulteration**
34. **Incidence of Diabetes and other chronic diseases**
35. **Human genetics**
36. **Blood groups and blood levels**
37. **Internet Usage in Villages**
38. **Android Phone usage by different people**
39. **Utilisation of free electricity to farmers and related issues**
40. **Gender ration in schooling lvel- observation.**

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmesare;

Programmes for School Children

1. Reading Skill Programme (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Programme on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Womens' Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps

4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programmes on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programmes for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programmes

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programmes in consonance with the Govt. Departments like –
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. Revenue and Survey
    ix. Natural Disaster Management
    x. Irrigation
    xi. Law & Order
    xii. Excise and Prohibition
    xiii. Mines and Geology
    xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.
- An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. **Preliminary Survey (One Week)**
   - A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
   - A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
   - The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

2. **Community Awareness Campaigns (One Week)**
   - Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. **Community Immersion Programme (Three Weeks)**

   Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

4. **Community Exit Report (One Week)**
   - During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks work to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

   Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I Sem **L T P C**

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(20A27501T) MILK AND MILK PRODUCTSPROCESSING

Course Objectives:

- To impart knowledge to the students on milk and milk products processing, manufacturing of indigenous milk products, packaging and storage of milk and milk products.

Course Outcomes

By the end of the course, the students will be able to

- Know about milk, its constituents, nutritive value, collection and its hygienic handling practices
- Study about Pasteurization, Homogenization and Sterilization of milk.
- Learn about manufacture of cream, butter, ghee, yoghurt, cheese, ice-cream, indigenous milk products and milk confectionery

UNIT I

Fluid Milk: Composition of milk and factors affecting it. Physico-chemical characteristics of milk and milk constituents. Production and collection, cooling and transportation of milk. Tests for milk quality and Adulteration. Pasteurization and Sterilization: Process and equipment for milk pasteurization, direct and indirect sterilization; Ultra - High - Temperature (UHT) sterilization. Fouling of pasteurizers and sterilizers. Aseptic packaging, dairy plant sanitization.

UNIT II

Homogenizers: principle of operation, design calculation for laminar and turbulent regimes, technology of homogenized milk production. Technology and standards of commercial liquid milk products: Toned, Double Toned Products, Reconstituted, Recombined, Standardized and Fermented Milks etc, FSSAI Specifications. Dairy Chemistry & Microbiology: Roles of lipids, proteins, carbohydrates, minerals, vitamins and enzymes, importance of psychophilic, mesophilic and thermophilic spoilage organisms in storage.

UNIT III

Dairy Products Manufacturing: Process Technology and standards of manufacturing of Fermented Products like dahi, shrikhand; lassi; mattha/Chhas and Other Milk Products (Casein, Whey Proteins, Lactose Etc.). Manufacturing of Indigenous dairy products like milk based puddings/ desserts- kheer; payasam; rabri, rasagulla, paneer, Channa, Khoa, Kalakhand, FSSAI Specifications.

UNIT IV

Definition, Classification, Composition and physico-chemical properties of Cream. Production processes and quality control. Butter: Definition, Classification, Composition and methods of manufacture, Packaging and storage. Butter oil/Ghee. Ice cream: History, Definition, Classification and Composition, Constituents and their role. Preparation of mixes and freezing of Ice cream, Overrun, Judging, Grading, and defects of Ice cream, FSSAI Specifications.

UNIT V

Evaporated and Condensed milk: Method of manufacture, Packaging and storage. Defects, Causes and prevention. Roller and Spray Drying of milk solids. Instantization. Flowability, Dustiness, Reconstituability, Dispersability, Wettability, Sinkability and appearance of milk powders. Manufacture of Casein, Whey protein, Lactose from milk or use in formulated foods, FSSAI Specifications.

Textbooks:

1. Outlines of dairy technology, Sukumar De. Oxford University Press. New Delhi.
2. P. Walstra, J.T.M.Wouters and T.J. Geurts, "Dairy Science Technology", CRC press, 2nd Edition, 2006.

References:

1. E. Spreer, "Milk and Dairy Product Technology", 2nd Edition, Marcel Dekker, 1998.
2. R.K. Robinson, "Modern Dairy Technology, Vol. 1: Advances in Milk Processing", 2nd Edition, Aspen Publishers, 1999.

3. R. K. Robinson, "Modern Dairy Technology, Vol. 2: Advances in Milk Products", , 2nd Edition, Aspen Publishers1996.
4. Sukumar De, "Outlines of Dairy Technology", 3rd Edition, Oxford University Press, 2006.
5. C. Eckles, W. Combs, and H. Macy, "Milk and Milk Products", 3rd Edition, Tata McGraw Hill,2003.
6. E. H. Marth and J. L. Eteele, "Applied Dairy Microbiology", 2nd Edition, Marcel Dekker, 2001.
7. P. Walstra, T.J. Geurts, A.Noomen, and J.S. Van Boekel, "Dairy Technology: Principles of Milk Properties and Processing", Marcel Dekker, Illustrated Edition, 1999

AWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I Sem

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(20A27502) BAKERY & CONFECTIONARY PRODUCTS PROCESSING

Course Objectives

- To impart knowledge to the students on majour/ minor ingredients, functions of proteins, carbohydrates, lipids, enzymes.
- To understand the students on bread making process, bread spoilage factors, Gums and Jellies, and Cocoa bean Processing.

Course Outcomes

By the end of the course, the students will be able to

- Know about majour/ minor ingredients, functions of proteins, carbohydrates, lipids, enzymes.
- Study about bread, gums and jellies, and cocoa bean making process, and bread spoilage factors, Processing.
- Learn about Bread, biscuits, chewing gum stypes, quality assessment and formulations

UNIT1

Majoringredientsandminoringredients:wheatflour,componentsandfunctions; proteins, carbohydrates, lipids, enzymes, sweeteners and shortenings, functions, sources, types and mechanisms.Yeastfunctions,typesandfactorsinfluencingthefermentation.Yeastfoods, enzymaticsupplements,oxidizingagents,salt,anddairyandeggproductsmoldinhibitors, dough strengtheners/ softeners and enrichment. Miscellaneous flours (rye).Bread types, quality assessment and formulations.

UNIT II

Bread making process: straightd ough, rapid processing ,mechanical dough development. Mixing and dough processing; functions of mixing, mixer types, fermentation, dough transfer system, doughmakeup; dividing rounding and pre- moulding, first proving, moulding, panning and proving. Process developments. Baking process, stages, baking reaction sand bread cooling, thermal reactions keeping properties of bread and related products. Bread spoilage and staling, factors and control measures.

UNITIII

Biscuits; biscuits, cookie, crackers, granulation, chemical leaveners. Baking powder, function, composition,andreactiverates,neutralizingvalue.Preparationofbiscuitsdough'smixingobjectives,mixertypes,fermentationofshapeddoughpieces.Biscuitbaking,heattransfer mechanism, changes during baking, cooling, and packaging.

UNIT IV

GumsandJellies:TechnologyandChemistryofHydrocolloids,Hydrocolloidpretreatmentprocesses,Liquorpreparation,Production(Shaping, Drying),Finishing treatments, Faults, CausesandCures.ChewinggumTechnology:Ingredients,Chewingproperties,Formulation, Processing methods. Countline Products: Ingredients, Formulation, Processing methods.

UNITV

Cocoa beanProcessing:Harvesting,Fermentation,Drying,Roasting.Cocoamass,Cocoa butter and Cocoa powder. Chocolate Manufacture: Raw materials used, Particle size reduction, Counching, Tempering, Enrobing, Moulding, Cooling, Panning and Packaging.

Textbooks:

1. Khetarpaul, N. (2005). Bakery Science and Cereal Technology. Daya Books.
2. Kent, N. L. (1966). Technology of Cereals, with special reference to wheat.
3. Scott J.H. 1951. Flour Milling Process. Chapman & Hall.
4. Hui, Y. H., Corke, H., De Leyn, I., Nip, W. K., & Cross, N. A. (Eds.). (2008). Bakery Products: Science and Technology. John Wiley & Sons.

References:

1. Faridi, H., &Faubion, J. M. (2012). Dough Rheology and Baked Product Texture. Springer Science & Business Media.
2. Cauvain, S. P., & Young, L. S. (2008). Baked Products: Science, Technology and Practice. John Wiley & Sons.

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B.Tech (FT)– III-I Sem

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(20A27503T) FOOD PACKAGING

Course Objectives:

- Need for packaging of foods
- Different packaging materials, packaging machinery
- Recent advances in food packaging and packaging regulations

Course Outcomes: By the end of the course, the students will be able to know

- About the importance of food packaging
- About different types of packaging materials such as paper, glass, metal & plastics
- About advanced packaging techniques and packaging machinery

UNIT I

Introduction: Importance and functions of food packaging, history of food packaging, forms of packaging-rigid, semi-rigid, and flexible, levels of packaging – primary, secondary, tertiary and quaternary, tests on packaging materials-mechanical strength (tensile, elongation at break, notchand tear), gas and water vapor transmission rates.

UNIT II

Paper: Types of paper and paperboards, paper production (pulping, beating, refining, converting), properties and applications in food packaging.

Glass: composition, properties, manufacturing and applications in food packaging.

Metal: Tinplate, tin-free steel, and aluminum containers - manufacturing, corrosion, protective coatings and applications in food packaging.

UNIT III

Plastic packaging: Thermoplastics &thermosetting plastics, merits & demerits of plastics, polyethylene terephthalate, polyolefines (polyethylene, polypropylene), polyvinyl chloride, polystyrene, polycarbonate, Nylon – structure, mechanical, sealing, barrier properties, recycling symbols, oriented, co-extruded, laminated, metalized films and applications in food packaging.

UNIT IV

Packaging machinery: Vacuum packaging, shrink, stretch packaging, form-fill & sealing machine.

Selection of packaging material for different foods: cereals, bakery products, fruits, vegetables, spices, Oils and Fruit &Carbonated Beverages.

UNIT V

Advances in Food Packaging: Active packaging- absorbers, emitters, antimicrobial, antioxidant systems. Intelligent Packaging – Time-temperature indicators, freshness indicators, radio frequency identification tags (RFIDs).

Biodegradable packaging, edible packaging,packaging and labeling regulations (FSSAI).

Packaging waste management: hierarchy of waste management, composting and biodegradation.

Textbooks:

1. G. L. Robertson,Food Packaging “Principles and Practices” 3rdEdition, CRC Press, 2013.
2. J.H. Han, “Innovation in Food Packaging.”, 1st Edition, Elsevier Publications, 2005.

References:

1. R. Coles, D. McDowell and M. J. Kirwan, “Food Packaging Technology”. 1stEdition CRC Press, 2003.
2. R. Ahvenainen, “Novel Food Packaging Techniques”. 1stEditionnWoodhead Publishing, 2003.
3. D.S. Lee, K. L. Yam, and L. Piergiovanni, “Food Packaging Science and Technology”. 1st Edition, CRC Press, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I Sem

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(20A27504a) FOOD NANOTECHNOLOGY
(PROFESSIONAL ELECTIVE-I)

Course Objectives:

- To understand nanotechnology, synthesis and characterization of nanomaterials, nanoscale delivery systems and regulatory aspects in foods.

Course Outcomes: By the end of this course students will attain

- Understand nanotechnology, natural and engineered nanoparticles in food
- Knowledge about synthesis and characterization ofnanomaterials.
- Knowledge ofnanoscale delivery systems and risk assessment-regulatory approaches to nanotechnology in food.

UNIT I

Introduction: Definition of nanotechnology, a brief history of nanotechnology, potential applicationsto food, natural nanostructures in food, use of engineered nanoparticles in food.

UNIT II

Synthesis of Nanomaterials: Top-down and bottom-up approaches – Mechanical, Chemical and Biological methods- Characterization of Nano materials: Powder X-ray diffraction, Scanning electron microscopy, Transmission electron microscopy, Dynamic light scattering- Infra-red spectroscopy

UNIT III

Nanoscale delivery systems: Nanoencapsulation- Need for nanoencapsulation- techniques for Nanoencapsulation:Liposome, Nanoemulsion, solid lipid nanoparticles- preparation, stability and applications in the food industry

UNIT IV

Nanotechnology for food quality and safety:nanomaterials as antimicrobial agents, nanosensors for the detection of food contaminants,food spoilage, and pathogenidentification.

UNIT V

Regulatory aspects of Nanotechnology in foods: European Union(EU) &non- EU regulation, regulatory aspect related to nanoscale food ingredients, food additives and food contactmaterials (FCM's).

Textbooks:

1. Padua G. W., Wang Q., "Nanotechnology Research Methods for Foods and Bioproducts", Wiley-Blackwell 2012.
2. Fulekar M.H., "Nanotechnology - Importance and Applications", Wiley Publications 2019.

References:

1. Q. Huang, "Nanotechnology in Food, Beverage and Nutraceutical Industries", Woodhead publishing 2012.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I Sem

L	T	P	C
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(20A27504b) FOOD SAFETY MANAGEMENT SYSYTEM
(PROFESSIONAL ELECTIVE-I)

Course Objectives:

- To understand the general aspects of food safety management system.
- To study the importance of implementing Food safety management systems in industries

Course Outcomes: At the end of the course student will gain

- Knowledge on various food safety and regulatory aspects, Food standards regulatory bodies etc.
- Understand Indian and Food Regulatory Regime (Existing and old), FSSAI, PFA Act and Rules
- AcquireCustoms Act and Import Control Regulations, Other Voluntary and mandatory product specific regulations.
- Know the necessity of Concept and Implementation of HACCP in a food premises.

UNIT I

Introduction, concept of food safety and Food Security. Indian and Food Regulatory Regime (Existing and old), FSSAI, PFA Act and Rules, Food Licensing and Registration System, Food Import Clearance System. Food hazards and contaminations - biological (bacteria, viruses and parasites), chemical (toxic constituents / hazardous materials) pesticides residues / environmental pollution / chemicals) and physical factors. Preventive food safety systems - monitoring of safety, wholesomeness and nutritional quality of food. Prevention and control of microbiological and chemical hazards.

UNIT II

Food Safety and Standards Act, 2006, Food Safety Standards Regulation, Essential Commodities Act, 1955, Global Scenario, Codex Alimentarius, WHO/FAO Expert Bodies (JECFA/JEMRA/JMPR). Food safety inspection services (FSIS) and their utilization. Legal Metrology act, Weight and Measures act.

UNIT III

Introduction to OIE and IPPC, Other International Food Standards (e.g. European Commission, USFDA etc). WTO: Introduction to WTO Agreements: SPS and TBT Agreement, Export and Import Laws and Regulations, Export (Quality Control and Inspection) Act, 1963. Customs Act and Import Control Regulations, Other Voluntary and mandatory product specific regulations, Other Voluntary National Food Standards: BIS Other product specific standards; AGMARK. Nutritional Labeling, Health claims.

UNIT IV

Risk assessment studies: Risk management, risk characterization and communication, risk assessment tools and techniques. Concept and Implementation of HACCP in a food premises.

UNIT V

Voluntary Quality Standards and Certification. GMP, GHP, GAP, Good Animal Husbandry Practices, ISO 9000, ISO 22000, ISO 14000, ISO 17025, PAS 22000, FSSC 22000, BRC, BRCIOP, IFS, SQF 1000, SQF 2000. Role of NABL, CFLS. Halal & Kosher Standard.

Textbooks:

1. Singal R.S., “Handbook of Indices of Food Quality and Authenticity”. Woodhead Publ. Cambridge, UK.
2. Shapton D.A., “Principles and Practices of Safe Processing of Foods”. Butterworth Publication, London.

References:

1. Jacob M.B., “The Chemical Analysis of Foods and Food Products”. CBS Publications. New Delhi.
2. Pomeranze Y, “Food Analysis - Theory and Practice”. CBS Publications, New Delhi.
3. FSSAI website: www.fssai.gov.in
4. Winton AL, “Techniques of Food Analysis”. Allied Science Publications New Delhi

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) – III-I Sem

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(20A27504c) ENERGY AUDIT AND CONSERVATION (PROFESSIONAL ELECTIVE-I)

Course Objectives:

- To know different sources of energy
- To understand the technologies used for energy conservation
- To acquire knowledge on energy saving and their utility

Course Outcomes: By the end of course

- Students will gain knowledge on engineering behind energy conservation, technologies used for energy conservation and energy from various wastes and saving of energy.

UNIT I

Fundamentals of Engineering Analysis and Management: Fundamentals of Heat Transfer, Fluid Mechanics, and Thermodynamics in Food Processing, Fundamentals of Energy Auditing, Sustainability in the Food Industry

UNIT II

Energy Conservation Technologies Applied to Food Processing Facilities: Energy Conservation in Steam Generation and Consumption System, in Compressed Air System, in Power and Electrical Systems, in Heat Exchangers, Waste-Heat Recovery and Thermal Energy Storage in Food Processing Facilities, novel Thermodynamic Cycles Applied to the Food Industry for Improved Energy Efficiency

UNIT III

Energy Saving Opportunities in Existing Food Processing Facilities: Energy Consumption pattern, Energy Conservation in Grains and Oilseeds Milling Facilities, in Sugar and Confectionary Processing Facilities, in Fruit and Vegetable Processing Facilities, in Dairy Processing Facilities, in Meat Processing Facilities, in Bakery Processing Facilities

UNIT IV

Energy Conservation in Emerging Food Processing Systems: Membrane Processing of Foods, Energy Efficiency and Conservation in Food Irradiation, in Pulsed Electric Fields Treatment, in High-Pressure Food Processing, in Microwave Heating, in Supercritical Fluid Processing

UNIT V

Conversion of Food Processing Wastes into Energy: Food Processing Waste Utilization, Anaerobic Digestion of Food Processing Wastes, Fermentation of Food Processing Wastes into Transportation Alcohols, Bio-diesel Production from Waste Oils and Fats, Thermo-chemical Conversion of Food Processing Wastes for Energy Utilization

Textbooks:

1. Lijun Wang, "Energy Efficiency and Management in Food Processing Facilities". CRC Press, 1st Edition, 2009.
2. R.P. Singh, "Energy in Food Processing". 1st Edition, Elsevier Publishing Co. Amsterdam, 1986.

References:

1. Berit Mattsson and Ulf Sonesson, "Environmentally Friendly Food Processing", 1st Edition, CRC Press, 2003

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-I Sem

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(20A27501P) MILK AND MILK PRODUCTS PROCESSING LAB

Course Objectives:

- To conduct various quality tests for milk and products prepared from milk.

Course Outcomes:

Students will be able to learn

- Different quality tests for milk
- Various process technologies for preservation and quality of milk
- Processing of value added products from milk

LABORATORY EXPERIMENTS

1. Sampling of milk and milk products
2. Platform tests of raw milk like clot on boiling (COB) test, alcohol test etc.
3. Determination of physical properties of milk
4. Determination of proximate composition and biochemical properties of milk
5. Determination of microbiological load in milk.
6. Detection of adulterants in milk
7. Identification and demonstration of liquid milk processing equipment, pipes and fittings
8. Preparing standardized milk as per requirement
9. Estimation of milk fat Gerber centrifuge.
10. Pasteurization and homogenization of milk
11. Packaging of liquid milk
12. Preparation of sterilized flavored milk
13. Preparation of reconstituted milk/rehydrated milk
14. Preparation of cream
15. Preparation of buttermilk
16. Preparation of curd and yogurt
17. Preparation of lassi

Note: Visit to chilling center and Visit to a dairy plant.

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B.Tech (FT)– III-I Sem

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(20A27503P) FOOD PACKAGING LAB

Course Objectives:

- To study the various properties of packaging materials and to measurements various packaging properties.

Course Outcomes: Students will be able to understand

- Measurements of various properties for different packaging materials
- Determination of quality tests for different packaging materials
- Packaging practices followed for packing fruits and vegetables
- Shelf-life calculations for food products

LABORATORY EXPERIMENTS

1. Classification of various packages based on material and rigidity
2. Measurement of thickness of paper, paper boards
3. Measurement of basic weight and grammage of paper and paperboards
4. Measurement of water absorption of paper, paper boards
5. Measurement of bursting strength of paper, paper boards
6. Measurement of tear resistance of papers
7. Measurement of puncture resistance of paper, paperboard and corrugated fiberboard (CFB)
8. Measurement of tensile strength of paper, paper boards
9. Measurement of grease resistance of papers
10. Determination of gas and water transmission rate of package films
11. Determination of laquer integrity test; Drop test, Box compression test
12. Identification of plastic films; Determination of seal integrity, ink adhesion
13. Packaging practices followed for packing fruits and vegetables
14. Head space analysis of packaged food
15. Study of vacuum packaging machine, bottle filling machine and form-fill-seal machine.
16. Thermal shock test for glass containers

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B.Tech (FT)– III-I Sem

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(20A52401) SOFT SKILLS
(Skill Oriented Course – II)

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 : 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

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)

Interpersonal 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 given topic.

