Jawaharlal Nehru Technological University Anantapur

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

Ananthapuramu–515 002 (A.P) India

III & IV year B.Tech

Course Structures and Syllabi under R19 Regulations

JNTUA Curriculum
Mechanical Engineering B. Tech Course Structure

III & IV Year Course Structure and Syllabus

S.No	Course No	Course Name	Category	L-T-P	Credits
		Semester - 5 (Theory - 7, Lab - 3)			
1.	19A03501T	Applied Thermodynamics	PC	2-1-0	3
2.	19A03502T	Manufacturing Technology	PC	2-0-0	2
3.	19A03503T	Heat Transfer	PC	2-1-0	3
4.	19A03505	Dynamics of Machinery	PC	2-1-0	3
5.	19A03504a 19A03504b 19A03504c 19A03504d 19A03504e	Professional Elective 1 Automobile Engineering Manufacturing Methods in Precision Engineering Design of Transmission Systems Power Plant Engineering Ergonomics and Human Factors in Engineering	PE	3-0-0	3
6.	19A01506a 19A01506b 19A02506a 19A03506a 19A03506b 19A04506a 19A04506b 19A05506a 19A05506b 19A27506a 19A27506b 19A54506a 19A52506a	Open Elective-I Experimental stress analysis. Building Technology Electrical Engineering Materials Introduction to Hybrid and Electric Vehicles Rapid Prototyping Analog Electronics Digital Electronics Free and Open Sources Systems Computer Graphics and Multimedia Animation Brewing Technology Computer Applications in Food Technology Optimization Techniques Technical Communication and Presentation Skills	PE	3-0-0	3
7.	19A03501P	Applied Thermodynamics Lab	PC	0-0-3	1.5
8.	19A03502P	Manufacturing Technology Lab	PC	0-0-3	1.5
9.	19A03403P	Fluid Mechanics & Hydraulic Machinery Lab	PC	0-0-2	1
10.	19A03507	Socially Relevant Projects (15 Hrs/Sem)	PR	0-0-0.5	0.5
11.	19A99501	Mandatory Course: Constitution Of India	MC	3-0-0	0
				Total	**21.5**

S.No	Course No	Course Name	Category	L-T-P	Credits
Semester - 6 (Theory - 7, Lab – 2)				
1.	19A03601	Design of Machine Elements	PC	2-1-0	3
2.	19A03602T	Introduction to CAD/CAM	PC	3-0-0	3
3.	19A52601T	English Language Skills	BS	3-0-0	3
4.	19A03603a 19A03603b 19A03603c 19A03603d 19A03603e	Professional Elective-II Alternative Fuels and Emission Control Simulation and Modeling of Manufacturing Systems Mechanical Behavior of Materials Refrigeration & Air Conditioning Production and Operations Management	PE	3-0-0	3
5.	19A01604a 19A01604b 19A02604a 19A02604b 19A03604a 19A03604b 19A04604a 19A04604b 19A05604a 19A05604b 19A27604a 19A27604b 19A54604a 19A52604a	Open Elective-II Industrial waste and waste water management. Building Services & Maintenance Industrial Automation System Reliability Concepts Introduction to Mechatronics Optimization techniques through MATLAB Basics of VLSI Principles of Communication Systems Fundamentals of VR/AR/MR Data Science Food Toxicology Food Plant Equipment Design Wavelet Transforms & its applications Soft Skills	OE	3-0-0	3
6.	19A52602a 19A52602b 19A52602c 19A52602d 19A52602e	Humanities Elective-I Entrepreneurship & Incubation Managerial Economics And Financial Analysis Business Ethics And Corporate Governance Enterprise Resource Planning Supply Chain Management	HS	3-0-0	3
7.	19A03503P	Heat Transfer Lab	PC	0-0-3	1.5
8.	19A52601P	English Language Skills Lab	BS	0-0-3	1.5
9.	19A03605	Socially Relevant Projects (15 Hrs/Sem)	PR	----	0.5
10.	19A99601	Research Methodology	MC	3-0-0	0
				Total	**21.5**