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

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

UNITIII

Problem Solving & Decision Making

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

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
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 BarunK.)Publisher: Oxford University Press; Pap/Cdr edition (July 22, 2012)
2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha KapoorPublisher : I K International Publishing House; 0 edition (February 28, 2018)

Reference Books:
1. 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, RenuShorey) 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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech(FT)– III-I Sem

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(20A99201) ENVIRONMENTAL SCIENCE

(Common to All Branches of Engineering)

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:

Learning outcomes:

At the end of this unit, the students will be able to

- To know the importance of public awareness
- To know about the various 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.

Learning outcomes:

At the end of this unit, the students will be able to

- To know about various echo systems and their characteristics
- To know about the biodiversity and its conservation

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.

Learning outcomes:

At the end of this unit, the students will be able to

- To know about the various sources of pollution.
- To know about the various sources of solid waste and preventive measures.
- To know about the different types of disasters and their managerial measures**.**

UNIT – IV

Social Issues andthe 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.

Learning outcomes:

At the end of this unit, the students will be able to

- To know about the social issues related to environment and their protection acts.
- To know about the various sources of conservation of natural resources.
- To know about the wild life protection and forest conservation acts.

UNIT – V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – 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..

Learning outcomes:

At the end of this unit, the students will be able to

- To know about the population explosion and family welfare programmes.
- To identify the natural assets and related case studies.

TEXT BOOKS:

1. Text book of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy,"Environmental Studies", Pearson education
3. S.AzeemUnnisa, "Environmental Studies" Academic Publishing Company
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

REFERENCES:

1. Deeksha Dave and E.Sai Baba Reddy,"Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma,Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

Course Outcomes:

At the end of the course, the student will be able to

- Grasp multidisciplinary nature of environmental studies and various renewable and nonrenewable resources.
- Understand flow and bio-geo- chemical cycles and ecological pyramids.
- Understand various causes of pollution and solid waste management and related preventive measures.
- About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
- Casus of population explosion, value education and welfare programmes.

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B.Tech (FT)– III-II Sem **L T P C**

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(20A27601T) FOOD MICROBIOLOGY

Course Objectives:

- To understand the role of beneficial micro-organisms in food processing and preservation.
- To list the major food spoilage microorganisms.
- To analyze methods used to control or destroy micro-organism commonly found in food.
- Fermentation technology and its application in Food industry
- Industrially important Microorganisms and their application in food industry

Course Outcomes:

- The studentswill become familiar with identification of microorganisms and its activityin various foods.
- The students would understand the spoilage of foods due to harmful microorganisms.
- The students also get to know the various methods to eliminate/inactivate the growth of microorganisms in different foods
- Know about different Industrially important micro-organisms
- Know about Industrial fermentation technique
- Know about different growth regulators (Hormones).
- Know about different products produced by Industrial fermentation process

UNIT I

Historical development, Fundamentals of Microbiology, Microscopy (Optical& Electron Microscopy anditypes),ClassificationofMicroorganisms,Microorganismsassociatedwith foods (Yeast, molds, bacteria andfungi)– Morphology characteristics, reproduction.

UNIT II

Factors affecting growth of microorganisms(Yeast, molds, bacteria and fungi):-Intrinsic factors and Extrinsic factors. Estimating the number of microorganisms:-Sampling;Serial dilution; Totalcellcounts; Viable cell count; Platecounters, Indicatororganisms, detection of specificmicrobes and toxins (rapid and alternatemethods)

UNIT III

Microbial spoilage in Foods: Types of micro-organisms. Microorganisms associated with meat, poultry, sea foods, vegetables, dairy products, fruits and vegetables. Assessing microbial population with the meat, poultry, sea foods, vegetables, dairy products, fruits and vegetables- microbial spoilage of meat, poultry, sea foods, vegetables, dairy products, fruits and vegetables.

UNIT IV

Food bornediseases (Organism, occurrence, foods involved incubation period, symptomsand prevention).Foodpoisoning(Botulism,Staphylococcus).Foodinfections(SalmonellaClostridium,Bacilluscereus, Ecoli, Yersinea,Shigella, Vibrio parahaemolyticus, Listeria, Campylobacter.)Foodborneviruses(HepatitisA&B,Gastroenteritis,Poliovirus, Spongiform encephalopathy)
BeneficialMicroorganisms in Food processing: Fermented foods, Beverages, Production of enzymes ,Singlecell protein

UNIT V

Water:Sources,uses,classificationofwater. Microbialquality:Sanitaryqualityofwater, Qualityofwaterforfoodprocessing,WaterPollution,Waterrelateddiseases,Purification and Treatment ofwater,waterqualitycriteriaand standards as perWHO, BIS, FSSA.

Textbooks:

1. Pelczar,M.J., E.C.S. Chan and N.R. Krieg "Microbiology".. McGraw-Hill New York 1993.
2. Frazier, W.C. and Westhoff, D.C. "Food Microbiology". 4thEdition. Tata McGraw Hill Publishing Co. Ltd., New Delhi 2008.

References:

1. Banwart, G.J, "Basic Food Microbiology" Van No Strand Reinhold Publishers, New York 1989.
2. Jay, J.M., "Modern Food Microbiology". CBS Publishers & Distributors, New Delhi 2000.

3. S.C. Prescott and C.G. Dunn, "Industrial MicrobiologyAgrobios (India)", 1st Edition, 2007.
4. A. H. Patel, "Industrial Microbiology", 2nd Edition, McMillan India Ltd., 2009.
5. Katoh and Fumitake Yoshida, "Biochemical Engineering Fundamentals". 1stEdition,Wiley VCH, 2009., J. E. Bailey, F. 2nd Edition, Oilis, Tata Mc Graw Hill, 2010.
6. M. L. Shuller, F. Kargi, "Bioprocess Engineering- Basic Concepts", 2nd Edition, PHI, 2002
7. P.F. Stanbary, A. Whitaker, Hall, "Principles of Fermentation Technology", 2nd Edition, Aditya Books vt. Ltd., 2008

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B.Tech (FT)– III-II Sem

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(20A27602T) UNIT OPERATIONS IN FOOD PROCESSING

Course Objectives

- To impart knowledge to the students on principles, operation and maintenance of various food processing equipment namely mixing, forming, size reduction, cutting and grinding equipment. centrifugation, filtration material handling equipment like belt, screw and pneumatic conveyors, bucket elevator.

Course Outcomes: By the end of the course, the students will be able to

- Understand different food processing equipment that are being used in food industries, Study about the principles, operation and maintenance of food processing equipment viz., material handling, cleaning, grading, mixing, forming, size reduction, cutting, grinding, centrifugation, filtration, evaporation and drying

UNIT I

Geometrical, physical and mechanical properties of foods. Cleaning, sorting and grading of foods. Peeling, decortications, deseeding of fruits, dehulling of grains, blanching of vegetables. Size Reduction: Principles and types of size reduction equipment, Crushers, Grinders, mills, disintegration of fibrous materials. Energy and power requirement, Mechanical expression of edible oil.

UNIT II

Sedimentation: Theory and principles of sedimentation, minimum area for continuous sedimentation, applications in food industry. Filtration: Principle of Constant pressure and constant rate filtration and types of filtration equipment, Settling classifiers and Flotation Screening, types of screen. Centrifugation: Principle of settling and centrifugation, devices for centrifugal separation. Membrane separation processes: Reverse osmosis, microfiltration, ultra-filtration, Nano-filtration dialysis and pervaporation.

UNIT III

Mixing: Mixing of liquids and solids (powder), mixing equipment, mixing index and mixing time, Agitation and blending, types of agitators, power consumption in mixing. Scope and importance of material handling devices; Study of different material handling systems: Classification, principles of operation, conveyor system selection/design; Separation/Grading: Theory and principles: Types of separators – Disk, Indent cylinder, spiral and specific gravity, stone, inclined belt, pneumatic and aspirator separators- separation based on fluidization techniques – magnetic, cyclone and color separator.

UNIT IV

Belt conveyor: Principle, characteristics, design, relationship between belt speed and width, capacity, inclined belt conveyors, idler spacing, belt tension, drive tension, belt tripper; Chain conveyor: Principle of operation, advantages, disadvantages, capacity and speed, conveying chain; Screw conveyor: Principle of operation, capacity, power, troughs, loading and discharge, inclined and vertical screw conveyors;

UNIT V

Bucket elevator: Principle, classification, operation, advantages, disadvantages, capacity, speed, bucket pickup, bucket discharge, relationship between belt speed, pickup and bucket discharge, buckets types; Pneumatic conveying system: Capacity and power requirement, types, air/product separators; Gravity conveyor design considerations, capacity and power requirement. Storage: Methods of storage, silos and bins, hoppers.

Textbooks:

1. R.L Earle. “Unit operations in Food Engineering”.
2. K.M Sahay and Singh “Unit operations of Agricultural Processing”. K.K. Vikas Publishing House Pvt. Ltd. New Delhi.

References:

1. Mc. Cabe, J.C Smith and P. Harriot. “Unit Operations of Chemical Engineering”. McGraw Hill Publishers. New Delhi.
2. N. N. Mohesinin “Physical Properties of Plant and Animal Materials”.

3. A. Chakraverty, Pulses and Oilseeds. “Post-Harvest Technology of Cereals”, Oxford & IBH Publishers. New Delhi.
4. P.J.Fellows “Food Processing Technology, Principles and Practice”, Wood Head Publishing Ltd., Cambridge, England.
5. R. P Singh and D.R. Heldman. “Introduction to Food Engineering”, 3rd Edition.
6. P.G Smith “Introduction to Food Process Engineering”.

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B.Tech (FT)– III-II Sem **L T P C**

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(20A27603T) MEAT, POULTRY, FISH AND MARINE PRODUCTS PROCESSING

Course Objectives:

- To enable the students to learn about national and international prospects of Meat industry along with processing and preservation technology of Meat, Egg and Poultry Products.
- To impart knowledge on fisheries and other marine foods, their nutritional composition and processing technologies

Course Outcomes: At the end the course students will acquire

- knowledge on composition and structure of Meat, Egg, Poultry & effective preservation techniques along with concepts of value addition & quality assessment of Meat and sanitary measures in meat industry
- Know the importance and status of meat and poultry in India and world
- Understand the characteristics and structure of meat and poultry muscle.
- Explain the various preservation techniques of meat
- Gain knowledge in the areas of fish and other marine food preservation and processing technology

UNIT I

Sources and importance of meat, and poultry; Status of Meat and poultry industry in India; World production of meat and poultry, characteristics and structure of meat and poultry muscle. Abattoir design and layout. Pre-slaughter and slaughtering operations for animals; stunning, methods of stunning –bleeding-skinning of animals. Ante-mortem inspection, Evaluation of animal carcasses.

UNIT II

Biochemical changes in meat-rigor mortis – Factors affecting post-mortem changes, properties and shelf life of meat; meat tenderization-artificial tenderization-muscle stretching-mechanical disruption by artificial enzymes. Mechanical deboning, grading, and aging; Preservation of meat by chilling, freezing, pickling, curing, cooking and smoking, dehydration, radiation, chemical and biological preservatives; Meat emulsions; Eating and cooking quality of meat.

Meat cutting and handling; Preparation, preservation of smoked meat, meat sausages, dehydrated meat products, comminuted meat products: ham, bacon, meat analogues and their quality evaluation; effect of processing on nutritive value; hygiene in meat processing.

Meat plant sanitation and safety; By-products of meat and their utilization; Safety standards in meat industry: HACCP/ISO/FSSAI/Kosher/Halal.

UNIT III

Poultry: Classification, differences between broilers and layers, anti-mortem and postmortem inspection, Pre-slaughter care and consideration; Poultry processing, tenderness and shelf-life of poultry meat, grading of poultry meat and products made from poultry meat, Operations in preparation of dressed poultry, its storage and marketing, processing of poultry. Egg: structure, composition, nutritive value, egg products, dehydrated egg powder. Effect of processing on nutritive value; additives used in poultry products.

UNIT IV

Fish: Types, Classification, composition, characteristics and quality assessment, spoilage of fish-microbiological, physiological, biochemical; Relationship between chilling and storage life.

Methods of Preservation of fish: Drying, Salting, Smoking and Curing. freezing, changes in quality during chilled and frozen storage; Principles of canning, effect of heat processing on fish, storage of canned fish.

Fish products: Fish muscle proteins, surimi process, fish sauce and pastes.

Fish by products - production of fish meal, fish protein extracts, fish protein hydrolysates, fish protein concentrate, fish liver oil.

UNIT V

Marine products: Prawns, crabs, lobsters, shrimps, shell fishes and Oysters – Processing and byproducts.

Textbooks:

1. B.D. Sharma and Kinshuki Sharma. “Outlines of Meat Science and Technology”. Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi. 2011.
2. B.D. Sharma. “Modern Abattoir Practices and Animal Byproducts Technology”. Jaypee Brothers Medical Publishers Pvt. Ltd., New Delhi. 2003.
3. D.P. Sen. “Advances in Fish Processing Technology”. 2005. Allied Publishers Pvt. Ltd., Delhi.

4. "Preservation of Fish and Meat". Brigitte Maas-van Berkel, Brigiet van den Boogaard and CorlienHeijnen. 2004. Agromisa Foundation, Wageningen.

References:

1. Alan H. Varnam and Jane P. Sutherland. "Meat and Meat Products: Technology, Chemistry and Microbiology". Chapman & Hall, London. 1995.
2. William J. Stadelman and Owen J. Cotterill. "Egg Science and Technology". 4th Edition. Food Products Press, NY, USA. 1995.
3. R.A. Lawrie. "Meat Science" 4th Ed. Pergamon Press, Oxford, UK. 1985.
4. Vikas Nanda. "Meat, Egg and Poultry Science & Technology". I.K. International Publishing House Pvt. Ltd., New Delhi. 2014.
5. George Borstorm. "Fish as Food - Vol. I, II, III and IV", Academic Press, New York. 1961.
6. K. Gopakumar. "Textbook of Fish Processing Technology", ICAR, New Delhi.
7. Y Charles L. Cutting. Processing and Preservation of Fish. Agro Bios, New Delhi.
8. G.M. Hall. "Fish Processing Technology", 2nd Edition, Chapman & Hall, London, UK, 1997

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) – III-II Sem

L	T	P	C
3	0	0	3

(20A27604a) FOOD PROCESSING EQUIPMENT DESIGN
(PROFESSIONAL ELECTIVE -II)

Course Objectives:

- To know materials for fabrication, Design of pressure and storage vessels, and operating conditions.
- To understand the different food processing equipment design
- To acquire knowledge on design concepts of various equipments

Course Outcomes: By the end of course

- Students will gain knowledge on Design of pressure and storage vessels , shell and its component, heat exchangers, evaporators, dryers extruders utilized in Food Processing

UNITI

Materials and properties: Materials for fabrication: Characteristics of construction material :Stainless steel, Aluminum, Nickel and Monel, Plastic Materials, etc., Design of pressure and storage vessels: Operating conditions, design conditions and stress

UNITII

Design of shell and its component, mountings and accessories, Design of heat exchangers: Design of shell and tube heat exchanger, plate heat exchanger, scraped surface heat exchanger, Sterilizer and retort.

UNITIII

Design of evaporators: Design of single effect and multiple effect evaporators and its components, Design of rising film and falling film evaporators and feeding arrangements for evaporators, Design of centrifuge separator.

UNIT IV

Design of dryers: Design of tray dryer, tunnel dryer, fluidized dryer, spray dryer, vacuum dryer, freeze dryer and microwave dryer.

UNIT V

Design of extruders: Cold and hot extruder design, design of screw and barrel, design of twin screw extruder, Safety measures in equipment design, pressure relief devices.

Textbooks:

1. Sarvacos G and AthanaciosEK , Handbook of Food Processing Equipment , 2nd Edition, Springer 2016
2. Mahajani and Umarji , Process Equipment Design, Macmillan Publisher India Ltd. 1996

References:

1. R. Paul Singh and Heldman DR, Introduction to Food Engineering, 5th Ed. Elsevier, Amsterdam, The Netherlands. 2014
2. Kenneth JV, Enrique R and RP Singh, Handbook of Food Engineering Practice, CRC Press, Boca Raton, FL, USA. 1997

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) – III-II Sem **L T P C**

3 0 0 3

(20A27604b) FOOD CHEMISTRY OF MACRO AND MICRO NUTRIENTS (PROFESSIONAL ELECTIVE-II)

Course Objectives:

- To know concepts of food chemistry, functional properties of role of water
- To understand the importance of macro and micro nutrients
- To acquire knowledge on Food toxicology

Course Outcomes: By the end of course

- Will understand the chemical composition of various food components
- Students will gain knowledge on macro, micro nutrients and food toxicology.

UNITI

Introduction: Nature Scope and development of food chemistry, role of food chemist. Moisture in foods: Role and type of water in foods; Functional properties of water; role of water in food spoilage; Water activity and sorption isotherm; Molecular mobility and foods stability. Dispersed systems of foods: Physicochemical aspects of food dispersion system (sol, gel, foam, emulsions, etc); Rheology of diphase systems

UNITII

Carbohydrates: Changes of carbohydrates on cooking, modification of carbohydrates, dietary fibres and carbohydrates digestibility; Enzymatic and chemical reactions of carbohydrates; Proteins in foods: Processing induced, physical, chemical and nutritional changes in protein, chemical and enzymatic modification of proteins. Lipids in foods: Role and use of lipids/fat, crystallization and consistency, chemical aspects of lipids, lipolysis, auto-oxidation, and thermal rancidity , thermal decomposition

UNITIII

Pigments in animal and plants kingdoms: Haeme pigments, chlorophyll, carotenoids, phenolic and flavonoids, betalins, effect of processing on pigment behaviour; Technology for retention of natural colours of food stuffs. Enzymic Browning and Non-enzymic browning reactions, Enzyme Inhibitors. Food colorants; Regulatory use of regulatory dyes; Colour losses during thermal processing;

UNITIV

Vitamins and minerals: Requirements, allowances, enrichment, restorations, fortifications, losses of vitamins and minerals, optimization and retention of vitamins and minerals; Chemistry of anti-nutritional factors.

UNITV

Food toxicology: Inherent toxicants – antinutritional factors their occurrence, effects and methods of elimination or inactivation- protease inhibitions, lectins, lathyrogens, phytates and flatulence factors; Terms in toxicology; Safety evaluation using traditional and modern approach; Food Contaminants; Pesticidal residues – permitted limits; Toxicology and public health

Textbooks:

1. Meyer L.H, Food Chemistry , CBS Publishers & Distributors, New Delhi (India) 2004
2. H.-D. Belitz, W. Grosch and P. Schieberle, Food Chemistry , 4th Ed. Springer-Verlag Berlin Heidelberg. 2009
3. DeMan JM, Principles of Food Chemistry , AVI Publishing Co Inc., 1976

References:

1. Swaminathan. M, Essentials of Food and Nutrition , Vol. II, Ganesh & Co., 1974
2. Eskin NAM, Henderson HM and TownsedRJ ,Biochemistry of Foods, Academic Press, New York 1971 .
3. Fennema, Owen R. "Food Chemistry, Marcel Dekker." Inc, New York ,1996.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) – III-II Sem **L T P C**

3 0 0 3

(20A27604c) NUTRACEUTICALS AND FUNCTIONAL FOODS
(PROFESSIONAL ELECTIVE-II)

Course Objectives:

- To develop comprehensive understanding of different nutraceuticals and functional foods
- To understand the potential of various functional foods in promoting human health.

Course Outcomes:

By the end of completion of the course

- Students will gain knowledge on the functional food concept as related to ingredient efficacy and safety.
- Familiarizes students the potential of various functional foods in promoting human.

UNITI

Background, status of nutraceuticals and functional food market, definitions, difference between nutraceuticals and functional foods, types of nutraceutical compounds and their health benefits, current scenario

UNITII

Types of nutraceutical compounds – Phytochemicals, phytosterols and other bioactive compounds, peptides and proteins, carbohydrates (dietary fibers, oligosaccharides and resistant starch), prebiotics, probiotics and synbiotics, lipids (Conjugated Linoleic Acid, omega-3 fatty acids, fat replacers), vitamins and minerals; their sources and role in promoting human health.

UNITIII

Cereal and cereal products, Milk and milk products, egg, oils, meat and meat products, sea foods, nuts and oilseeds, functional fruits and vegetables, herbs and spices, beverages (tea, wine etc), Fermented foods – their health benefits and role in conditions like cardiovascular diseases, hypertension, diabetes etc.

UNITIV

Future prospects of functional foods and nutraceuticals and their potential for use in improving health. Development in processing of functional foods. Formulation and fabrication of functional foods, Customized foods.

UNITV

Stability of Nutraceuticals. Safety, Consumer acceptance and assessment of health claims, labeling, marketing and regulatory issues related to Nutraceuticals and functional foods.

Textbooks:

1. Wildman REC, Handbook of Nutraceutical and Functional Foods, CRC Press 2001
2. Ghosh D et al, Innovations in Healthy and Functional Foods, CRC Press 2012

Reference Books:

1. Pathak YV, Handbook of nutraceuticals Volume 2, CRC Press 2011
2. Various journals of food technology, food science and allied subjects.
3. Saarela M., Functional Foods: Concept to Product. 2nd edition. Oxford, Cambridge. Wood

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II Sem

L	T	P	C
0	0	3	1.5

(20A27601P) FOOD MICROBIOLOGY LAB

Course Objectives:

- This lab gives an idea about counting microorganisms by various techniques in selected foods and identification of specific microorganisms in different foods

Course Outcomes:

- Students will learn the different techniques for useful for microorganismsgrowth, media and colony counting
- Students will able to identify the specific microorganism present in food by specific procedure.

LABORATORY EXPERIMENTS

1. Different types of growth media and preparation of media.
2. Streaking techniques and dilutions
3. Methylene blue reduction test.
4. Identification of fungi from ground nuts and bread.
5. Identification of Gram-positive and Gram- negative bacteria.
6. Microbial examination of milk and milk products: Identification, isolation, and confirmation
7. Direct total, viable, and non-viable count of microorganisms in milk.
8. Determination of Standard Plate Count (SPC) in natural and/or processed foods.
9. Microbiological examination of potable water: Total and coliform count.
10. Enumeration of coliform organism in poultry
11. Isolation and screening of citric acid/ amylase/ protease /antibiotic producing microbes
12. Starter activity of Baker's yeast in mushroom production.

Laboratory Manuals

1. McLandsborough, L. (2004). Food microbiology laboratory. CRC press.
2. Harrigan, W. F. (1998). Laboratory methods in food microbiology. Gulf professional publishing.
3. Garg, N., Garg, K. L., & Mukerji, K. G. (2010). Laboratory manual of food microbiology. IK International Pvt Ltd.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II Sem

L	T	P	C
0	0	3	1.5

(20A27602P) UNIT OPERATIONS IN FOOD PROCESSING LAB

Course Objectives

- To impart practical orientation of usage of different mills, concept of terminal and settling velocity.
- Calculation of filter cake resistances.

Course Outcomes

By the end of the course, the students will be able to

- Find out screen efficiency, grading efficiency & separation efficiency
- Find out particle size distribution
- Find out grinding index
- How to find out resistances in filtration

LABORATORY EXPERIMENTS

1. Particle size distribution using sieve shaker.
2. To find out the screen effectiveness of a given sample by vibratory screen
3. To find out the grading efficiency of a given sample by destoner
4. To find out the grading efficiency of a given sample in specific gravity separator
5. To find out the grading efficiency of a given sample in spiral separator
6. Estimation of work index of material in grinding
7. Verification of crushing laws with the actual power ratio using hammer mill
8. Verification of the communition laws and the critical speed of a ball mill
9. Mixing experimentation and determination of mixing index.
10. Determination of power consumption in mixing/agitation.
11. Determination of equivalent and specific cake resistance in filtration.
12. Determine the efficiency of Cyclone separator.
13. Settling velocity of a particle by sedimentation.
14. Determination of separation efficiency of suspension by using tubular bowl/nozzle centrifuge.
15. Determination of specific cake resistance and medium resistance of a leaf filter
16. Determination of drying characteristics and drying coefficient of a wet solid in a tray

Note: Visit to the local Industries for observing the unit operations.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II Sem

L	T	P	C
0	0	3	1.5

(20A27603P) MEAT, POULTRY, FISH AND MARINE PRODUCTSPROCESSING LAB

Course Objectives:

- To learn the different preservation methods for meat, poultry and fish and preparation of value added products.

Course Outcomes:

By the end of the course, the students will

- Learn different methods of slaughter, Postmortem changes, preservation techniques and methods of value addition to meat

Develop practical skills in preservation and processing technology of fish and marine products

LABORATORY EXPERIMENTS

1. Study of post-mortem changes;
2. Meat cutting and handling
3. Determination of meat pH
4. Preservation of meat by curing and pickling
5. Value added meat products
6. Preparation and evaluation of meat sausages
7. Tenderization of meat
8. Evaluation of quality of eggs by candling.
9. Grading of eggs by FSSAI Standards
10. Preparation of value added poultry meat products
11. Value added egg products
12. Preparation and evaluation of meat/ chicken patties
13. Study of anatomy and dressing of fish
14. Preparation of value added sea products: Cutlets, bullets, wafers

Note: Visit to Abattoir

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B.Tech (FT)– III-II Sem

L	T	P	C
1	0	2	2

(20A27606) EXTRUSION TECHNOLOGY
(Skill Oriented Course - IV)

Course Objectives:

- To learn the different extrusion principles, uses of extruders, hot extrusion process and Cold Extrusions.

Course Outcomes:

By the end of the course, the students will

- Learn different methods of extruders in the food industry, factors affecting extrusion process.
- Develop practical skills in Flour properties for extrusion, counter rotating and co-rotating twin screw extruder.

UNIT I

Extrusion: definition, introduction to extruders, principles and types, Uses of extruders in the food industry, Single screw extruder: principle of working, net flow, factors affecting extrusion process, Twin screw extruder: counter rotating and co-rotating twin screw extruder, Process characteristics of the twin screw extruder

UNIT II

Hot Extrusion:Pre-conditioning of raw materials used in extrusion process, Chemical and nutritional changes in food during extrusion, Classification of Breakfast cereals, Texturized vegetable protein: Definition, processing techniques of preparation. Expanded products

Cold Extrusion: Flour properties for extrusion Pre-conditioning of raw materials, process and quality testing of vermicelli, spaghetti, pasta and macaroni products,

PRACTICALS

1. Physical properties of extruded foods (expansion, density, water absorption index, etc)
2. Physicochemical properties of proteins
3. Preparation of noodles/ vermicelli
4. Preparation of spaghetti
5. Preparation of weaning foods
6. Studies on properties of texturized vegetable protein
7. Determination of oil absorption capacity of extruded products
8. Determination of water absorption capacity of noodles
9. Cooking quality of TVP
10. Studies on Textural Profile Analysis of extruded products
11. Effect of extrusion cooking on antinutritional factors.

Note: Visit to extrusion industry

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II Sem

L	T	P	C
2	0	0	0

(20A99601) INTELLECTUAL PROPERTY RIGHTS AND PATENTS
(Mandatory Non-Credit Course)

Course Objectives:

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

Course Outcomes:

- Understand IPR law & Cyber law
- Discuss registration process, maintenance and litigations associated with trademarks
- Illustrate the copy right law
- Enumerate the trade secret law.

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

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

UNIT IV

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks 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:

1. Deborah E.Bouchoux: “Intellectual Property”. Cengage learning, New Delhi
2. Kompal Bansal &Parishit Bansal “Fundamentals of IPR for Engineers”, BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western’s Special Topics Collections

References:

1. Prabhuddha Ganguli: ‘ Intellectual Property Rights” Tata Mc-Graw – Hill, New Delhi
2. Richard Stim: “Intellectual Property”, Cengage Learning, New Delhi.
3. R. Radha Krishnan, S. Balasubramanian: “Intellectual Property Rights”, Excel Books. New Delhi.
4. M. Ashok Kumar and Mohd. Iqbal Ali: “Intellectual Property Right” Serials Pub.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem **L T P C**

3 0 0 3

(20A27701a) FOOD ENGINEERING
(PROFESSIONAL ELECTIVE-III)

Course Objectives

- To know the Physical and mechanical properties of biological materials
- To understand the moisture content, moisture content representation, determination methods of food materials.
- To learn Food Freezing, Blanching, evaporation, dehulling and dehusking methods.

Course Outcomes By the end of course

- Student will gain knowledge on the Physical and mechanical properties of biological materials,the moisture content, moisture content representation, determination methods of food materials
- Equilibrium moisture content and psychometry
- Food Freezing, Blanching, evaporation, dehulling and dehusking methods.

UNIT I

Physical properties of biological materials: Size, Shape, Sphericity, Radius of curvature, Roundness, Aspect ratio, Bulk density, True density, Porosity, Specific gravity, Angle ofrepose, Frictional properties, Angle of internal friction, Coefficient of internal friction, oiling friction or resistance, optical properties (Colour); Thermal properties of biological materials: Specific heat, Enthalpy, Thermal conductivity, Thermal diffusivity, heat of respiration, transpiration

UNIT II

Rheology: Bio-materials and mechanical properties, Deformation of the materials, Stress, Strain, Modulus of elasticity, Viscoelastic behaviour, Stress relaxation behavior, Creep behaviour; Flow of material – Newton's Law of Viscosity, Viscous fluids - Newtonian and non-Newtonian, Time Dependency, Classical Ideal materials, Ideal elastic behavior, Ideal plastic behaviour, Ideal viscous behaviour, Rheological models, electrical equivalents of Rheological models, and Rheological equations.Food Texture: Measurement, Fundamental tests, Empirical tests, Imitative tests, Texture Analyzer, Probes of Texture analyzer and type of actions, Texture profile analysis (TPA). Electrical and dielectric properties of biological materials.

UNIT III

Moisture content, moisture content representation, determination methods, direct and indirect methods, Equilibrium moisture content (EMC), EMC determination methods, EMC or isotherm models, Hysteresis, reasons for hysteresis, water activity, relationship between water content and water activity, relationship between water content and food stability, psychometry, psychometry terms, construction and use of psychometric charts.

UNIT IV

Food Freezing: Theory of freezing, Ice crystal formation, Time-temperature characteristic curve for freezing process, Solute concentration; Food thawing, Freezing time, Plank's equation, Pham's method, Freezing equipment, Indirect contact systems, Direct-Contact Systems, Design considerations for freezing equipment, Quality changes during Freezing, Freeze Drying: Theory, Heat and mass transfer during freeze drying and drying time, Rat of heat transfer, Rate of mass transfer, Partial pressure of water at the sublimation front, Freeze drying time, Equipment for freeze drying.

Blanching: Methods of Blanching, Equipment, Steam blanchers, Individual Quick Blanching (IQB), Hot water blanchers, Reel hot water blancher, Pipe blancher, Fluidized bed blancher, Effect of blanching on foods.

UNIT V

Evaporation: Evaporation vs dehydration, Evaporators: Single effect evaporators and Multiple effect evaporators, heat and mass balance in single effect and multiple effect evaporator, Boiling point Elevation, Types of evaporators, Design of single effect evaporator, Design of multiple effect evaporator, Methods of Improving Evaporator Efficiency.

Dehulling and dehusking: Hulling: Dehulling methods, Wet milling method, Dry milling method, Dehulling with and without splitting, Equipment for dehulling and deshusking: Under-runner disk huller, Engle berg huller, Rubber roll sheller, Abrasion Debranner, Dehulling or dehusking efficiency.

Textbooks:

1. Chakraverty A & De DS. 1999. Post-harvest Technology of Cereals, Pulses and Oil seeds. Oxford & IBH
2. Hall CW.. Drying ofFarmCrops. Lyall Book Depot. 1970
3. Van Arsdel, Wallace B., Michael J. Copley, and A. I. Morgan."Food dehydration, Vol. 1."*Westport: Principles, AVI* (1973).
4. Fellows, Peter J. Food Processing Technology: Principles and Practice. Elsevier, 2009

Reference books:

1. **Sreenivasula, RB.** 2021. Text Book of Food Engineering.Published by the Directorate of Knowledge Management in Agriculture (DKMA),IndianCouncil of Agricultural Research (ICAR), New Delhi.ISBN: 978-81-7164-199-4.
2. Kudra, Tadeusz, and Arun S. Mujumdar.AdvancedDrying Technologies. CRC press, 2009. Earle, Richard Laurence. Unit Operations in Food Processing.Elsevier, 2013.
3. Sahay KM and Singh KK. 1994. Unit Operations of Agricultural Processing. Vikas Publishing House.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem **L T P C**

3 0 0 3

(20A27701b) FOOD TOXICOLOGY
(PROFESSIONAL ELECTIVE-III)

Course Objectives:

- To know the various toxins and their evaluation.
- To understand their tolerance and control measures.

Course Outcomes: By the end of course

- Student will gain knowledge on principles of toxicity and characteristics of toxins and their classification.
- Examination and prevention of toxins in foods etc.

UNIT I

Principles of Toxicology: classification of toxic agents; characteristics of exposure; spectrum of undesirable effects; interaction and tolerance; biotransformation and mechanisms of toxicity. Evaluation of toxicity: risk vs. benefit: experimental design and evaluation: prospective and retrospective studies: Controls :Statistics (descriptive, inferential): animal models as predictors of human toxicity: Legal requirements and specific screening methods: LD50 and TD50: in vitro and in vivo studies; clinical trials. Cell lines used for human toxicity studies.

UNIT II

Natural toxins in food: natural toxins of importance in food- toxins of plant and animal origin; microbial toxins (e.g., bacterial toxins, fungal toxins and Algal toxins), natural occurrence, toxicity and significance, prevention and management of toxicants in foods.

UNIT III

Food allergies and sensitivities: natural sources and chemistry of food allergens; true/untrue food allergies; handling of food allergies; food sensitivities (anaphylactoid reactions, metabolic food disorders and idiosyncratic reactions); Safety of genetically modified food: potential toxicity and allergenicity of GM foods.

UNIT IV

Environmental contaminants and drug residues in food: fungicide and pesticide residues in foods; heavy metal and their health impacts; use of veterinary drugs, other contaminants in food, radioactive contamination of food, Food adulteration and potential toxicity of food adulterants.

UNIT V

Food additives and toxicants added or formed during food processing: safety of food additives; food processing generated toxicants: nitroso-compounds, heterocyclic amines, dietary Supplements and toxicity related to dose: common dietary supplements; relevance of the dose; possible toxic effects.

Textbooks:

1. Helferich, W., and Winter, C.K "Food Toxicology",. CRC Press, LLC. Boca Raton, FL. 2007.
2. Shibamoto, T., and Bjeldanes, L. "Introduction to Food Toxicology", 2009, 2nd Edition. Elsevier Inc., Burlington, MA.
3. Watson, D.H. "Natural Toxicants in Food", CRC Press, LLC. Boca Raton, FL1998.

References:

1. Duffus, J.H., and Worth, H.G. J. "Fundamental Toxicology", The Royal Society of Chemistry. 2006.
2. Stine, K.E., and Brown, T.M. "Principles of Toxicology", 2nd Edition. CRC Press. 2006.
3. Tönu, P. "Principles of Food Toxicology". CRC Press, LLC. Boca Raton, FL. 2007

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem **L T P C**

3 0 0 3

(20A27701c) NOVEL TECHNOLOGIES FOR FOOD PROCESSING
(PROFESSIONAL ELECTIVE-III)

Course Objectives:

- To know the high pressure processing concepts, mechanism of microbial inactivations and applications.
- To understand Pulsed ElectricField processing, Microwave and, Oscillating Magnetic Fields and Infrared technologiesforFood Processing

Course Outcomes: By the end of course

- Student will gain knowledge on high pressure processing concepts, mechanism of microbial inactivation and applications.
- Principles of Pulsed ElectricFields, Radio Frequency, Oscillating Magnetic Fields and Infrared technologiesforFood Processing.

UNITI

High Pressure Processing–Concept, Equipmentfor High-Pressure Processing treatment. Mechanism of Microbial inactivation and its applications in Food Processing. High Hydrostatic Pressure: Introduction, Engineering Principles, Biological Effects.

UNITII

Pulsed ElectricField (PEF) for Food Processing: Principles, System Components, Applications of pulsed electricfields technology, Factors effecting outcome of Pulse Electric Field Treatment (Technological Factors, Biological effects, Media Factors).

UNITIII

Radio Frequency ElectricFields(RFEF)as athermalProcess: RFEF treatment System, Biological effectsMechanisms of Action, Treatment Chamber Design. High Intensity Pulsed Light Technology: Introduction, Principles, Equipment and Applications in Food Processing. Ultrasonic Processing: Introduction, Principles, Equipment, Process parameters, Applications in Food Industry.

UNITIV

UseofOscillatingMagneticFieldsinFoodProcessing:Equipment,Applications.Non-Thermal Plasma as Novel Food Processing Technology: Methods toGeneratePlasma, Classification of Plasma,Mechanism ofMicrobialInactivationbyColdPlasma,ApplicationsofNon-ThermalPlasma TechniqueinFoodProcessing.

UNIT V

Infrared technologies: Working principle, Applications in food preservation. Gamma irradiation and application in food processing. New Chemical and Biochemical Hurdles: Introduction, Organic Acids, Plant derived, antimicrobials, Chitin, Nisin, Lactoferin, Ozone treatment, Electrolyzed water, Chlorine Dioxide gas.Membrane technologies in food processing.Supercriticalfluid extraction and ultrasonication. Microencapsulation of bioactive and Technology of oil powder.

Textbooks:

1. Food Chemistry, Revised and Expanded Edition by Owen R Fennema.
2. Modern Food Microbiology by James M Jay.
3. Mechanism of Action of Food Preservation Procedures by G W Gould.

References:

1. Principles of Food Science (Part II): Physical Principles of Food Preservation by
2. M Karel Owen R Fennema and D B Lund.
3. Food Processing Technologies Principles and Practices by P J Fellows.
4. Food Processing Principles and Application by Stephanie Clark and others.
5. Food Processing and Preservation Techniques by Peter Zeuthen and Leif Bagh,
6. Non Thermal Preservation of Foods by Gustavo V Barbosa and others.
7. Food Product and Process Innovations (2 volumes) by Hari Niwas Mishra.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I **L T P C**

3 0 0 3

(20A27702a) BREWING TECHNOLOGY
(PROFESSIONAL ELECTIVE – IV)

Coues Objectives:

- To understand the Beer manufacturing, ingredients and their roles.
- To understand overall view of a brewing industry

Course Outcomes: By the end of this course, students will attain the:

- Knowledge of beer making, chemistry of ingredients used for brewing,
- Knowledge on brewing industry, Unit operations and equipment involved

UNIT I

Introduction of brewing, history of brewing; Raw materials: barley, hops, water, yeast; Adjuncts for beer production: Maize, rice, millet, wheat, sugar etc. Malt production, role of enzymes for malting; Barley storage, steeping, germination, kilning, cooling, storage.

UNIT II

Malt from other cereals, caramel malt, roasted malt, smoked malt, malt extract; Malt quality evaluation, Wort production, malt milling, Mashing, Mashing vessels; Wort boiling, clarification, cooling and aeration Enzyme properties, starch degradation, b-glucan degradation; Conversion of fatty matter, Biological acidification

UNIT III

Beer production methods, fermentation technology, changes during fermentation; Filtration procedure and equipment, beer stabilization conditions and durations, beer carbonation process; Packaging equipment and packaging materials, storage conditions and distribution process

UNIT IV

Brewing Equipment. Grain mill, kettles, siphons, carboys, fermentation equipment, wort chillers, pumps beer bottles, cans, labels, bottle caps, sanitation equipments, ling phenomenon of beer, possible measures against staling reactions, oxidation.

UNIT V

Recent advances: Immobilized Cell Technology in Beer Production, immobilized yeast cell technology Energy management in the brewery and smelting's; waste water treatment Automation and plant planning, Regulatory aspects of Brewing industry.

Textbooks:

1. Brewing: "Science and Practice, Brookes and Roger Stevens", Dennis E. Briggs, Chris A. Boulton, Peter A. 2004, Woodhead publishing limited.
2. Die Deutsche "Bibliothek Technology: "Brewing and Malting", Wolfgang Kunze. 2010, Bibliographic information published

References:

1. "Handbook of Brewing": Process, Technology, Markets, Hans Michael Eblinger. 2009, Wiley-VCH Verlag GmbH & Co.
2. Brewing: "New Technologies", Charles W. Bamforth. 2006, Woodhead Pub

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem **L T P C**

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(20A27702b)FOOD ADDITIVES
(PROFESSIONAL ELECTIVE –IV)

Coues Objectives

- To provide theoretical knowledge on the definition of food additives, and their role in the food industry in the context of current food regulations; current national and international regulations on food additives;
- Understanding of functional classification and safety assessment of food additives.
- To develop the scientific approach and critical thinking and communication skills required for the assessment of the impacts of food additive applications on health, food safety, and quality, and the current issues related to food additives.