S.No	Course No	Course Name	Category	L-T-P	Credits
		Semester – 7 (Theory - 5, Labs -2 & Project – 1)			
1.	19A03701	Operations Research	PC	2-1-0	3
2.	19A03702T	Metrology & Measurements	PC	2-0-0	2
3	19A03703a 19A03703b 19A03703c 19A03703d 19A03703e	Professional Elective-III Automotive Transmission Systems Additive Manufacturing Mechanics of Composite Materials Solar and Wind Energy Product Marketing	PE	3-0-0	3
4.	19A01704a 19A01704b 19A02704a 19A02704b 19A03704a 19A03704b 19A04704a 19A04704b 19A05704a 19A05704b 19A27704a 19A27704b 19A54704a	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 Corporate Governance in Food Industries Process Technology for Convenience & RTE Foods Numerical Methods for Engineers (ECE , CSE, IT &CE)	PE	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.	19A03702P	Metrology & Measurements Lab	PC	0-0-3	1.5
7.	19A03602P	CAD / CAM Lab	PC	0-0-3	1.5
8.	19A05406P	IOT Lab		0-0-2	1
9.	19A03705	Project Stage – I	PR	0-0-4	2
10.	19A99701	Industrial Training / Skill Development / Research Project	PR	- - -	1.5
				Total	21.5

Semester – 8 (Theory - 2, Project – 1)					
S.No	Course No	Course Name	Category	L-T-P	Credits
1.	19A03801a 19A03801b 19A03801c 19A03801d 19A03801e	Professional Elective-IV Autotronics Robotics and Applications in Manufacturing Mechanical Vibrations Computational Fluid Dynamics Total Quality Management (TQM)	PE	3-0-0	3
2.	19A01802a 19A01802b 19A02802a 19A02802b 19A03802a 19A03802b 19A04802a 19A04802b 19A04802c 19A04802d 19A05802a 19A05802b 19A27802a 19A27802b 19A54802a	Open Elective-IV Disaster Management. Global Warming and climate changes IoT Applications in Electrical Engineering Smart Electric Grid Energy conservation and management Non destructive testing Introduction to Image Processing Principles of Cellular and Mobile Communications Industrial Electronics Electronic Instrumentation Block Chain Technology and Applications MEAN Stack Technology Food Plants Utilities & Services Nutraceuticals & Functional Foods Mathematical Modeling & Simulation	OE	3-0-0	3
3.	19A03803	Project	PR	------	7
				Total	13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– III-I Sem	L	T	P	C
	2	1	0	3

(19A03501T) APPLIED THERMODYNAMICS

Course Objectives

- To familiarize the Working Principles of IC engines.
- To teach combustion process in SI and CI engines.
- To introduce different types of compressors.
- To familiarize concepts of thermodynamic cycles used in steam power plants and gas turbines
- To impart knowledge on the working of nozzles, turbines, refrigeration and air conditioning.

UNIT I   **10 hours**

IC Engines: Working and classification of IC engines, comparison of two stroke and four stroke engines, comparison of SI and CI Engines.
Testing and Performance of IC Engines: Methods of testing IC Engines, performance analysis of IC Engines.
Combustion in IC Engines: SI engine: stages of combustion, normal combustion, abnormal combustion, variables effecting delay period and knocking, pre-ignition. CI engine: stages of combustion, normal combustion, abnormal combustion, variables effecting delay period and knocking. Fuel requirements and fuel rating.

Learning Outcomes:

After completion of this unit, students will be able to
- Understand working of IC engines on the basis of thermodynamic cycles. (L2)
- Estimate engine performance. (L5)
- Identify the effects of abnormal combustion in IC engines. (L3)

UNIT II   **8 hours**

Air compressors

Reciprocating Compressor: Single stage reciprocating compressors, work required, effect of clearance in compressors, volumetric efficiency, multi stage compressor, effect of inter cooling in multi stage compressors, compressor performance.

Rotary Compressor: Working principle of a rolling piston type compressor (fixed vane type), multi vane type compressors, characteristics of rotary vane type compressor, working principle of centrifugal compression and axial flow compressors, velocity triangles.

Learning Outcomes:

After completion of this unit, students will be able to
- Classify different types of air compressors. (L2)
- Compare the performance of different types of air compressors (L2)

UNIT III   8 hours

Vapour Power Cycles: Vapour power cycle, simple Rankine cycle, mean temp of heat addition thermodynamic variables effecting efficiency and output of Rankine cycle

Gas power Cycle: Simple gas turbine plant, Brayton cycle, closed cycle and open cycle for gas turbines, condition for maximum pressure ratio and optimum pressure ratio, actual cycle. Methods to improve performance: regeneration, intercooling and reheating. Introduction to jet propulsion: working principle of ramjet, turbojet, turbofan, turboprop and pulse jet engines,

Learning Outcomes:

After completion of this unit, students will be able to
- Explain concepts of vapour power cycle used in steam power plant. (l2)
- Evaluate the cycles used in gas turbines. (l5)
- Outline the jet propulsion system (l2)

UNIT IV   8 hours

Nozzles: Type of nozzles - air and steam nozzles. Compressible flow through nozzle- condition for maximum discharge - nozzle efficiency.