Course Outcomes: By the end of this course, students will attain the:

- Knowledge on the definition, classification and specifications of permitted food additives and their conditions of use in the context of current regulations.
- Knowledge on current national and international food regulations.
- Knowledge on safety assessment of food additives
- Ability to assess the impacts of food additive applications on health, food safety and quality.
- Ability to critically assess news and information on current issues related to food additives on different media channels

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UNIT I

Introduction: Introduction to Food Additives; Scope of food additives; Functions and uses of Food Additives; Classification- Intentional & Unintentional Food additives; Types of food additives Toxicology and Safety Evaluation of Food Additives: Effects of Food Additives; Food Additives generally recognized as safe (GRAS); Tolerance levels & Toxic levels in Foods; Legal safeguard; Risks of food additives

UNIT II

Naturally occurring food additives: Classification; Health Implications; Role in Foods Acidulants: Introduction; Different acidulants; Role in food processing Food colorants: Introduction; Natural & Synthetic food colorants; Classification of Food colorants; Chemical nature; Impact on health. Pigments: Importance; Classification: Utilization as food color

UNIT III

Food Preservatives: Introduction; Classification- Natural & chemical preservatives; Mode of action; Role in Food processing. Antioxidants & chelating agents: Introduction; Role in foods; Types of antioxidants -natural & synthetic; Mode of action of antioxidants in foods; Chelating agents- Naturally & synthetic; Mode of action of chelating agents; Applications of antioxidants and chelating agents

UNIT IV

Stabilizers, thickeners and Emulsifiers: Introduction; Types; Applications in food processing; Sweeteners: Introduction; Classification- Artificial sweeteners & Non-nutritive sweeteners; Health implications; Role in food processing. Bleaching & maturing agents: Introduction; Different bleaching & maturing agents; Role in food processing

UNIT V

Taste and Flavoring agents: Introduction; Classification of flavors- natural & synthetic; Flavor enhancer/ Potentatior; Importance of taste and flavours; Role of flavoring agents in food processing. Anti-caking agents and Humectants: Introduction; Different Anti-caking agents and Humectants; Role in food processing Starch modifiers: Introduction; Chemical nature; Role in food processing. Antimicrobial agents, Clarifying agents, antifoaming agents, Fat mimetics and replacers: Introductions; Role in food processing;

Textbooks:

1. Branen, A. L., Davidson, P. M., Salminen, S., &Thorngate, J. (Eds.). (2001). Food additives. CRC Press.
2. Lewis, R. J. (1989). Food additives handbook. Springer Science & Business Media.

3. Mahindru, S. N. (2008). Food additives: characteristics, detection and estimation (pp. 4435-36). New Delhi-India:: APH Publishing Corporation.

References:

1. Fennema, O. R. (1996). Food chemistry (Vol. 76). CRC Press.
2. Belitz, H. D., Grosch, W., &Schieberle, P. (2008). Food chemistry. Springer Science & Business Media.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem

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(20A27702c) THERMAL PROCESSING OF FOODS (PROFESSIONAL ELECTIVE-IV)

Coues Objectives

- To understand different types of Pasteurization techniques and kinetics of microbial reactions.
- To understand various types of heat exchangers for food process engineering.
- Importance and applications of hot extrusion processing, changes of properties and functional components of extruded foods

Course Outcomes: By the end of this course, students will attain the:

- Determine the extent of nutrient retention and enzyme inactivation during a thermal process.
- Apply basic kinetic equations to various thermal processes
- Knowledge of aseptic processing related equipment design and environment.
- Knowledge on Microwave and radio frequency heating, drying principles and de-humidifiers.

UNIT I

Blanching, different types of Pasteurization, ultra-pasteurization, hot fill and UHT. Thermal processing equipment, canning operations.Temperature distribution and heat penetration, Kinetics of microbial reactions, Z-value, F value, and process requirements.

UNIT II

Quality considerations and process optimization.Fundamentals of aseptic processing, Aseptic processing equipment design, Aseptic process design. Aseptic process environment.

UNIT III

Microwave and radio frequency heating: Principles, interaction of electrical fields. Ohmic heating: Principles, inactivation mechanism, equipment. Frying, vacuum frying, deep frying. Baking: Principles and equipment.

UNIT IV

Drying- Principles, different types of dryers- Solar dryer, Vacuum dryer, Fluidized bed dryer, tunnel dryer, drum drying, spray dryer. Freeze dryer. Drying curves. Hybrid drying technologies. Single stage and multi stage drying. De-humidifier.

UNIT V

Various types of heat exchangers for food process engineering. Importance and applications of hot extrusion processing, Changes of properties and functional components of extruded foods.

Textbooks:

1. Holdsworth S D, Thermal Processing of Packaged Foods, 3rd Edition, Springer
2. Gary Tucker, Susan Featherstone, Essentials of Thermal Processing, Willey

References:

1. Nelson, P.E. (Editor). 2010. Principles of Aseptic Processing and Packaging. 3rd edition. Purdue University Press.
2. Sun, D. (Editor). 2005. Emerging Technologies for Food Processing. Elsevier Academic Press.
3. Metaxas, A.C., Meridith, R.J. 1993. Industrial Microwave Heating. Peter Pergrinus Ltd., London.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem **L T P C**

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(20A27703a)EXTRUSION TECHNOLOGY
(PROFESSIONAL ELECTIVE –V)

Course Objectives:

- To impart knowledge to the students about extrusion technology, principle of working, classification of extruders according to process and construction, extruded products and their processing.

Course Outcomes: By the end of the course, the students will be able to

- Learn about use of extrusion technology in food industry
- Study about Extrusion cooking, preconditioning of raw material, types of extruders and operating parameters

UNIT I

Extrusion definition, introduction to extruders and their principles, types of extruders. Extruders in the food industry: History and uses of extruders in the food industry. Single screw extruder: principle of working, net flow, factors affecting extrusion process, co-kneaders.

UNIT II

Twin screw extruder: counter rotating and co-rotating twin screw extruder. Process characteristics of the twin screw extruder: feeding, screw design, screw speed, screw configurations, die design. Barrel temperature and heat transfer, adiabatic operation, heat transfer operations and energy balances. Problems associated with twin screw extruder.

UNIT III

Pre-conditioning of raw materials used in extrusion process, Pre-conditioning operations and benefits of pre-conditioning and devolatilization. Interpreted-flight expanders - extruders, dry extruders. Chemical and nutritional changes in food during extrusion. Practical considerations in extrusion processing: pre-extrusion processes, cooker extruder Profiling.

UNIT IV

Practical considerations in extrusion processing: Addition and subtraction of materials, shaping and forming at the die, post extrusion processes. Breakfast cereals: introduction, type of cooking - High shear cooking process, steam cookers, low shear, low pressure cookers and continuous steam pre-cooking, available brands. Cold extrusion processing. Principles and products like sphagetti, noodles, pasta, and macaroni.

UNIT V

Breakfast cereal processes: traditional and extrusion methods, classification of breakfast cereals - flaked cereals, oven puffed cereals, gun puffed cereals, shredded products. Texturized vegetable protein: Definition, processing techniques, and foods. Snack food extrusion: Direct expanded (DX) and third generation (3G) Snacks: types, available brands, co- extruded snacks and indirect-expanded products.

Textbooks:

1. "Extrusion Cooking, Technologies and Applications". Guy R Wood Head Publishing Limited, Abington, Cambridge.
2. Frame N.D. "The Technology of Extrusion Cooking". Blackie Academic & Professional, New York. 1994,

References:

1. Harper. "Extrusion of Foods. Vol. 1 & 2". J.M. CRC Press, Inc; Boca Raton, Florida1991,.
2. O'Connor C. "Extrusion Technology for the Food Industry". Elsevier Applied Science, New York.
3. Fast R.B. and Caldwell E.F. "Breakfast Cereals" and how they are made. 2000, American Association of Cereal Chemists., St. Paul, Minnesota. 1987,
4. Richardson P. "Thermal Technologies in Food Processing". Wood Head Publishers, Cambridge

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem **L T P C**

3 0 0 3

(20A27703b) FOOD SAFETY AND STANDARD ACT & REGULATIONS IN INDIA

(PROFESSIONAL ELECTIVE –V)

Course Objectives:

- To study theSalient features of food safety and standards Act.
- To get knowledge on Food safety standards of licensing and registration of food Business regulations.
- To know about Food safety standards of packaging and labeling regulations.
- To learn about Food safety standards of food product standards and food additives regulations.
- To understand Food safety standards of prohibition and restriction sales regulations.

Course Outcomes: By end of the course students are exposed to know about

- To study theSalient features of food safety and standards Act,

UNIT I

Food Safety and Standards Act: Salient features of food safety and standards Act, 2006, administration at central and state level, functions, duties and responsibilities of food safety regulators, implementation of food regulation –FSS act, 2006 including licensing and registration, inspection and reports, improvement notices and prohibition Orders.

UNIT II

Food safety standards of licensing and registration of food Business regulations: short title, commencement, definitions, licensing and registration of food business, schedule I, II, III, IV. general requirements of hygienic and sanitary practices to be followed by all food business operators applying license, specific hygienic and sanitary practices to be followed by food business operator engaged in manufacturing, processing, storage and selling of milk and milk products, meat and meat products, specific hygienic and sanitary practices to be followed by food business operators engaged in catering/ food service management.

UNIT III

Food safety standards of packaging and labeling regulations-Short title and commencement, definition, registration. Packaging - general requirements, product specific requirements. labeling - manner of declaration, specific requirements and restriction on manner of labeling, restriction on advertisement, exemption from labeling requirement, notice of addition, admixture or deficiency in food.

UNITIV

Food safety standards of food product standards and food additives regulations-Short title, commencement, definition and regulation of dairy products and analogues, fats, oils and fat emulsions ,fruits and vegetable products, nuts and raisins, cereal and cereal products, bakery products, meat and meat products, fish and fish products, sweet and confectionery, sweetening agents, salt , spices , condiments and related products, common salt, beverages- alcoholic and non-alcoholic, irradiation of foods, food additives and other food products.

UNIT V

Food safety standards of prohibition and restriction sales regulations - title, commencement, definitions, prohibition and restriction of sales – sale of certain admixtures prohibited, restriction on the use of certain ingredients, prohibition and restriction on sale of certain products.Food safety and standards of contaminants, toxins and residues regulation -short title, commencement and definition of metal contaminants, crop contaminates and naturally occurring toxic substances, residues, antibiotic another pharmacologically active substances. Food safety standards of laboratory and sample analysis, - short title, commencement and definition of notified laboratories to import, referral laboratories, procedure for sampling.

Textbooks:

1. Gazette of Food Safety and Standards Act, (2006) Food Safety regulations and food safety management. Food Safety and Standards Authority of India. New Delhi.

References:

1. The training manual for Food Safety Regulators. Vol.III, Food Safety regulations and food safety management. Food Safety and Standards Authority of India. New Delhi.

2. To get knowledge on licensing and registration of food Business regulations & packaging and labeling regulations
3. To learn about Food product standards and food additives regulations & prohibition and restriction sales regulations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem **L T P C**

3 0 0 3

(20A27703c) FOOD PLANT SANITATION AND HYGIENE (PROFESSIONAL ELECTIVE-V)

Course Objectives

- To explore the knowledge on types of sanitizers and methods to eradicate the pests and good hygienic practices by individual and organization.

Course Outcomes

- Students are exposed to different sanitizers for cleaning the equipment and methods of hygienic practices in food industry.

UNIT I

Sanitation and food industry Sanitation, importance of sanitation in food plants, sanitation laws and guidelines, establishment of sanitary practices. Food contamination sources, Sources of contamination, contamination of foods, protection against contamination.

UNIT II

Cleaning compounds and sanitizers: Classification, selection of cleaning compounds, handling and storage, precautions, sanitizing methods: thermal, steam, hot water, radiation, HHP, Vacuum/Steam/Vacuum, chemical sanitizers: chlorine, iodine, bromine, quaternary ammonium compounds, acid sanitizers, detergent formulations, iodophores. In plant quality control, design of a clean-in-place(CIP) unit, use of detergents, sterilants, and quality system needed for different size factories (small, medium, national, and international level of business).

UNIT III

Pest and Rodent Control Insect infestation, cockroaches, rodents, birds, use of pesticides, integrated pest management. Sanitary design and construction for food processing plant. Site selection, site preparation, building construction considerations, pest control design, construction materials.

UNIT IV

Water quality and treatment Characteristics of drinking water – physical (temperature, colour, turbidity, taste and odour), chemical (pH, hardness, alkalinity), microbiological (total plate count, E.coli, Streptococcus faecalis), waste disposal – industrial waste, influent, effluent, biological oxygen demand, chemical oxygen demand, tolerance limits for industrial effluent discharged into surface water, water treatment – primary (screening, sedimentation, floatation), secondary (trickling filters, activated sludge method, lagoons), tertiary (chemical coagulation and flocculation process), utilization of waste from food processing industry.

UNIT V

Personal hygiene and sanitary food handling Personal hygiene, employee hygiene, sanitary food handling, role of employee supervision, employee responsibility. Role of GAP, GHP, HACCP in sanitation HACCP, HACCP development, interface with GMP and SSOPs, HACCP principles, organization, implementation and maintenance.

Textbooks:

1. S. Roday, "Food Hygiene and Sanitation". Tata McGraw Hill, 1st Edition, 1998.
2. N. G. Marriott, "Principles of Food Sanitation. Springer", 5th Edition, 2006.
3. Jim Mclauchlin and Christine Little (Eds), "Hobbs Food Poisoning and Food Hygiene". 7th Edition, 2007.

References:

1. Bernard L Bruinsma, "Food Plant Sanitation", Marcell Dekker Inc J Richard Gorham
2. John Troller, "Sanitation in Food Processing", 2nd Edition. Academic Press, 1993

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem

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20A52701a) ENTREPRENEURSHIP & INCUBATION (HUMANITIES ELECTIVE II)

Course Objectives:

- 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:

- Understand the concept of Entrepreneurship and challenges in the world of competition.
- Apply the Knowledge in generating ideas for New Ventures.
- Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
- Evaluate the role of central government and state government in promoting Entrepreneurship.
- Create and design business plan structure through incubations.

UNIT I

Entrepreneurship - Concept, knowledge and skills requirement - Characteristics of successful entrepreneurs - Entrepreneurship process - Factors impacting emergence of entrepreneurship - Differences between Entrepreneur and Intrapreneur - Understanding individual entrepreneurial mindset and personality - Recent trends in Entrepreneurship.

UNIT II

Starting the New Venture - Generating business idea – Sources of new ideas & methods of generating ideas - Opportunity recognition - Feasibility study - Market feasibility, technical/operational feasibility - Financial feasibility - Drawing business plan - Preparing project report - Presenting business plan to investors.

UNIT III

Sources of finance - Various sources of Finance available - Long term sources - Short term sources - Institutional Finance – Commercial Banks, SFC's in India - NBFC's in India - their way of financing in India for small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions in aid of entrepreneurship development

UNIT IV

Women Entrepreneurship - Entrepreneurship Development and Government - Role of Central Government and State Government in promoting women Entrepreneurship - Introduction to various incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions available - Women entrepreneurship - Role and importance - Growth of women entrepreneurship in India - Issues & Challenges - Entrepreneurial motivations.

UNIT V

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 the Type/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure - Value proposition

Textbooks:

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

B.Tech (FT)– III-II Sem **L T P C**

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(20A52701b) MANAGEMENT SCIENCE
(HUMANITIES ELECTIVE-II)

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:

- 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
- Analyze 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 analyze the business through SWOT.
- Create Modern technology in management science.

UNITI 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 - **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- Deming's contribution to Quality. **Material 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.

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

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.

Textbooks:

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”, 6th edition, 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”, 9th edition, PHI, 2005

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– III-II Sem

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(20A52701c) ENTERPRISE RESOURCE PLANNING (HUMANITIES ELECTIVE-II)

Course Objectives:

- To provide a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning
- To enable the students in knowing the Advantages of ERP
- To train the students to develop the basic understanding of how ERP enriches the
- Business organizations in achieving a multidimensional growth.
- Impart knowledge about the historical background of BPR
- To aim at preparing the students, technologically competitive and make them ready to self-upgrade with the higher technical skills.

Course Outcomes:

- Understand the basic use of ERP Package and its role in integrating business functions.
- Explain the challenges of ERP system in the organization
- Apply the knowledge in implementing ERP system for business
- Evaluate the role of IT in taking decisions with MIS
- Create reengineered business processes with process redesign

UNITI

Introduction to ERP: Enterprise – An Overview Integrated Management Information, Business Modeling, Integrated Data Model Business Processing Reengineering(BPR), Data Warehousing, Data Mining, On-line Analytical Processing(OLAP), Supply Chain Management (SCM), Customer Relationship Management(CRM),

UNITII

Benefits of ERP: Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Design-making Capability

UNITIII

ERP Implementation Lifecycle: Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation Team Training, Testing, Going Live, End-user Training, Post-implementation (Maintenance mode)

UNITIV

BPR: Historical background: Nature, significance and rationale of business process reengineering (BPR), Fundamentals of BPR. Major issues in process redesign: Business vision and process objectives, Processes to be redesigned, Measuring existing processes,

UNITV

IT in ERP: Role of information technology (IT) and identifying IT levers. Designing and building a prototype of the new process: BPR phases, Relationship between BPR phases. MIS - Management Information System, DSS - Decision Support System, EIS - Executive Information System.

Textbooks:

1. Pankaj Sharma. “Enterprise Resource Planning”. Aph Publishing Corporation, New Delhi, 2004.
2. Alexis Leon, “Enterprise Resource Planning”, IV Edition, Mc.Graw Hill, 2019

References:

1. Marianne Bradford “Modern ERP”, 3rd edition.
2. “ERP making it happen Thomas f. Wallace and Michael
3. Directing the ERP Implementation Michael w pelphrey

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT)– IV-I Sem

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(20A27706) BAKERY PRODUCTS
(Skill Oriented Course-V)

Course Objectives:

- To impart knowledge on bakery products, to manufacture those products

Course Outcomes:

By the end of the course, the students will be able

- Acquire knowledge on practical aspects of producing bakery products.

UNIT I

Bakery products, role of bakery ingredients (major and minor), from hard wheat: bread processes of bread making using straight and sponge, dough methods role of each ingredient, quality control Testing of raw material testing of final product.Quality control evaluation of bakery products, some texture properties and some sensory quality

UNIT II

Baked Products from soft wheat:cookies, crackers, biscuits, cakes: types, ingredients, process. Other bakery products: using hard wheat, pizza, pastry and its types.

PRACTICALS

1. Preparation of bread
2. Preparation of biscuit
3. Evaluation of physical properties of cookies
4. Preparation of sponge cake
5. Preparation of flour-based confectionery
6. Preparation of pizza base
7. Preparation of fruit biscuits
8. Preparation of fruit bread
9. Preparation of buns
10. Preparation of puffs
11. Preparation of cookies
12. Preparation of burger base
13. Preparation of flat bread

Note: Visit to wheat milling industry, visit to bakery unit

OPEN ELECTIVES

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem **L T P C**

3 0 0 3

(20A01505) BUILDING TECHNOLOGY

(Open Elective-I)

Course Objectives:

- To know different types of buildings, principles and planning of the buildings.
- To identify the termite control measure in buildings, and importance of grouping circulation, lighting and ventilation aspects in buildings.
- To know the different modes of vertical transportation in buildings.
- To know the utilization of prefabricated structural elements in buildings.
- To know the importance of acoustics in planning and designing of buildings.

Course Outcomes (CO):

- Understand the principles in planning and design the buildings
- To get different types of buildings, principles and planning of the buildings
- To know the different methods of termite proofing in buildings.
- Know the different methods of vertical transportation in buildings.
- Know the implementation of prefabricated units in buildings and effect of earthquake on buildings.
- Know the importance of acoustics in planning and designing of buildings.

UNIT I

Overview of the course, basic definitions, buildings-types-components-economy and design-principles of planning of buildings and their importance. Definitions and importance of grouping and circulation-lighting and ventilation-consideration of the above aspects during planning of building.

UNIT II

Termite proofing: Inspection-control measures and precautions-lighting protectionof buildings-general principles of design of openings-various types of fire protection measures to be considered while panning a building.

UNIT III

Vertical transportation in a building: Types of vertical transportation-stairs-different forms of stairs-planning of stairs-other modes of vertical transportation –lifts-ramps-escalators.

UNIT IV

Prefabrication systems in residential buildings-walls-openings-cupboards-shelves etc., planning and modules and sizes of components in prefabrication. Planning and designing of residential buildings against the earthquake forces, principles, seismic forces and their effect on buildings.

UNIT V

Acoustics –effect of noise –properties of noise and its measurements, principles of acoustics of building. Sound insulation-importance and measures.

Textbooks:

1. Building construction by Varghese, PHI Learning Private Limited 2nd Edition 2015
2. Building construction by Punmia.B.C, Jain.A.K and Jain.A.K Laxmi Publications 11th edition 2016

Reference Books:

1. National Building Code of India, Bureau of Indian Standards
2. Building construction-Technical teachers training institute, Madras, Tata McGraw Hill.
3. Building construction by S.P.Arora and S.P.BrndraDhanpat Rai and Sons Publications, New Delh 2014 edition

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https://nptel.ac.in/courses/105103206

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem

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(20A02505) ELECTRIC VEHICLES

(Open Elective-I)

Course Objectives:

- To get exposed to new technologies of battery electric vehicles, fuel cell electric vehicles
- To get exposed to EV system configuration and parameters
- To know about electro mobility and environmental issues of EVs
- To understand about basic EV propulsion and dynamics
- To understand about fuel cell technologies for EV and HVEs
- To know about basic battery charging and control strategies used in electric vehicles

Course Outcomes:

- Understand and differentiate between conventional and latest trends in Electric Vehicles
- Analyze various EV resources, EV dynamics and Battery charging
- Apply basic concepts of EV to design complete EV system
- Design EV system with various fundamental concepts

UNIT I INTRODUCTION TO EV SYSTEMS AND PARAMETERS

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

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

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

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 CONTROL

Battery charging: Basic requirements, charger architecture, charger functions, wireless charging, power factor correction.

Control: Introduction, modelling of electromechanical system, feedback controller design approach, PI controllers designing, torque-loop, speed control loop compensation, acceleration of battery electric vehicle

Textbooks:

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001.
2. 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.

Online Learning Resources: 1. https://onlinecourses.nptel.ac.in/noc22_ee53/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem

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(20A03505) 3D PRINTING TECHNOLOGY
(Open Elective-I)

Course Objectives:

- Familiarize techniques for processing of CAD models for rapid prototyping.
- Explain fundamentals of rapid prototyping techniques.
- Demonstrate appropriate tooling for rapid prototyping process.
- Focus Rapid prototyping techniques for reverse engineering.
- Train Various Pre – Processing, Processing and Post Processing errors in RP Processes.

Course Outcomes:

- Use techniques for processing of CAD models for rapid prototyping.

- Understand and apply fundamentals of rapid prototyping techniques.
- Use appropriate tooling for rapid prototyping process.
- Use rapid prototyping techniques for reverse engineering.
- Identify Various Pre – Processing, Processing and Post Processing errors in RP processes.

UNIT I Introduction to 3D Printing

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

UNIT II Solid and Liquid Based RP Systems

Working Principle, Materials, Advantages, Limitations and Applicationsof Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

UNIT III Powder Based & Other RP Systems

Powder Based RP Systems: Working Principle,Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM).

Other RP Systems: Working Principle,Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballastic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

UNIT IV Rapid Tooling & Reverse Engineering

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development.

UNIT V Errors in 3D Printing and Applications:

Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc.

Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.

Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Textbooks:

1. Chee Kai Chua and Kah Fai Leong, "3D Printing and Additive Manufacturing Principles and Applications" 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing", Springer, 2/e, 2010.

Reference Books:

1. Frank W.Liou, "Rapid Prototyping & Engineering Applications", CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, **"**Rapid Prototyping: Principles and Applications in Manufacturing", John Wiley&Sons, 2006.

Online Learning Resources:

- NPTEL Course on Rapid Manufacturing.
- https://nptel.ac.in/courses/112/104/112104265/
- https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/
- https://slideplayer.com/slide/6927137/

- https://www.mdpi.com/2073-4360/12/6/1334
- https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-%20FDM.pdf
- https://lecturenotes.in/subject/197
- https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf
- https://www.youtube.com/watch?v=NkC8TNts4B4

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem

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(20A04505) DIGITAL ELECTRONICS
(Open Elective Course- I)

Course Objectives:

- To provide the fundamental concepts associated with the digital logic and circuit design.
- To introduce the basic concepts and laws involved in the Boolean algebra and logic families and digital circuits.
- To familiarize with the different number systems, logic gates, and combinational and sequential circuits, memory elements utilized in the different digital circuits and systems.
- To introduce different digital logic families

Course Outcomes:

- Become familiar with the Boolean algebra, logic gates, logical variables, the truth table, number systems, codes, and their conversion from to others
- Learn the minimization techniques to simply the hardware requirements of digital circuits, implement it, design and apply for real time digital systems
- Understand the working mechanism and design guidelines of different combinational, sequential circuits, memory elements and their role in the digital system design.
- Understand different logic families and use the best combination of ICs during the design of a digital system

UNIT 1

DIGITAL FUNDAMENTALS: Number Systems - Decimal, binary, octal, Hexadecimal,1's and 2's complements,Codes - Binary, BCD, Excess 3, Gray, Alphanumeric codes, Booleantheorems. Logic gates: Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization.

UNIT II

COMBINATIONAL CIRCUITS: Half and Full Adders, Half and FullSubtractors, Binary Parallel Adder Carry look ahead Adder, BCD 'Adder, Multiplexer,Demultiplexer, MagniudeComparator, Decoder, Encoder, Priority Encoder.

UNIT III

SYNCHRONOUS SEQUENTIAL CIRCUITS: Flip flops - SR, JK, T, D, Master/Slave FF- operation and excitation tables, Triggering of FF, conversion of FF. Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT IV

MEMORY DEVICES: Basic memory structure - ROM, PROM, EPROM, EEPROM, EAPROM, RAM, Static and dynamic RAM.Programmable Logic Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL), Field Programmable Gate Arrays (FPGA).

UNIT V

Digital Logic Families: Logic levels,propagation delay, power dissipation, fan-out and fan-in, noise margin, RTL, TTL, ECL, CMOS.

Textbooks:

1. Modern Digital Electronics(Edition III) : R. P. Jarn; TMH
2. Digital Fundamentals: Thomas I. Floyd
3. Digital circuits and design: S. Salivahanan, and S. Anvzzhagan

References:

1. Digital Integrated Electronics: Taub & Schilling; MGH
2. Digital Design: Morris Mano; PHI.Course

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem **L T P C**

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(20A05505a) JAVA PROGRAMMING

(Open Elective Course – I)

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:

- Solve real-world problems using OOP techniques.
- Apply code reusability through inheritance, packages and interfaces
- Solve problems using java collection framework and I/O classes.
- Develop applications by using parallel streams for better performance and develop applets for web applications.
- 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, Karthik andGajalakshmi, University Press
4. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
5. Object Oriented Programming through Java, P. Radha Krishna, University Press.
6. Programming in Java, S. Malhotra, S. Chaudhary, 2nd edition, Oxford Univ. Press.
7. Java Programming and Object-oriented Application Development, R.A. Johnson, Cengage Learning.

Online Learning Resources:

https://www.w3schools.com/java/java_oop.asp
http://peterindia.net/JavaFiles.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem

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(20A05502T) ARTIFICIAL INTELLIGENCE
Open Elective Course - I

Course Objectives:

This course is designed to:

- Introduce Artificial Intelligence
- Teach about the machine learning environment
- Present the searching Technique for Problem Solving
- Introduce Natural Language Processing and Robotics

Course Outcomes:

After completion of the course, students will be able to

- Apply searching techniques for solving a problem
- Design Intelligent Agents
- Develop Natural Language Interface for Machines
- Design mini robots
- Summarize past, present and future of Artificial Intelligence

UNIT I **Introduction** Lecture 9Hrs

Introduction: What is AI, Foundations of AI, History of AI, The State of Art.

Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT II **Solving Problems by searching** Lecture 9 Hrs

Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

UNIT III **Reinforcement Learning & Natural Language Processing** Lecture 8Hrs

Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL

Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

UNIT IV **Natural Language for Communication** Lecture 8 Hrs

Natural Language for Communication: Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Machine Translation, Speech Recognition

Perception: Image Formation, Early Image Processing Operations, Object Recognition by appearance, Reconstructing the 3D World, Object Recognition from Structural information, Using Vision.

UNIT V **Robotics** Lecture 10Hrs

Robotics: Introduction, Robot Hardware, Robotic Perception, planning to move, planning uncertain movements, Moving, Robotic software architectures, application domains

Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right direction, What if AI does succeed.

Textbooks:

1. Stuart J.Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education, 2019.

Reference Books:

1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.
2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.

Online Learning Resources:

http://peterindia.net/AILinks.html
http://nptel.ac.in/courses/106106139/
https://nptel.ac.in/courses/106/105/106105152/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem **L T P C**
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(20A12502) MOBILE APPLICATION DEVELOPMENT USINGANDROID
(Open Elective-I)

Course Objectives:

- Facilitate students to understand android SDK.
- Help students to gain a basic understanding of Android application development.
- Inculcate working knowledge of Android Studio development tool.

Course Outcomes:

- Identify various concepts of mobile programming that make it unique from programming for other platforms.
- Evaluate mobile applications on their design pros and cons.
- Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
- Develop mobile applications for the Android operating system that use basic and advanced phone features.
- Demonstrate the deployment of applications to the Android marketplace for distribution.

UNIT I **Introduction and Mobile User Interface Design**

Introduction to Android: The Android Platform, Android SDK, Android Studio Installation, Android Installation, building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

UNIT II **Activities, Intents and Android User Interface**

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions

UNIT III **Advanced User Interface and Data Persistence**

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

UNIT IV **Android Services, Publishing Android Applications**

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

UNIT V **Android Databases**

Using Common Android APIs: Using Android Data and Storage APIs, managing data using SQLite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

Textbooks:

1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011).
2. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development," Wiley India, FirstEdition,2012.

Reference Books:

1. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
2. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd
3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

Online Learning Resources:

1. https://developer.android.com/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem

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(20A05505a) JAVA PROGRAMMING

(Open Elective Course – I)

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:

- Solve real-world problems using OOP techniques.
- Apply code reusability through inheritance, packages and interfaces
- Solve problems using java collection framework and I/O classes.
- Develop applications by using parallel streams for better performance and develop applets for web applications.
- Build GUIs and handle events generated by user interactions and Use the JDBC API to access the database.

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Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, Using final with inheritance, Object class,

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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

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13. Programming in Java, S. Malhotra, S. Chaudhary, 2nd edition, Oxford Univ. Press.
14. Java Programming and Object-oriented Application Development, R.A. Johnson, Cengage Learning.

Online Learning Resources:

https://www.w3schools.com/java/java_oop.asp

http://peterindia.net/JavaFiles.html

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B.Tech III-I Sem

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(20A05602T)ARTIFICIAL INTELLIGENCE
Open Elective Course - I

Course Objectives:

This course is designed to:

- Introduce Artificial Intelligence
- Teach about the machine learning environment
- Present the searching Technique for Problem Solving
- Introduce Natural Language Processing and Robotics

Course Outcomes:

After completion of the course, students will be able to

- Apply searching techniques for solving a problem
- Design Intelligent Agents
- Develop Natural Language Interface for Machines
- Design mini robots
- Summarize past, present and future of Artificial Intelligence

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Online Learning Resources:

http://peterindia.net/AILinks.html

http://nptel.ac.in/courses/106106139/

https://nptel.ac.in/courses/106/105/106105152/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem **L T P C**

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(20A12502) MOBILE APPLICATION DEVELOPMENT USINGANDROID

(Open Elective-I)

Course Objectives:

- Facilitate students to understand android SDK.
- Help students to gain a basic understanding of Android application development.
- Inculcate working knowledge of Android Studio development tool.

Course Outcomes:

- Identify various concepts of mobile programming that make it unique from programming for other platforms.
- Evaluate mobile applications on their design pros and cons.
- Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
- Develop mobile applications for the Android operating system that use basic and advanced phone features.
- Demonstrate the deployment of applications to the Android marketplace for distribution.

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UNIT IV **Android Services, Publishing Android Applications**

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UNIT V **Android Databases**

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Reference Books:

4. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
5. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd
6. Android Application Development All in one for Dummies by Barry Burd, Edition: I

Online Learning Resources:

2. https://developer.android.com/

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(20A54501) OPTIMIZATION TECHNIQUES

(Open Elective- I)

Course Objectives:

This course enables the students to classify and formulate real-life problem for modeling as optimization problem, solving and applying for decision making.

Course Outcomes: Student will be able to

- 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.

UNIT I

Introduction to operational research-Linear programming problems (LPP)-Graphical method-Simplex method-Big M Method-Dual simplex method.

UNIT II

Transportation problems- assignment problems-Game theory.

UNIT III

CPM and PERT –Network diagram-Events and activities-Project Planning-Reducing critical events and activities-Critical path calculations.

UNIT IV

Sequencing Problems-Replacement problems-Capital equipment- Discounting costs- Group replacement.

UNIT V

Inventory models-various costs- Deterministic inventory models-Economic lot size-Stochastic inventory models- Single period inventory models with shortage cost.

Textbooks:

1. Operations Research , S.D. Sharma.
2. Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.
3. Operations Research, Nita H Shah, Ravi M Gor, Hardik Soni, PHI publishers

Reference Books:

1. Problems on Operations Research, Er. Prem kumargupta, 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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem

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(20A56501) MATERIALS CHARACTERIZATION TECHNIQUES
(Open Elective- I)

Course Objectives:

- To provide an exposure to different characterization techniques.
- To enlighten the basic principles and analysis of different spectroscopic techniques.
- To explain the basic principle of Scanning electron microscope along with its limitations and applications.
- To identify the Resolving power and Magnification of Transmission electron microscope and its applications.
- 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

- To explain the structural analysis by X-ray diffraction.
- To understand the morphology of different materials using SEM and TEM.
- To recognize basic principles of various spectroscopic techniques.
- To study the electric and magnetic properties of the materials.
- To make out which technique can be used to analyse a material

UNIT I

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

Microscopy technique -1 –Scanning Electron Microscopy (SEM)

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT III

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

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

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.

Textbooks:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods –Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2008

2. Handbook of Materials Characterization -by Sharma S. K. - Springer

References:1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and Elaine M. McCash, Tata McGraw-Hill, 2008.

2. Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks, Prentice Hall, 2001

3. Materials Characterization: Introduction to Microscopic and Spectroscopic Methods-Yang Leng- John Wiley & Sons4. Characterization of Materials 2nd Edition, 3 Volumes-Kaufmann E N -John Wiley (Bp)

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B.Tech III-I Sem

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(20A51501) CHEMISTRY OF ENERGY MATERIALS
(Open Elective- I)

Course Objectives:

- To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
- To understand the basic concepts of processing and limitations of fossil fuels and Fuel cells & their applications.
- To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method
- Necessasity of harnessing alternate energy resources such as solar energy and its basic concepts.
- To understand and apply the basics of calculations related to material and energy flow in the processes.

Course Outcomes:

- Ability to perform simultaneous material and energy balances.
- Student learn about various electrochemical and energy systems
- Knowledge of solid, liquid and gaseous fuels
- To know the energy demand of world, nation and available resources to fulfill the demand
- To know about the conventional energy resources and their effective utilization
- To acquire the knowledge of modern energy conversion technologies
- To be able to understand and perform the various characterization techniques of fuels
- To be able to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively

UNIT I: 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 II: 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 III: 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.

UNIT IV:Solar Energy: Solar energy introduction and prospects, photo voltaic (PV) technology, concentrated solar power (CSP), Solar Fuels, Solar cells.

UNIT V: Photo and Photo electrochemical Conversions: Photochemical cells and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions.

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

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B.Tech IV-I Sem

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(20A01605) ENVIRONMENTAL ECONOMICS

(Open Elective Course - II)

Course Objectives:

- To impart knowledge on sustainable development and economics of energy
- To teach regarding environmental degradation and economic analysis of degradation
- To inculcate the knowledge of economics of pollution and their management
- To demonstrate the understanding of cost benefit analysis of environmental resources
- To make the students to understand principles of economics of biodiversity

Course Outcomes :

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

- The information on sustainable development and economics of energy
- The information regarding environmental degradation and economic analysis of degradation
- The identification of economics of pollution and their management
- The cost benefit analysis of environmental resources
- The principles of economics of biodiversity

UNIT I

Sustainable Development: Introduction to sustainable development - Economy-Environment inter-linkages - Meaning of sustainable development - Limits to growth and the environmental Kuznets curve – The sustainability debate - Issues of energy and the economics of energy – Nonrenewable energy, scarcity, optimal resources, backstop technology, property research, externalities, and the conversion of uncertainty.

UNIT II

Environmental Degradation: Economic significance and causes of environmental degradation - The concepts of policy failure, externality and market failure - Economic analysis of environmental degradation – Equi –marginal principle.

UNIT - III

Economics of Pollution: Economics of Pollution - Economics of optimal pollution, regulation, monitoring and enforcement - Managing pollution using existing markets: Bargaining solutions – Managing pollution through market intervention: Taxes, subsidies and permits.

UNIT IV

Cost – Benefit Analysis: Economic value of environmental resources and environmental damage - Concept of Total Economic Value - Alternative approaches to valuation – Cost-benefit analysis and discounting.

UNIT V

Economics of biodiversity: Economics of biodiversity conservation - Valuing individual species and diversity of species -Policy responses at national and international levels. Economics of Climate Change – stern Report

Textbooks:

1. An Introduction to Environmental Economics by N. Hanley, J. Shogren and B. White Oxford University Press.(2001)

2. Blueprint for a Green Economy by D.W. Pearce, A. Markandya and E.B. Barbier Earthscan, London.(1989)

Reference Books:

1. Environmental Economics: An Elementary Introduction by R.K. Turner, D.W. Pearce and I. Bateman Harvester Wheatsheaft, London. (1994),

2. Economics of Natural Resources and the Environment by D.W. Pearce and R.K. Turner Harvester Wheat sheaf, London. (1990),

3. Environmental and Resource Economics: An Introduction by Michael S. Common and Michael Stuart 2nd Edition, Harlow: Longman.(1996),

4. Natural Resource and Environmental Economics by Roger Perman, Michael Common, Yue Ma and James Mc Gilvray 3rd Edition, Pearson Education.(2003),

Online Learning Resources:

https://nptel.ac.in/courses/109107171

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem

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(20A02605) SMART ELECTRIC GRID
(Open Elective Course-II)

Course Objectives:

- Understand recent trends in grids, smart grid architecture and technologies
- Analyze smart substations
- Apply the concepts to design smart transmission systems
- Apply the concepts to design smart distribution systems

Course Outcomes:

- Understand trends in Smart grids, needs and roles of Smart substations
- Design and Analyze Smart Transmission systems
- Design and Analyze Smart Distribution systems
- Analyze SCADA and DSCADA systems in practical working environment

UNIT I INTRODUCTION TO SMART GRID

Working definitions of Smart Grid and Associated Concepts – Smart Grid Functions – Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid

UNIT II SMART GRID TECHNOLOGIES

Characteristics of Smart grid, Micro grids, Definitions, Drives, benefits, types of Micro grid, building blocks, Renewable energy resources, needs in smart grid, integration impact, integration standards, Load frequency control, reactive power control, case studies and test beds

UNIT III SMART SUBSTATIONS

Protection, Monitoring and control devices, sensors, SCADA, Master stations, Remote terminal unit, interoperability and IEC 61850, Process level, Bay level, Station level, Benefits, role of substations in smart grid, Volt/VAR control equipment inside substation

UNIT IV SMART TRANSMISSION SYSTEMS

Energy Management systems, History, current technology, EMS for the smart grid, Synchro Phasor Measurement Units (PMUs), Wide Area Monitoring Systems (WAMS), protection & Control (WAMPC), needs in smart grid, Role of WAMPC smart grid, Drivers and benefits, Role of transmission systems in smart grid

UNIT V SMART DISTRIBUTION SYSTEMS

DMS, DSCADA, trends in DSCADA and control, current and advanced DMSs, Voltage fluctuations, effect of voltage on customer load, Drivers, objectives and benefits, voltage-VAR control, VAR control equipment on distribution feeders, implementation and optimization, FDIR - Fault Detection

Isolation and Service restoration (FDIR),faults, objectives and benefits, equipment, implementation

Textbooks:

1. Stuart Borlase, Smart Grids - Infrastructure, Technology and Solutions, CRC Press, 1e, 2013
2. Gil Masters, Renewable and Efficient Electric Power System, Wiley–IEEE Press, 2e, 2013.