Steam Turbines: Classification of steam turbines -impulse turbine and reaction turbine - compounding in turbines - velocity diagrams in impulse and reaction turbines, efficiency, degree of reaction - governing of turbines

Learning Outcomes:

After completion of this unit, students will be able to
- Compare the performance of nozzles, used in turbines. (l2)
- Classify steam turbines and applications. (l4)

● Analyse the performance of steam turbines under different operating conditions. (l5)

UNIT V   **8 hours**

Refrigeration: Bell-Coleman cycle - vapour compression cycle, effect of vapour condition on COP of VCR, -vapour absorption cycle, properties of common refrigerants
Principles of Psychrometry and Air Conditioning: Psychometric terms, psychometric processes and air conditioning systems.

Learning Outcomes:

After completion of this unit, students will be able to

- Outline the operation of refrigerators. (l2)
- Identify different refrigerants and applications.(l3)
- Use properties of moist air in calculations for air-conditioning system. (l3)

Course Outcomes

After completing this course, the students can

- Explain working of IC engines with combustion process. (L2)
- Select compressors for different applications. (L1)
- Use T-s diagram in vapour power and gas power cycles. (L3)
- Explain the basic principles of steam turbines. (L2)
- Select appropriate refrigerant for different applications. (L1)

Text Book(s)

1. Ganesan V, "Internal Combustion Engines", Tata McGraw Hill, 2017.
2. M.L.Mathur and F.S.Mehta, "Thermal Engineering", Jain brothers,2014

References:

1. Mahesh V Rathore, "Thermal Engineering", Tata McGraw Hill 2017
2. Yahya, S. M., Turbines, "Compressors and Fans", 4th edition, Tata McGraw Hill, 2010.
3. Nag P.K, "Engineering Thermodynamics", 4th edition, Tata McGraw-Hill, 2008.
4. Onkar Singh, "Thermal Turbomachines", 3rd edition, Wiley India, 2014.
5. P.L.Ballaney, "Thermal Engineering", 2nd edition, Khanna, 2005.

19A03502T MANUFACTURING TECHNOLOGY

Course Objectives:

- Explain parameters in the metal cutting operation.
- Relate tool wear and tool life and the variables that control them.
- Calculate machining times for different machining processes.
- Teach various metal cutting processes. (lathe, drilling, boring shaping, slotting, milling and grinding).
- Familiarise the principles of jigs and fixtures and types of clamping and work holding devices.

UNIT I:

Material Removal Processes: **8hrs**

Metal Cutting: Single and multi-point cutting, orthogonal cutting, various force components, chip formation, tool wear and tool life, surface finish and integrity, machinability, cutting tools and materials, cutting fluids, coatings.

Learning Outcomes:

At the end of the this unit, the student will be able to
- Describe cutting processes and variables. (l2)
- Classify various types of chips, cutting tool materials and cutting fluids. (l4)
- Calculate cutting force, speed and feed finding techniques during machining. (l5)

UNIT II:

Machining processes for round shapes: **12hrs**

Lathe and Lathe Operations: Principles of working, specifications, types of lathes, operations performed, work holders and tool holders. Taper turning, thread turning attachments for lathes. machining time calculations. Turret and capstan lathes - Principle of working, collect chucks, other work holders - tool holding devices.
Drilling and Drilling Machines: Principles of working, specifications, types, and operations performed - tool holding devices - nomenclature of twist drill.
Boring and Boring Machines- Principles of working, specifications, types, and operations performed - tool holding devices - nomenclature of boring tools

Reaming and Reamers: Principles of working, specifications, types, and operations performed - tool holding devices - nomenclature of reamers.

Taping and Taps: Principles of working, specifications, types, and operations performed - tool holding devices - nomenclature of taps.

Learning Outcomes:

At the end of this unit, the student will be able to
- List the specifications for various types of lathes. (l1)
- Determine cutting speeds for different machining operations. (l5)
- Identify parts of drilling, boring, reaming machines. (l3)

UNIT III:

Machine processes for other shapes: 8hrs

Milling operations and Milling machines - Principles of working, specifications, classifications of milling machines, machining operations, types and geometry of milling cutters, methods of indexing, and accessories to milling machines, machining time calculations.