Reference Books:

1. A.G. Phadke and J.S. Thorp, Synchronized Phasor Measurements and their Applications, Springer Edition, 2e, 2017.
2. T. Ackermann, Wind Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2e, 2012.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ee82/preview

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B.Tech IV-I Sem

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(20A03605c) INTRODCUTION TO ROBOTICS
(Open Elective-II)

Course Objectives:

- Learn the fundamental concepts of industrial robotic technology.
- Apply the basic mathematics to calculate kinematic and dynamic forces in robot manipulator.
- Understand the robot controlling and programming methods.
- Describe concept of robot vision system

Course Outcomes:

After completing the course, the student will be able to,

- Explain fundamentals of Robots
- Apply kinematics and differential motions and velocities
- Demonstrate control of manipulators
- Understand robot vision
- Develop robot cell design and programming

UNIT I Fundamentals of Robots

Introduction, definition, classification and history of robotics, robot characteristics and precision of motion, advantages, disadvantages and applications of robots. Introduction to matrix representation of a point in a space a vector in space, a frame in space, Homogeneous transformation matrices, representation of a pure translation, pure rotation about an axis.

UNIT II Kinematics, Differential motions and velocities of robot

Kinematics of robot: Forward and inverse kinematics of robots- forward and inverse kinematic equations for position and orientation, Denavit-Hartenberg(D-H) representation of forward kinematic equations of robots, the inverse kinematic of robots, degeneracy and dexterity, simple problems with D-H representation.

Differential motions and Velocities: Introduction, differential relationship, Jacobian, differential motions of a frame-translations, rotation, rotating about a general axis, differential transformations of a frame. Differential changes between frames, differential motions of a robot and its hand frame, calculation of Jacobian, relation between Jacobian and the differential operator, Inverse Jacobian.

UNIT III Control of Manipulators

Open- and close-loop control, the manipulator control problem, linear control schemes, characteristics of second-order linear systems, linear second-order SISO model of a manipulator joint, joint actuators, partitioned PD control scheme, PID control Scheme, computer Torque control, force control of robotic manipulators, description of force-control tasks, force control strategies, hybrid position/force control, impedance force/torque control.

UNIT IV Robot Vision

Introduction, architecture of robotic vision system, image processing, image acquisition camera, image enhancement, image segmentation, imaging transformation, Camera transformation and calibrations, industrial applications of robot vision.

UNIT V Robot Cell Design and Programming

Robot cell layouts-Robot centred cell, In-line robot cell, considerations in work cell design, work cell control, interlocks, error detection, work cell controller. methods of robot programming, WAIT, SIGNAL, and DELAY commands, Robotic languages, VAL system.

Textbooks:

1. Mikell P. Groover and Mitchell Weiss, Roger N. Nagel,Nicholas G.Odrey , Industrial Robotics — Mc Graw Hill, 1986.
2. R K Mittal and I J Nagrath, Robotics and control, Illustrated Edition, Tata McGraw Hill India 2003.

References:

1. Saeed B. Niku, Introduction to Robotics – Analysis, System, Applications, 2nd Edition, John Wiley & Sons, 2010.
2. H. Asada and J.J.E. Slotine, Robot Analysis and Control, 1st Edition Wiley- Interscience, 1986.
3. Robert J. Schillin, Fundamentals of Robotics: Analysis and control, Prentice-Hall Of India Pvt. Limited, 1996.

Online Learning Resources:

https://nptel.ac.in/courses/108105088
https://nptel.ac.in/courses/108105063
https://nptel.ac.in/courses/108105062
https://nptel.ac.in/courses/112104288

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B.Tech IV-I Sem

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(20A04605) SIGNAL PROCESSING
(Open Elective Course –II)

Course objectives:

- Understand, represent and classify continuous time and discrete time signals and systems, together with the representation of LTI systems.
- Ability to represent continuous time signals (both periodic and non-periodic) in the time domain, sdomain and the frequency domain
- Understand the properties of analog filters, and have the ability to design Butterworth filters
- Understand and apply sampling theorem and convert a signal from continuous time to discrete time or from discrete time to continuous time (without loss of information)
- Able to represent the discrete time signal in the frequency domain
- Able to design FIR and IIR filters to meet given specifications

Course Outcomes:

- Understand and explain continuous time and discrete time signals and systems, in time and frequency domain
- Apply the concepts of signals and systems to obtain the desired parameter/ representation
- Analyse the given system and classify the system/arrive at a suitable conclusion
- Design analog/digital filters to meet given specifications
- Design and implement the analog filter using components/ suitable simulation tools
- Design and implement the digital filter using suitable simulation tools, and record the input and output of the filter for the given audio signal

UNIT I

Signal Definition, Signal Classification, System definition, System classification, for both continuous time and discrete time. Definition of LTI systems

UNIT II

Introduction to Fourier Transform, Fourier Series, Relating the Laplace Transform to Fourier Transform, Frequency response of continuous time systems

UNIT III

Frequency response of ideal analog filters, Salient features of Butterworth filters Design and implementation of Analog Butterworth filters to meet given specifications

UNIT IV

Sampling Theorem- Statement and proof, converting the analog signal to a digital signal. Practical sampling. The Discrete Fourier Transform, Properties of DFT. Comparing the frequency response of analog and digital systems.

UNIT V

Definition of FIR and IIR filters. Frequency response of ideal digital filters

Transforming the Analog Butterworth filter to the Digital IIR Filter using suitable mapping techniques, to meet given specifications. Design of FIR Filters using the Window technique, and the frequency sampling technique to meet given specifications Comparing the designed filter with the desired filter frequency response

Textbooks:

1. ‘Signals and Systems’, by Simon Haykin and Barry Van Veen, Wiley.

References:

1. 'Theory and Application of Digital Signal Processing', Rabiner and Gold
2. ‘Signals and Systems’, Schaum’s Outline series
3. ‘Digital Signal Processing’, Schaum’s Outline series

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B.Tech III-II Sem **L T P C**

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(20A04701b) INTRODUCTION TO INTERNET OF THINGS

(Open Elective Course-II)

Course Objectives:

Students will understand the concepts of Internet of Things and can able to build IoT applications.

Course Outcomes:

- 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 1

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.

References:

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
3. Adrian McEwen, “Designing the Internet of Things”, Wiley Publishers, 2013

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B.Tech III-II Sem

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(20A05605a) PRINCIPLES OF OPERATING SYSTEMS

(Open Elective Course – II)

Course Objectives:

- Understand basic concepts and functions of operating systems
- Understand the processes, threads and scheduling algorithms.
- Expose the students with different techniques of handling deadlocks
- Provide good insight on various memory management techniques
- Explore the concept of file-system and its implementation issues

Course Outcomes:

- Demonstrate and understand of computer systems and operating systems functions
- Distinguish between process and thread and classify scheduling algorithms
- Solve synchronization and deadlock problems
- Compare various memory management schemes
- Explain file systems concepts and i/o management

UNIT I Introduction to Computer and Operating system

Computer Types, Functional Units, Basic Operational Concepts, Number Representation and Arithmetic Operations, Character Representation, Performance, Historical Perspective, Memory Locations and Addresses, Memory operations, Instructions and Instruction Sequencing, Addressing modes

Architecture Operating System Structure, Operations Process, Memory, Storage Management, Protection and Security Computing Environments Operating System Services User Operating System Interface System Calls Types System Programs OS Structure OS Generation System Boot.

UNIT II Process, Threads and Scheduling

Process Concept Scheduling Operations on Processes Cooperating Processes Inter-Process Communication Threads - Multithreading Models -Thread Libraries- Threading Issues – Scheduling Criteria Scheduling Algorithms Algorithm Evaluation.

UNIT III Process Synchronization and Deadlocks

The Critical-Section Problem Synchronization Hardware Mutex Locks -Semaphores Classic Problems of Synchronization Critical Regions Monitors Deadlocks System Model Deadlock Characterization Methods for Handling Deadlocks Deadlock Prevention Deadlock Avoidance Deadlock Detection Recovery from Deadlock.

UNIT IV Memory Management

Introduction - Swapping Contiguous Memory Allocation Paging Segmentation- Structure of the Page Table - Virtual Memory- Background Demand Paging Copy on Write Page Replacement Allocation of Frames Thrashing.

UNIT V Input/ Output and Files

Overview of Mass Storage Structure - Disk Structure - Disk Scheduling and Management-File System Interface File Concept - Access Methods -Directory and Disk Structure- Directory Implementation - Allocation Methods- I/O Systems I/O Hardware- Application I/O Interface - Kernel I/O Subsystem.

Textbooks:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky and NaraigManjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.
2. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating Systems Concepts, Ninth Edition, Wiley,2012.

Reference Books:

1. William Stallings, Operating Systems: Internals and Design Principles, Ninth Edition, Prentice-Hall, 2018.
2. Andrew Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall, 2009.

Online Learning Resources:

https://nptel.ac.in/courses/106/106/106106144/

http://peterindia.net/OperatingSystems.html

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B.Tech III-II Sem

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(20A05605b) FOUNDATIONS OF MACHINE LEARNING

Open Elective Course– II

Course Objectives:

- Acquire theoretical knowledge on setting hypothesis for pattern recognition.
- Apply suitable machine learning techniques for data handling and to gain knowledge from it.
- Evaluate the performance of algorithms and to provide solution for various real-world applications.

Course Outcomes (CO):

After completion of the course, students will be able to

1. Understand the characteristics of machine learning strategies.
2. Apply various supervised learning methods to appropriate problems.
3. Identify and integrate more than one technique to enhance the performance of learning.
4. Create probabilistic and unsupervised learning models for handling unknown pattern.
5. Analyse the co-occurrence of data to find interesting frequent patterns.
6. Pre-process the data before applying to any real-world problem and can evaluate its performance

UNIT - I **Introduction to Machine Learning** Lecture 8Hrs

What is machine learning, learning associations, classification, regression, unsupervised learning, reinforcement learning

Supervised Learning: learning a class from examples, learning multiple classes, model selection and generalization

UNIT - II **Parametric, Non-Parametric methods** Lecture 9Hrs

Parametric Methods: Introduction, maximum likelihood estimation, evaluating an estimator, parametric classification, regression, model selection procedures

Nonparametric Methods: Introduction, nonparametric density estimation: histogram estimator, kernel estimator, k-nearest neighbour estimator

UNIT - III **Multivariate Methods** Lecture 9Hrs

Multivariate Methods: Multivariate data, parameter estimation, estimation of missing values, multivariate normal distribution, multi variate classification

UNIT - IV **Dimensionality Reduction, Clustering** Lecture 8Hrs

Dimensionality Reduction: Introduction, subset selection, principal component analysis, singular value decomposition and matrix factorization

Clustering: Mixture densities, k-means clustering, expectation-maximization algorithm, mixtures of latent variables

UNIT - V **Deep Learning** Lecture 8Hrs

Deep Learning: Introduction, train multiple hidden layers, improving training convergence, regularization, convolution layers, tuning the network structure, learning sequences.

Textbooks:

1. EthemAlpaydin, Introduction to Machine Learning, Fourth Edition, MIT Press, Fourth Edition, 2020
2. MehryarMohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2012

Reference Books:

1. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, "Mathematics for Machine Learning", Cambridge University Press, 2019.
2. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", 2nd Edition, CRC Press, 2015.
3. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014.

Online Learning Resources:

1. https://bloomberg.github.io/foml/
2. https://d1rkab7tlqy5f1.cloudfront.net/EWI/Over%20de%20faculteit/Afdelingen/Intelligent%20Systems/Pattern%20Recognition%20Laboratory/PR/Reading%20Group/Foundations_of_Machine_Learning.pdf

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B.Tech (IT)– III-II Sem

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(20A05605c) DATA ANALYTICS USING R

(Open Elective-II)

Course Objectives:

- Facilitate students to understand R programming
- Help students to gain a basic understanding of Data Analytics
- Inculcate working knowledge of plotting

Course Outcomes:

- Identify and execute basic syntax and programs in R
- Perform the Matrix operations using R built in functions
- Apply nonnumeric values in vectors
- Create the list and data frames
- Exploit the graph using ggplot2.

UNIT I Introduction to R Programming

History and Overview of R- Basic Features of R-Design of the R System- Installation of R- Console and Editor Panes- Comments- Installing and Loading R Packages- Help Files and Function Documentation-Saving Work and Exiting R- Conventions- R for Basic Math- Arithmetic- Logarithms and Exponentials - E-Notation - Assigning Objects – Vectors - Creating a Vector-Sequences, Repetition, Sorting and Lengths – Subsetting and Element Extraction -Vector – Oriented Behavior.

UNIT II Matrices and Arrays

Defining a Matrix – Defining a Matrix- Filling Direction- Row and Column Bindings- Matrix Dimensions-Subsetting- Row, Column, and Diagonal Extractions- Omitting and Overwriting- Matrix Operations and Algebra- Matrix Transpose- Identity Matrix- Matrix Addition and Subtraction- Matrix Multiplication-Matrix Inversion-Multidimensional Arrays-Subsets, Extractions and Replacements.

UNIT III Non-Numeric values

Logical Values- Relational Operators- Characters- Creating a String- Concatenation- Escape Sequences-Substrings and Matching- Factors- Identifying Categories- Defining and Ordering Levels-Combining and Cutting.

UNIT IV Lists and Data frames

List of Objects - Component Access – Naming – Nesting - Data Frames - Adding Data Columns and Combining Data Frames – Logical Record Subsets – Some Special Values – Infinity – NaN – NA - NULL – Attributes – Object - Class-Is-Dot Object-Checking Functions-As-Dot Coercion Functions

UNIT V Basic Plotting

Using plot with Coordinate Vectors-Graphical Parameters-Automatic Plot Types-Title and Axis Labels-Color-Line and Point Appearances-Plotting Region Limits-Adding Points, Lines, and Text to an ExistingPlot-ggplot2 Package-Quick Plot with qplot-Setting Appearance Constants with Geoms—Reading and Writing Files- R-Ready Data Sets- Contributed Data Sets- Reading in External Data Files- Writing Out Data Files and Plots-AdHoc Object Read/Write Operations

Textbooks:

1. Tilman M. Davies, "The Book of R-A First Programming, Statistics" Library of Congress Cataloging-in-Publication Data, 2016.

Reference Books:

1. Hadley Wickham, Garrett Grolemund,"R for Data Science",Oreilly Publication,2017.

2. Roger D. Peng, "R Programming for Data Science" Lean Publishing, 2016.

3. Steven Keller, "R ProgrammingforBeginners",CreateSpaceIndependentPublishingPlatform2016.

Online Learning Resources:

1. https://www.coursera.org/learn/data-analysis-r
2. https://www.careers360.com/courses-certifications/data-analysis-with-r-courses-brpg

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B.Tech III-II Sem

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(20A54701) WAVELET TRANSFORMS AND ITS APPLICATIONS

(Open Elective-II)

Course Objectives:

This course provides the students to understand Wavelet transforms and its applications.

Course Outcomes:

- 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

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

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

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

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

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

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B.Tech III-II Sem **L T P C**

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(20A56701) PHYSICS OF ELECTRONIC MATERIALS AND DEVICES
(Open Elective-II)

Course Objectives:

- To impart the fundamental knowledge on various materials, their properties and applications.
- To provide insight into various semiconducting materials, and their properties.
- To enlighten the characteristic behavior of various semiconductor devices.
- To provide the basics of dielectric and piezoelectric materials and their properties.
- To explain different categories of magnetic materials, mechanism and their advanced applications.

Course Outcome: At the end of the course the student will be able

- To understand the fundamentals of various materials.
- To exploit the physics of semiconducting materials
- To familiarize with the working principles of semiconductor-based devices.
- To understand the behaviour of dielectric and piezoelectric materials.
- To identify the magnetic materials and their advanced applications.

UNIT I Fundamentals of Materials Science

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 (RT and glow discharge).

UNIT II Semiconductors

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 III Physics of Semiconductor devices

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 IV Dielectric Materials and their applications:

Introduction, Dielectric properties, Electronic polarizability and susceptibility, Dielectric constant and frequency dependence of polarization, Dielectric strength and dielectric loss, Piezoelectric properties.

UNIT V Magnetic Materials and their applications

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.

Textbooks

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, Dhanpat Rai 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.

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem **L T P C**

3 0 0 3

(20A51701) CHEMISTRY OF POLYMERS AND ITS APPLICATIONS

Course Objectives:

- To understand the basic principles of polymers
- To synthesize the different polymeric materials and their characterization by various instrumental methods.
- To impart knowledge to the students about fundamental concepts of Hydro gels of polymer networks, surface phenomenon by micelles
- To enumerate the applications of polymers in engineering

Course Outcome

- At the end of the course, the student will be able to:
- Understand the state of art synthesis of Polymeric materials
- Understand the hydro gels preparation, properties and applications in drug delivery system.
- Characterize polymers materials using IR, NMR, XRD.
- Analyze surface phenomenon fo micelles and characterise using photoelectron spectroscopy, ESCA and Auger spectroscopy

UNIT I : Polymers-Basics and Characterization

Basic concepts: monomers, repeat units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: condensation, addition, radical chain, ionic and coordination and copolymerization. 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 and 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, PEAK.

Learning Outcomes:

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem **L T P C**

3 0 0 3

(20A01704) COST EFFECTIVE HOUSING TECHNIQUES

(Open Elective Course - III)

Course Objectives:

- To understand the requirements of structural safety for future construction.
- To know about the housing scenario, housing financial systems land use and physical
- planning for housing and housing the urban poor
- To know the traditional practices of rural housing
- To know the different innovative cost effective construction techniques
- To know the alternative building materials for low cost housing.

Course Outcomes :

- To know the repair and restore action of earthquake damaged non engineered buildings and ability to understand the requirements of structural safety for future construction
- To know about the housing scenario, housing financial systems land use and physical planning for housing and housing the urban poor
- Apply the traditional practices of rural housing
- Understand the different innovative cost effective construction techniques
- Suggest the alternative building materials for low cost housing

UNIT I

a) **Housing Scenario :**Introducing - Status of urban housing - Status of Rural Housing
b) **Housing Finance**: Introducing - Existing finance system in India - Government role as facilitator - Status at Rural Housing Finance - Impedimently in housing finance and related issues
c) **Land use and physical planning for housing :**Introduction - Planning of urban land - Urban land ceiling and regulation act - Efficiency of building bye lass - Residential Densities
d) **Housing the urban poor :**Introduction - Living conditions in slums - Approaches and strategies for housing urban poor

UNIT II

Development and adoption of low cost housing technology

Introduction - Adoption of innovative cost effective construction techniques - Adoption of precast elements in partial prefatroices - Adopting of total prefactcation of mass housing in India- General remarks on pre cast rooting/flooring systems -Economical wall system - Single Brick thick loading bearing wall - 19cm thick load bearing masonry walls - Half brick thick load bearing wall – Fly-ash gypsum thick for masonry - Stone Block masonry - Adoption of precast R.C. plank and join system for roof/floor in the building

UNIT III

Alternative building materials for low cost housing

Introduction - Substitute for scarce materials – Ferro-cement - Gypsum boards - Timber substitutions

- Industrial wastes - Agricultural wastes - alternative building maintenance

Low cost Infrastructure services:

Introduce - Present status - Technological options - Low cost sanitation - Domestic wall - Water supply, energy

UNIT IV

Rural Housing: Introduction traditional practice of rural housing continuous - Mud Housing technology Mud roofs - Characteristics of mud - Fire treatment for thatch roof - Soil stabilization - Rural Housing programs

UNIT V

Housing in Disaster prone areas:

Introduction – Earthquake - Damages to houses - Traditional prone areas - Type of Damages and Railways of non-engineered buildings - Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions. Requirement's of structural safety of thin precast roofing units against Earthquake forces Status of R& D in earthquake strengthening measures - Floods, cyclone, future safety

Textbooks:

1. Building materials for low – income houses – International council for building research studies and documentation.
2. Hand book of low cost housing by A.K.Lal – Newage international publishers.
3. Low cost Housing – G.C. Mathur by South Asia Books

Reference Books:

1. Properties of concrete – Neville A.m. Pitman Publishing Limited, London.
2. Light weight concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.
3. Modern trends in housing in developing countries – A.G. Madhava Rao, D.S. Rama chandra Murthy &G.Annamalai. E. & F. N. Spon Publishers

Online Learning Resources:

https://nptel.ac.in/courses/124107001

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

L	T	P	C
3	0	0	3

(20A02704) IoT APPLICATIONS IN ELECTRICAL ENGINEERING

(Open Elective Course – III)

Course Objectives:

- Understand basics of Internet of Things and Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process
- Analyze motion less and motion detectors in IoT applications
- Understand about Analyze applications of IoT in smart grid
- Apply the concept of Internet of Energy for various applications

Course Outcomes:

- Understand the concept of IoT in Electrical Engineering
- Analyze various types of motionless sensors and various types of motion detectors
- Apply various applications of IoT in smart grid
- Design future working environment with Energy internet

UNIT I SENSORS

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

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

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

Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home

UNIT V INTERNET of ENERGY (IoE)

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. Ersan Kabalci and Yasin Kabalci, From Smart grid to Internet of Energy, 1st Edition, Academic Press, 2019

Reference Books:

1. Raj Kumar Buyya and Amir Vahid Dastjerdi, 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 Sundaram Shriram, 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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A03704) PRODUCT DESIGN AND DEVELOPMENT
(Open Elective-III)

Course Objectives:

- To Design products creatively while applying engineering design principles.
- To Apply principles of human factors, ethics and environmental factorsin product design.
- To Work in groups or individually in their pursuit of innovative product design.
- To implement value design for optimum product cost.

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

- Apply knowledge of basic science and engineering fundamentals
- Undertake problem identification, formulation and solution
- Understanding of the principles of sustainable design and development
- Understanding of professional and ethical responsibilities and commitment to them

UNIT I Product Development Process

General problem-solving process - Flow of Work during the process of designing - Activity Planning Timing and scheduling, Planning Project and Product Costs - Effective Organization Structures - Interdisciplinary Cooperation, Leadership and Team behaviour.

UNIT II Task Clarification

Importance of Task Clarification - Setting up a requirements list - Contents, Format, Identifying the requirements, refining and extending the requirements, Compiling the requirements list, Examples. Using requirements lists - Updating, Partial requirements lists, Further uses - Practical applications of requirements lists.

UNIT III Conceptual Design

Steps in Conceptual Design. Abstracting to identify the essential problems - Aim of Abstraction, Broadening the problem. Formulation, Identifying the essential problems from the requirements list, establishing functions structures, Overall function, Breaking a function down into sub-functions. Developing working structures - Searching for working principles, Combining Working Principles, Selecting Working Structures, Practical Application of working structures. Developing Concepts - Firming up into principle solution variants, Evaluating principle solution variants, Practical Applications of working structures. Examples of Conceptual Design - One Handed Household Water Mixing Tap, Impulse - Loading Test Rig.

UNIT IV Embodiment Design

Steps of Embodiment Design, Checklist for Embodiment Design Basic rules of Embodiment Design Principles of Embodiment Design - Principles of Force Transformations, Principles of Division of Tasks, Principles of Self-Help, Principles of Stability and Bi-Stability, Principles of Fault-Free Design Guide for Embodiment Design - General Considerations, Design to allow for expansion, Design to allow for creep and relaxation, Design against Corrosion, Design to minimize wear, Design to Ergonomics, Design for Aesthetics, Design for Production, Design for Assembly, Design for Maintenance, Design for Recycling, Design for Minimum risk, Design to standards. Evaluation of Embodiment Designs.

UNIT V Mechanical Connections, Mechatronics And Adaptronics:

Mechanical Connections - General functions and General Behaviour, Material connections, From Connections, Force connections, Applications. Mechatronics - General Architecture and Terminology, Goals and Limitations, Development of Mechatronic Solution, Examples. Adaptronics - Fundamentals and Terminology, Goals and Limitations, Development of Adaptronics Solutions, Examples.

Textbooks:

1. G.Paul; W. Beitzetal, Engineering Design, Springer International Education, 2010.
2. Kevin Otto: K. Wood, Product Design And Development, Pearson Education, 2013.

References:

1. Kenith B. Kahu, Product Planning Essentials, Yes dee Publishing, 2011.
2. K.T. Ulrich, Product Design and Development, TMH Publishers, 2011.

Online Learning Resources:

- https://nptel.ac.in/courses/112107217
- https://nptel.ac.in/courses/112104230
- https://www.youtube.com/watch?v=mvaqZAFdL6U
- https://nptel.ac.in/courses/107103082
- https://quizxp.com/nptel-product-design-and-manufacturing-assignment-5/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A04704) ELECTRONIC SENSORS
(Open Elective Course –III)

Course Objectives:

- Learn the characterization of sensors.
- Known the working of Electromechanical, Thermal, Magnetic and radiation sensors
- Understand the concepts of Electro analytic and smart sensors
- Able to use sensors in different applications

Course Outcomes:

- Learn about sensor Principle, Classification and Characterization.
- Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro analytic sensors
- Understand the basic concepts of Smart Sensors
- Design a system with sensors

UNIT I

Sensors / Transducers: Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization

Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor – Types-Capacitive Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors

UNIT II

Thermal Sensors: Introduction, Gas thermometric Sensors, Thermal Expansion Type Thermometric Sensors, Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors, Helium Low Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer ,Resistance Change Type Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors

UNIT III

Magnetic sensors: Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros.

UNIT IV

Radiation Sensors: Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, Xray and Nuclear Radiation Sensors, Fibre Optic Sensors

Electro analytical Sensors: The Electrochemical Cell, The Cell Potential - Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

UNIT V

Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation Sensors –Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing –Sensors for environmental Monitoring

Textbooks:

1. "Sensors and Transducers - D. Patranabis" –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravindraghu, CRC press, 2011

References:

1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media,2014.
3. Sensors handbook- Sabriesoloman, 2nd Ed. TMH, 2009

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A05704a) WEB TECHNOLOGIES
(Open Elective-III)

Course Objectives:

The course is designed to Introduce the key technologies that have been developed as part of the birth and maturation of the World Wide Web.

Course Outcomes:

- Understand the Web essentials.
- Develop web pages using XHTML
- Apply style to web pages using CSS
- Write scripts for client side
- Develop and transform XML documents.

UNIT I Web Essentials: Clients, Servers, and Communication

The Internet, Basic Internet protocols, WWW, HTTP request message, HTTP response message, Web clients, Web Servers, Case study.

UNIT II Markup Languages: XHTML 1.0

An introduction to HTML, Basic XHTML syntax and semantics, fundamental HTML elements, Relative URLs, Lists, Tables, Frames, Forms, Defining XHTML's abstract syntax, Creating HTML documents.

UNIT III Cascading Style Sheets

Introduction, features, core syntax, style sheets and HTML, style rule cascading and inheritance, text properties, Box model, normal flow box layout, beyond the normal flow, lists, tables, cursor styles.

UNIT IV Client-side programming: JavaScript

Basic syntax, variables and data types, statements, operators, literals, functions, objects, Arrays, built-in objects, JavaScript debuggers.

UNIT V Representing Web Data: XML

Documents and vocabularies, Versions and declaration, Namespaces, Ajax, DOM and SAX parsers, transforming XML documents, XPath, XSLT, Displaying XML documents in Web browsers.

Textbooks:

1. J.C. Jackson, Web technologies: A computer science perspective, Pearson.

Reference Books:

1. Sebesta, Programming world wide web, Pearson.
2. Dietel and Nieto , Internet and World Wide Web – How to program, Pearson Education
3. Chris Bates , Web Programming, building internet applications, 2nd edition, WILEY, Dreamtech

Online Learning Resources:

http://getbootstrap.com/

https://www.w3schools.com/whatis/

https://nptel.ac.in/courses/106105084

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem **L T P C**

3 0 0 3

(20A05704b) VR & AR FOR ENGINEERS
(Open Elective Course – III)

Course Objectives:

- Introduce to the design of visualization tools
- Demonstrate Virtual reality
- Learn Virtual reality animation and 3D Art optimization
- Understand the foundational principles describing how hardware, computer vision algorithms function
- Explore the history of spatial computing and design interactions

Course Outcomes:

- Apply VR/MR/AR in various fields in industry
- Design Data visualization tools
- Design audio and video interaction paradigms
- Apply technical and creative approaches to make successful applications and experiences.
- Explain how the humans interact with computers

UNIT I

Computer generated worlds: what is augmented reality? what is virtual reality?
Understanding virtual space: defining visual space and content, defining position and orientation in three dimensions, navigation
The Mechanics of Sight: the visual path way, spatial vision, and Depth Cues.
Component Technologies of Head mounted Displays: Display fundamentals, related terminology and concepts, optical Architectures.

UNIT II

Augmented Displays: Binocular augmenting displays, Monocular augmenting displays.
Fully immersive Displays: PC-Console driven displays, smartphone based displays, CAVES and Walls, Hemispheres and Domes.
The Mechanics of hearing: Defining sound, the auditory pathway, sound cues and localization, the vestibular system.
Audio displays: Conventional audio

UNIT III

The Mechanics of Feeling: The Science of feeling, Anatomy and Composition of the skin.
Tactile and force feedback Devices: Haptic illusions, tactile feedback devices, Force feedback devices.
Sensors for tracking Position, and orientation and motion: introduction to sensor technologies, optical trackers, beacon trackers,electromagnetic trackers, inertial sensors, acoustic sensors.
Devices to enable navigation and interaction: 2D vs 3D interaction and navigation, the importance of a manual interface, hand and gesture tracking, whole body tracking, gaming and entertainment interfaces, navigating with your mind.

UNIT IV

Gaming and Entertainment: Virtual reality and the arts, gaming, immersive video/ cinematic virtual reality.
Architecture and Construction: Artificial spaces, architectural design: Manage group architectures, Construction management, real estate sales applications, architectural acoustics.
Science and engineering: Simulate and innovate, naval architecture and marine engineering, automotive engineering, aerospace engineering, nuclear engineering and manufacturing.

Health and medicine: advancing the field of medicine, training applications, treatment applications.

UNIT V

Aerospace and Defence: Flight simulation and training, mission planning and rehearsal, dismounted soldier situational awareness, advanced cockpit avionics, space operations.

Education: Tangible skills education, theory, knowledge acquisition and concept formation.

Information control and big data visualization: What is big data?, big data analytics and human vision.

Telerobotics and Telepresence: Defining Telerobotics and Telepresence, space applications and robonaut, undersea applications, Terrestrial and airborne applications.

Textbooks:

1. Steve Aukstakalnis, "Practical Augmented Reality", Pearson Education, 2017.

Reference Books:

1. Erin Pangilinan, Steve lukas, and Vasanth Mohan, "Creating Augmented& Virtual Realities", O'REILLY

Online Learning Resources:

1. https://www.coursera.org/learn/intro-augmented-virtual-mixed-extended-reality-technologies-applications-issues
2. https://www.coursera.org/learn/ar

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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

(20A05704c) SOFTWARE ENGINEERING
(Open Elective Course – III)

Course Objectives:

- To learn the basic concepts of software engineering and life cycle models
- To explore the issues in software requirements specification and enable to write SRS documents for software development problems
- To elucidate the basic concepts of software design and enable to carry out procedural and object oriented design of software development problems
- To understand the basic concepts of black box and white box software testing and enable to design test cases for unit, integration, and system testing
- To reveal the basic concepts in software project management

Course Outcomes (CO):

After completion of the course, students will be able to

- Obtain basic software life cycle activity skills.
- Design software requirements specifications for given problems.
- Implement structure, object oriented analysis and design for given problems.
- Design test cases for given problems.
- Apply quality management concepts at the application level.

UNIT – I **Basic concepts in software engineering and software project management** Lecture 8Hrs

Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, Halstead's Software Science, project scheduling, staffing, Organization and team structure, risk management, configuration management.

UNIT – II **Requirements analysis and specification** Lecture 8Hrs

The nature of software, The Unique nature of Webapps, Software Myths, Requirements gathering and analysis, software requirements specification, Traceability, Characteristics of a Good SRS Document, IEEE 830 guidelines, representing complex requirements using decision tables and decision trees, overview of formal system development techniques, axiomatic specification, algebraic specification.

UNIT - III **Software Design** Lecture 9Hrs

Good Software Design, Cohesion and coupling, Control Hierarchy: Layering, Control Abstraction, Depth and width, Fan-out, Fan-in, Software design approaches, object oriented vs. function oriented design. Overview of SA/SD methodology, structured analysis, Data flow diagram, Extending DFD technique to real life systems, Basic Object oriented concepts, UML Diagrams, Structured design, Detailed design, Design review, Characteristics of a good user interface, User Guidance and Online Help, Mode-based vs Mode-less Interface, Types of user interfaces, Component-based GUI development, User interface design methodology: GUI design methodology.

UNIT – IV **Coding and Testing** Lecture 9Hrs

Coding standards and guidelines, code review, software documentation, Testing, Black Box Testing, White Box Testing, debugging, integration testing, Program Analysis Tools, system testing, performance testing, regression testing, Testing Object Oriented Programs.

UNIT – V **Software quality, reliability, and other issues** Lecture 9Hrs

Software reliability, Statistical testing, Software quality and management, ISO 9000, SEI capability maturity model (CMM), Personal software process (PSP), Six sigma, Software quality metrics, CASE and its scope, CASE environment, CASE support in software life cycle, Characteristics of software maintenance, Software reverse engineering, Software maintenance processes model, Estimation maintenance cost. Basic issues in any reuse program, Reuse approach, Reuse at organization level.

Textbooks:

1. Rajib Mall, “Fundamentals of Software Engineering”, 5th Edition, PHI, 2018.
2. Pressman R, “Software Engineering- Practioner Approach”, McGraw Hill.

Reference Books:

1. Somerville, “Software Engineering”, Pearson 2.
2. Richard Fairley, “Software Engineering Concepts”, Tata McGraw Hill.
3. JalotePankaj, “An integrated approach to Software Engineering”, Narosa

Online Learning Resources:

https://nptel.ac.in/courses/106/105/106105182/

http://peterindia.net/SoftwareDevelopment.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A54702) NUMERICAL METHODS FOR ENGINEERS

(OPEN ELECTIVE-III)

Course Objectives:

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.

Course Outcomes:

- 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.

UNIT I Solution of Algebraic & Transcendental Equations

Introduction-Bisection Method-Iterative method-Regula falsi method-Newton Raphson method. System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.

UNIT II Curve Fitting

Principle of Least squares- Fitting of curves- Fitting of linear, quadratic and exponential curves.

UNIT III Interpolation

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae Gauss forward and backward formula, Stirling's formula, Bessel's formula

UNIT IV Numerical Integration

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule

UNIT V Solution of Initial value problems to Ordinary differential equations

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:

4. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
5. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole,PNIE.
6. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India

Reference Books:

3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

Online Learning Resources:

https://slideplayer.com/slide/8588078/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem **L T P C**

3 0 0 3

(20A56702) SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS (OPEN ELECTIVE-III)

Course Objectives:

- To provide exposure to various kinds of sensors and actuators and their engineering applications.
- To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
- To enlighten the operating principles of various sensors and actuators
- To educate the fabrication of sensors
- To identify the required sensor and actuator for interdisciplinary application

Course Outcomes:

- To recognize the need of sensors and actuators
- To understand working principles of various sensors and actuators
- To identify different type of sensors and actuators used in real life applications
- To exploit basics in common methods for converting a physical parameter into an electrical quantity
- To make use of sensors and actuators for different applications

UNIT I Introduction to Sensors and Actuators

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Materials used and their fabrication process: Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

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, Simple applications of Actuators.

UNIT II Temperature and Mechanical Sensors

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, VRP.

UNIT III Optical and Acoustic Sensors

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo-resistors based sensors, Photomultipliers, Infrared sensors: thermal, PIR, thermopiles

Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones.

UNIT IV Magnetic, Electromagnetic Sensors and Actuators

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

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-Mueller counters, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Textbooks:

1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd 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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A51702) CHEMISTRY OF NANOMATERIALS AND APPLICATIONS
(OPEN ELECTIVE-III)

Course Objectives:

- To understand synthetic principles of Nanomaterials by various methods
- To characterize the synthetic nanomaterials by various instrumental methods
- To enumerate the applications of nanomaterials in engineering

Course Outcomes:

- Understand the state of art synthesis of nano materials
- Characterize nano materials using ion beam, scanning probe methodologies, position sensitive atom probe and spectroscopic ellipsometry.
- Analyze nanoscale structure in metals, polymers and ceramics
- Analyze structure-property relationship in coarser scale structures
- Understand structures of carbon nano tubes

UNIT I

Introduction: Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nano materials.

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 II

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.

UNIT III

Techniques for characterization: Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, 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, liquid crystals.

UNIT V

Engineering Applications of Nanomaterials

Textbooks:

1. NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007.
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, BaldevRai, BB Rath and James Murday, Univ. Press, 2012.

References:

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.

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B.Tech IV-I Sem

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(20A01705) HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT PRACTICES

(Open Elective Course-IV)

Course Objectives:

- To understand safety, health and environmental management.
- To be familiar with hazard classification and assessment, hazard evaluation and hazard . control, environmental issues and management
- To get exposed to accidents modeling, accident investigation and reporting, concepts of. HAZOP and PHA
- To be familiar with safety measures in design and process operations.
- To get exposed to risk assessment and management, principles and methods

Course Outcomes:

- To understand safety, health and environmental management.
- To be familiar with hazard classification and assessment, hazard evaluation and hazard.
- To get exposed to accidents modelling, accident investigation and reporting control, environmental issues and management
- To get concepts of HAZOP and PHA.
- To be familiar with safety measures in design and process operations.

UNIT I

Introduction to safety, health and environmental management - Basic terms and their definitions - Importance of safety - Safety assurance and assessment - Safety in design and operation - Organizing for safety.

UNIT II

Hazard classification and assessment - Hazard evaluation and hazard control.

Environmental issues and Management - Atmospheric pollution - Flaring and fugitive release - Water pollution - Environmental monitoring - Environmental management.

UNIT III

Accidents modelling - Release modelling - Fire and explosion modelling - Toxic release and dispersion Modelling

UNIT IV

Accident investigation and reporting - concepts of HAZOP and PHA.

Safety measures in design and process operations - Inserting, explosion, fire prevention, sprinkler systems.

UNIT V

Risk assessment and management - Risk picture - Definition and characteristics - Risk acceptance criteria - Quantified risk assessment - Hazard assessment - Fatality risk assessment - Risk

management principles and methods.

Textbooks:

1. Process Safety Analysis, by Skelton. B, Gulf Publishing Company, Houston, 210pp., 1997.
2. Risk Management with Applications from Offshore Petroleum Industry, by TerjeAven and Jan Erik Vinnem, Springer, 200pp., 2007.

Reference Books:

1. Introduction to Safety and Reliability of Structures, by Jorg Schneider
2. Structural Engineering Documents Vol. 5, International Association for Bridge and Structural Engineering (IABSE), 138pp., 1997.
3. Safety and Health for Engineers, by Roger L. Brauer, John Wiley and Sons Inc. pp. 645-663, 2006.
4. Health, Safety and Environmental Management in Offshore and Petroleum Engineering, Srinivasan Chandrasekaran, John Wiley and Sons, 2016.

Online Learning Resources:https://nptel.ac.in/courses/114106017

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem **L T P C**

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(20A02705) RENEWABLE ENERGY SYSTEMS

(Open Elective Course – IV)

Course Objectives:

- Understand various sources of Energy and the need of Renewable Energy Systems.
- Understand the concepts of Solar Radiation, Wind energy and its applications.
- Analyze solar thermal and solar PV systems
- Understand the concept of geothermal energy and its applications, biomass energy, the concept of Ocean energy and fuel cells.

Course Outcomes:

- Understand various alternate sources of energy for different suitable application requirements
- Understand the concepts of solar energy generation strategies and wind energy system
- Analyze Solar and Wind energy systems
- Understand the basics of Geothermal Energy Systems, various diversified energy scenarios of ocean, biomass and fuel cells

UNIT I SOLAR ENERGY

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

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

Principle of wind energy conversion; Basic components of wind energy conversion systems; windmill 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

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

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.

Textbooks:

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

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B.Tech IV-I Sem

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(20A03705) INTRODUCTION TO COMPOSITE MATERIALS
(Open Elective-IV)

Course Objectives:

- Introduce composite materials and their applications.
- Build proper background for stress analysis in the design of composite structures.
- Familiarize various properties of composite materials.
- Focus on biodegradable composites.

Course Outcomes:

- Identify the practical applications of composites. (L3)
- Identify the polymer matrix composites. (L3)
- Classify of bio- degradable composites. (L2)
- Outline the various types of ceramic matrix materials. (L2)

UNIT I Introduction to composites

Fundamentals of composites – Definition – classification– based on Matrix – based on structure – Advantages and applications of composites - Reinforcement – whiskers – glass fiber – carbon fiber - Aramid fiber – ceramic fiber – Properties and applications.

UNIT II Polymer matrix composites

Polymers - Polymer matrix materials – PMC processes - hand layup processes – spray up processes – resin transfer moulding – Pultrusion – Filament winding – Auto clave based methods - Injection moulding – sheet moulding compound – properties and applications of PMCs.

UNIT III Metal matrix composites

Metals - types of metal matrix composites – Metallic Matrices. Processing of MMC – Liquid state processes – solid state processes – In-situ processes. Properties and applications of MMCs.

UNIT IV Ceramic matrix composites

Ceramic matrix materials – properties – processing of CMCs –Sintering - Hot pressing – Infiltration – Lanxide process – Insitu chemical reaction techniques – solgel polymer pyrolsis –SHS - Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). Properties and Applications of CCMs.

UNIT V Advances & Applications of composites

Advantages of carbon matrix – limitations of carbon matrix carbon fibre – chemical vapour deposition of carbon on carbonfibre perform. Properties and applications of Carbon-carbon composites. Composites for aerospace applications.Bio degradability, introduction of bio composites, classification, processing of bio composites, applications of bio composites - Mechanical, Biomedical, automobile Engineering.

Textbooks:

1. Chawla K.K, Composite materials, 2/e, Springer – Verlag, 1998.
2. Mathews F.L. and Rawlings R.D., Chapman and Hall, Composite Materials: Engineering and Science, 1/e, England, 1994.

Reference Books:

1. H K Shivanand, B V Babu Kiran, Composite Materials, ASIAN BOOKS, 2011.
2. A.B. Strong , Fundamentals of Composite Manufacturing, SME Publications, 1989.
3. S.C. Sharma, Composite materials, Narosa Publications, 2000.
4. Maureen Mitton, Hand Book of Bio plastics & Bio composites for Engineering applications, John Wiley publications, 2011.

Online Learning Resources:

- https://nptel.ac.in/courses/112104229
- https://nptel.ac.in/courses/112104168
- https://nptel.ac.in/courses/101104010
- https://nptel.ac.in/courses/105108124
- https://nptel.ac.in/courses/112104221

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B.Tech IV-I Sem

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(20A04705) MICROCONTROLLERS & APPLICATIONS
(Open Elective Course –IV)

Course Objectives:

- Describe the Architecture 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 1 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.

UNIT II
Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples to use these instructions.

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.

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.

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.

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.

References:

1. Manish K Patel, “The 8051 Microcontroller Based Embedded Systems”, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2. Raj Kamal, “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Pearson Education, 2005.

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B.Tech IV-I Sem

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(20A05705a) CYBER SECURITY
(Open Elective-IV)

Course Objectives:

The course is designed to provide awareness on different cyber crimes, cyber offenses, tools and methods used in cybercrime.

Course Outcomes:

- Classify the cybercrimes and understand theIndian ITA 2000
- Analyse the vulnerabilities in any computing system and find the solutions
- Predict the security threats of the future
- Investigate the protection mechanisms
- Design security solutions for organizations

UNIT I Introduction to Cybercrime

Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT II Cyber Offenses: How Criminals Plan Them

Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing

UNIT III Cybercrime: Mobile and Wireless Devices

Introduction, 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, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT IV Tools and Methods Used in Cybercrime

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT V Cyber Security: Organizational Implications

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Textbooks:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J.David Irwin. CRC Press T&F Group

Online Learning Resources:

http://nptel.ac.in/courses/106105031/40

http://nptel.ac.in/courses/106105031/39

http://nptel.ac.in/courses/106105031/38

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B.Tech IV-I Sem **L T P C**

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(20A05705b)INTRODUCTION TO FULL STACK DEVELOPMENT

(Open Elective Course – IV)

Course Objectives:

- To build foundation on HTML this will help developer to use HTML concepts for building responsive web application.
- To Develop HTML based Single application for Browsers.
- To Understand OOPs concepts and its applications by building competency in object –oriented Programming.
- To implement frontend and backend scenarios using Web Sockets.
- To become proficient in Bootstrap concepts.

Course Outcomes:

- Able to how to program a browser like using JavaScript, jQuery, Angular, or Vue.
- Distinguishing trends in multi-device implementation.
- Create webpages that function using external data.
- Disambiguate the different structures that a no SQL database may represent.
- Derive information from data and implement data into applications.

UNIT I

e The Modern Web: Rise of the Web, Mobile Web, The State of HTML, Applications vs Web Sites, Keeping Up.

Planning Your Work: Identifying Requirements, Defining the Work, Tracking the Work Continuous Improvement, Prioritization &Estimation, Managing Bugs, Continuous Delivery

User Experience: Information Architecture, Getting the User Experience Right, Polishing the User Experience, Implementing the User Experience.

UNIT II

Designing Systems: System Architectures, Identifying Concepts, Identifying User Interactions, Handling Commonalities, Working with Legacy and External Dependencies, Component Interactions, Applications vs. Modules, Cross-Functional Requirements, Caching, Designing for Failure, Designing Modules, Refactoring, Tools, Changing Your Architecture.

Ethics: Privacy, Cognitive Load, Energy Usage, Trust.

Front End: HTML, From Server to Browser, Styling, Components, Responsive Design, Progressive Enhancement to Progressively Enhance, or Not? Mobile First, Feature Detection, Progressive Enhancement of Style, When Not Using Progressive Enhancement, Search Engine Optimization, Build Tools.

UNIT III

Testing: Test-Driven Development, Test Pyramid, Behaviour-Driven Development, Three Amigos, Manual Testing, Visual Testing, Cross-Functional Testing,

JavaScript: Asynchronicity, JavaScript in the Browser, Offline-First Development, Document Object Model, Server-Side JavaScript, Table of Contents viii JavaScript Modules, Structuring Your JavaScript, JavaScript Types, Object-Oriented Programming, Functional Programming, Communicating Between Components, Connecting Components Together, Testing, Build Tools.

Accessibility: Accessible from the Start, Working with Assistive Technologies, Dealing with

Interactive UI, Testing for Accessibility, Avoiding Common Mistakes.

UNIT IV

APIs: API Responsibilities, designing a REST API, Securing Your API, Event-Based APIs, Discovering APIs, Using APIs

Storing Data: Types of Databases, To SQL, or NoSQL?,Where to Store Your Data, Accessing Data from Your App, Managing Your Data, Protecting Your Data.

Security: Trust, Responding to Incidents, The Golden Rule, Threats, Security Checklists, Passwords, Indirect Attacks.

UNIT V

Deployment: Twelve Factor Apps, Developer Machines, Production Environments, Moving Code into Production, Configuring Your Box, Infrastructure, Immutable Infrastructure, Continuous Delivery & Continuous Deployment.

In Production: Fire Drills, Run Books, Monitoring, Responding to Incidents

Constant Learning: Collecting, Experiments, Analysing Results, Hypothesis-Driven.

Textbook:

1. Chris Northwood, The full Stack Developer, Apress, 2018.

Reference Books:

1. Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker, Frank Zammetti.
2. Full Stack Web Development for Beginners, Riaz Ahmed.

Online Learning Resources:

1. Learn Full Stack Web Development with 40+ Projects and Exercises | Udemy

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B.Tech IV-I Sem **L T P C**

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(20A05705c) INDUSTRIAL IOT

(Open Elective-IV)

Course Objectives:

- Acquire theoretical knowledge on Industrial Internet of Things.
- Apply suitable machine learning techniques for data handling and to gain knowledge from it.
- Evaluate the performance of algorithms for sensors and data transmission.

Course Outcomes:

- 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.
- Analyse 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.

Reference Books:

1. Industrial IoT. Available online: https://medium.com/iotforall/whatproduct-managers-need-to-know-about-industrial-iot-8c92eec1d9d2
2. IIoT Cloud Platforms. Available online: https://fr.farnell.com/willthere-be-a-dominant-iiot-cloud-platform.
3. 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

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(20A54703) NUMBER THEORY AND ITS APPLICATIONS

(OPEN ELECTIVE-IV)

Course Objectives:

This course enables the students to learn the concepts of number theory and its applications to

information security.

Course Outcomes:

- Understand number theory and its properties.
- Understand principles on congruences
- Develop the knowledge to apply various applications
- Develop various encryption methods and its applications.

UNIT I Integers, Greatest common divisors and prime Factorization

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

UNIT II Congruences

Introduction to congruences -Linear congruences-The Chinese remainder theorem-Systems of linear congruences

UNIT III Applications of Congruences

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

Finite fields- quadratic residues and reciprocity-Pseudo primes-rho method-fermat factorization and factor bases.

UNIT V Cryptology

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

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B.Tech IV-I Sem

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(20A56703) SMART MATERIALS AND DEVICES
(OPEN ELECTIVE-IV)

Course Objectives:

- To provide exposure to smart materials and their engineering applications.
- To impart knowledge on the basics and phenomenon behind the working of smart materials
- To enlighten the properties exhibited by smart materials
- To educate various techniques used to synthesize and characterize smart materials
- To identify the required smart material for distinct applications/devices

Course Outcomes:

- to recognize the need of smart materials
- to understand the working principles of smart materials
- to know different techniques used to synthesize and characterize smart materials
- to exploit the properties of smart materials
- to make use of smart materials for different applications

UNIT I

Introduction: 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: Physical principles of optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials

UNIT III: Synthesis of smart materials: 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, Sol-gel, spray pyrolysis.

UNIT IV: Characterization techniques: 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: Materials and Devices: 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.

Textbooks:

1. Encyclopaedia of 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

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem **L T P C**

3 0 0 3

(20A51703) GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (OPEN ELECTIVE-IV)

Course Objectives:

- 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.
- Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

Course Outcomes:

- Recognize and acquire green chemistry concepts and apply these ideas to develop respect for the inter connectedness of our world and an ethic of environmental care and sustainability.

UNIT I: 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 II: 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, Heterogenising the Homogenous catalysts, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide, Bio-catalysis and photo-catalysis with examples.

UNIT III: 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 IV: EMERGING GREENER TECHNOLOGIES AND ALTERNATIVE ENERGY SOURCES

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 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: Photochemical Reactions: Advantages of 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. 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 V: GREEN PROCESSES FOR GREEN NANOSCIENCE

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing Green Nanoscience. Green Synthesis of Nanophase Inorganic Materials and Metal Oxide Nanoparticles: Hydrothermal Synthesis, Reflux Synthesis, Microwave-Assisted Synthesis, Other methods for Green synthesis of metal and metal oxide nanoparticles, Green chemistry applications of Inorganic nanomaterials

Textbooks:

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 AckmezMudhoo, CRC Press, 2010.
2. Edited by AlvisePerosa and Maurizio Selva , Hand Book of Green chemistry Volume 8:Green Nanoscience, wiley-VCH, 2013.

HONOURS

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) **L T P C**

3 1 0 4

(20A27H01) TECHNOLOGY OF OILS AND FATS
(Honours)

Course Objectives:

- To familiarize production of oils & oil seeds in India &world;distinction between oils &fats
- To understand Principles of refining of oils and process types.
- To understand handling and storage of oil seeds, hydrogenation of oil/fats–types of oils used for hydrogenation.

Course Outcomes (CO):

- Students will learn the production of oils & oil seeds in India &world;distinction between oils &fats
- Students will understand Principles of refining of oils, handlingand storage of oil seeds; hydrogenation of oil/fats

UNITI

Production of oils & oil seeds in India & world. Definition, structure, composition, of oils &fats, Distinction between oils &fats. Glycerides:-Definition, types–simple, mixed triglycerides, mono & diglycerides, random,-distribution of fatty–acids in glyceride molecule. Fatty acids:-definition types with examples saturated, unsaturated, fatty acids with keto-acids, artificially produced fattyacids. Nonglyceride components of oils and fats, constituents present in Crude &Refined oils– Eg:- phosphatides, sterols, pigments, tocopherols, antioxidants vitamin A, D &E.

UNITII

Classification of oils &fats with examples and detailed glyceride composition with important characteristic of oils. Physico-chemical properties of oils &fats:- solubility, specificgravity, refractive index, color, viscosity, smoke flash &fire points, melting points, anisidine value, saponification value etc. Importance of oils &fats in human Diet & nutrition. Chemical reactions of oils &fats in relation to triglycerides, carboxylgroups&fattyacids.

UNITIII

Handling and storage of oil seeds- Mechanical pretreatment principles and process types- preparation of animal matter, preparation of oilseeds -Cleaning, dehulling & separation of hulls, Reduction in size of oilseeds. Heat treatment of oil bearing material principles and process types- Animal origin Dry rendering, wet rendering, digestive rendering. Plant origin: Cooking, Hydraulic pressing, continuous pressing. Mechanical expression of oil seed principles and process typesBatch process-Open type, closed type. Continuous Pressing, Low pressure presses. Solvent extraction of oil principles and process types- Solvent used for oil extraction, type of Extractors-Batch, continuous.

UNITIV

Refining of oils –principles and process types- Alkalirefining using caustic soda, batchrefining by dry method, Batch refining by wet method continuous caustic refining Liquid, liquid refining, steam refining, micelle refining. Bleaching–principles and process types Adsorbents-batch bleaching, continuous process, recovery of oil from spentclay, chemical bleaching. Deodorization:- batch process, Continuous process. Filtration of oils–principlestypesand process.

UNITV

Hydrogenation of oil/fats–types of oils used for hydrogenation, process of hydrogenation, Products based on Hydrogenation-shortenings, margarine, salad dressings, mayonnaise, Low calorie spreads. Winterizations of oils e.g.:- salad oils Fortification of oils &fats with nutrients processing of non-edible oils and animal fats. Fractionation, inter estificationand esterification of oils.

Textbooks:

1. EIRI Board, Technology of Oilseeds Processing, Oils& Fats and Refining, Engineers India Research Institute
2. Richard D. O'Brien, Fats and Oils: Formulating and Processing for Applications, Second Edition, CRC Press.
3. NIIR Board ,Modern Technology of Oils, Fats &Its Derivatives (2nd Revised Edition) ASIA Pacific Business Press.
4. M.M. Chakravarthy, Chemistry, Technology of oils and fats, Allied Publishers Pvt. Ltd

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) **L T P C**

3 1 0 4

(20A27H02) FOOD STORAGE ENGINEERING
(Honours)

Course Objectives:

- To familiarize production and storage of grains, physical, chemical, and bio-chemical changes occurring during storage.
- To understand cold Chain management, nutritional aspects of freezing, Glass transition temperature and stability of frozen foods.
- To understand controlled atmospheric storage, hypobaric Storage and warehousing

Course Outcomes (CO):

- Students will learn the physical, chemical, and bio-chemical changes occurring during storage
- Students will understand cold Chain management, nutritional aspects of freezing, Glass transition temperature and stability of frozen foods and controlled atmospheric storage, hypobaric Storage and warehousing

UNIT I

Introduction: production and storage of grains, principles of storage, grain storage. Structures: traditional, improved, modern storage. Structure: godown- bag storage, bulk storage (Silos storage). Design of structures, location, stacking arrangements, specifications, advantages and disadvantages. Changes occurring in grain on storage, physical, chemical, and bio-chemical changes. Economics of storage, causes of losses in storage, stored food. Weight loss, food loss, and quality loss, monetary loss. Loss of goodwill, seed, seed loss, post harvest processing (harvesting, shelling, drying, cooling, aeration, cleaning, milling, conveying).

UNIT II

Cold Chain management: Refrigerated storage, cold rooms, walk-in-coolers, Different types of freezers. Frozen Storage Quality loses in frozen foods- Physical changes, Chemical changes in food components, Nutritional aspects of freezing, Glass transition temperature and stability of frozen foods, Temperature requirements during frozen storage, Modeling loss of quality in frozen foods, Time-Temperature integrators.

UNIT III

Controlled Atmospheric StorageBiochemical considerations of CAS, Gas exchange mechanisms, Mass balance principles, Gas generators, Equipment for producing and regulating controlled atmosphere, Design of controlled atmosphere storage chambers.

UNIT IV

Hypobaric Storage: History of hypobaric storage, Experimental errors in hypobaric storage setups, Gas and vapor mass transfer at low pressure, requirements for installation. Measurement devices (Relative humidity, Pressure, Air-change rate, Oxygen, Carbon dioxide, Ethyl alcohol, Acetaldehyde, hypobaric acid vapor), Flow control, Humidity control, Effects on food, Effects on microbes.

UNIT V

Warehousing: Principles, types of warehouses, utility of warehouses. Warehouse management. Cocoon storage.Benefits from warehouses: Regular production, Time utility, Storage of surplus goods, Price stabilization, Minimization of risk, Packing and grading, Financing

Textbooks:

1. Hypobaric storage in food industry- Advances in technology and theory- Stanley.P.Berg
2. Frozen food science and Technology- Judith.A.Evans
3. Engineering for storage of fruits and vegetables- Chandra Gopala Rao

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) **L T P C**

3 1 0 4

(20A27H03) TQM IN FOOD INDUSTRY
(Honours)

Course Objectives:

- To familiarize quality management, quality management and quality management tools
- To understand Quality management certifications and regulations for food industry.
- To understand the Environmental management system and Eco-friendly food processing system

Course Outcomes (CO):

- Students will learn the quality management, quality management tools. Adulterant identification techniques for milk, honey, oils, spices, etc.,
- Students will understand the and regulations for food industry, Environmental management system and Eco-friendly food processing system

UNIT I

Introduction to quality management - Definition, Scope, Significance and Objectives of Qualitymanagement; Dimensions of quality in foods, Food quality evaluation techniques, Qualitycontrol Vs Quality assurance.

UNIT II

Adulteration - Types of adulterants, Adulterant identification techniques for milk, honey, oils, spices, sugar, pulses, tea powder, coffee,etc as per the FSSAI manual. Quality assurance forraw materials, work in process and finished goods, Safe handling of food product, equipmentand machineries; personal hygiene- MPL for adulterants

UNIT III

Quality Management Tools- Seven old and new Quality management tools, Statistical process control – Mean & range chart,P chart and C chart, Seven deadly wastages, PDCA cycle, Quality circle, Quality audit, Internalaudit, Continuous improvement of productivity- proficiency testing for product quality- Six Sigma Concept.

UNIT IV

Quality management certifications and regulations for food industry, Implementation procedure for HACCP (ISO 22000), QMS, ISO 9001, BIS, APEDA and Sixsigma certifications; AGMARK and Codex Alimentary Commission regulations; Packaging andlabeling regulations for food products; Regulations for food products export and imports.

UNIT V

Environmental management system (EMS) -ISO 14001, Effluent treatment plant location andmaintenance- Eco-friendly food processing system, green plant, challengesinEMS.

Textbooks:

1. Poornimacharantimath, Total quality management, Dorling Kindersley, Publishers SouthAsia Ltd., 2009.
2. Sohrab, 2001 Integrated ISO 9001 HACCP for food processing industries, Allied Publishers Ltd, Mumbai

References:

1. Krammer, A. and Twigg, B.A. 2006. Quality control for the food industry, Volume 2
2. .Applications. The AVI Publishing Company. Inc., Westport, Connecticut.
3. Ranganna, S. 1994. Handbook of analysis and Quality control for fruits and Vegetable Products. Tata McGraw hill. New Delhi.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (FT) **L T P C**

3 1 0 4

(20A27H04) ENTREPRENEURSHIP DEVELOPMENT
(Honours)

Course Objectives:

- To familiarize Entrepreneur, entrepreneurial flair, Trade license, trademarks registration and registration marks
- To understand the role of agencies for promotion of food processing industries.
- To understand the Preparation of detailed project report and Project economics

Course Outcomes (CO):

- Students will learn the small, medium and large scale manufacturing industries.
- Students will understand the trade license, trademarks registration, FSSAI registration, DPR and Project economics

UNIT I

Entrepreneur and entrepreneurial flair; Classification of small, medium and large scale manufacturing industries; Opportunities of food processing industries.

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UNIT II

Trade license, trademarks registration and registration marks; Sources of finance; Selection of land and factory sheds.

UNIT III

Agencies for promotion of food processing industries; Source of machine and equipment. FSSAI registration and licensing. Exports and imports policies and licensing, EXIM Bank procedures, IPR and patent registration process.

UNIT IV

Preparation of detailed project report (DPR); Market feasibility reports; Techno-economic feasibility report on fruits and vegetable processing, bakery and confectionery, mushroom manufacture and soybean processing

UNIT V

Project economics- Cost of operations, Fixed and variable costs- plant and machinery, pre operative cost, post operative cost, working capital.

Textbooks/ References:

1. Entrepreneurial Development by Sarwate (Everest Publication).
2. Entrepreneurship Development by Abha Mathur, Taxmann Publications, 1st Edition 2021.
3. Entrepreneurship, by Robert D. Hisrich, Michael P. Peters, and Dean A. Shepherd, Mc Graw Hills, 11th Edition.