Shaping, Slotting and planing machines - Principles of working - principal parts, specification, classification, operations performed, machining time calculations

Learning Outcomes:

At the end of this unit, the student will be able to
- Recognize the parts of milling, shaping, slotting and planing machine. (l3)
- Compare tool geometry for milling, shaping, slotting and planing operations. (l3)
- Calculate machining times. (l5)

UNIT IV:

Abrasive Machining: 6hrs

Grinding and grinding machines: Grinding process, types of grinding machines, grinding process parameters, honing, lapping, other finishing processes.

Learning Outcomes:

At the end of this unit, the student will be able to
- Understand the basic principles of abrasive processes. (l2)
- Classify different types of grinding machines and their applications. (l4)
- Assess the grinding process and variables that effect the operation. (l5)
- Estimate the time and power required for the grinding operation. (l5)
- Explain various types of abrasive processes such as honing and lapping for final finishing operation. (l2)

UNIT V   **8hrs**

Jigs and Fixtures Principles of design of Jigs and fixtures and uses, 3-2-1 principle of location and clamping, classification of Jigs & Fixtures, types of clamping and work holding devices, typical examples of jigs and fixtures.

Learning Outcomes:

At the end of this unit, the student will be able to
- Classify various types of jigs and fixtures. (l4)
- Identify various types of work and tool holding devices. (l3)
- Explain the design principles of jigs and fixtures. (l2)
- Design a jig and fixture for a given application. (l6)

Course Outcomes:

At the end of the course, the student will be able to

- Choose cutting processes and variables. (l3)
- Relate tool wear and tool life. (l1)
- Calculate the machining parameters for different machining processes. (l5)
- Identify methods to generate different types of surfaces. (l3)
- Explain work-holding requirements. (l2)
- Design jigs and fixtures. (l6)

Text books:

1. P.N. Rao, "Manufacturing Technology: Metal Cutting and Machine Tools", (Volume 2), 3rd edition, Tata McGraw-Hill Education, 2013
2. R.K. Jain and S.C. Gupta, "Production Technology", 17th edition, Khanna Publishers, 2012.

Reference books:

1. Kalpakzian S and Schmid SR, "Manufacturing Engineering and Technology", 7th edition, Pearson, 2018.
2. Milton C.Shaw , "Metal Cutting Principles", 2nd edition, Oxford, 2012
3. Hindustan Machine Tools, "Production Technology", TMH, 2001
4. V.K.Jain, Advanced Machining Process,12th edition, Allied Publications, 2010

5. AB. Chattopadhyay, "Machining and Machine Tools", 2nd edition, Wiley, 2017
6. Halmi A Yousuf & Hassan, "Machine Technology: Machine Tools and Operations", CRC Press Taylor and Francis Group, 2008

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B.Tech (ME)– III-I Sem **L   T   P   C**

2   1   0   3

(19A03503T)   HEAT TRANSFER

Course Objectives

- To impart the basic laws of conduction, convection and radiation heat transfer and their applications
- To familiarize the convective heat transfer concepts
- To explain basics of radiation heat transfer
- To make conversant with the heat transfer analysis related to thermal systems like heat exchangers, evaporator, and condenser.
- To understand the phenomenon of boiling and condensation to familiarize the mass transfer process

UNIT I   **10 hours**

Introduction: Basic modes of heat transfer- rate equations- generalized heat conduction equation - steady state heat conduction solution for plain and composite slabs - cylinders - critical thickness of insulation- heat conduction through fins of uniform cross section- fin effectiveness and efficiency.

Unsteady State Heat Transfer Conduction- Transient heat conduction- lumped system analysis and use of Heisler charts.

Learning Outcomes:

After completion of this unit, students will be able to
- Identify the phenomenon related to different modes of heat transfer (L1)
- Compare different types of conduction heat transfer (L2)
- Apply concept of thermal resistance and its importance in practical problems (L3)

UNIT II   **9 hours**

Convection: Basic concepts of convection–heat transfer coefficients - types of convection – forced convection and free convection.

Forced convection in external flow–concepts of hydrodynamic and thermal boundary layers- use of empirical correlations for flow over plates and cylinders. Fluid friction – heat transfer analogy, approximate solution to laminar boundary layer equation for external flow. Internal flow – Use of empirical relations for convective heat transfer in horizontal pipe flow.

Free Convection -development of hydrodynamic and thermal boundary layer along a vertical plate – use of empirical relations for convective heat transfer on plates and cylinders in horizontal and vertical orientation

Learning Outcomes:

After completion of this unit, students will be able to
- Apply the convective heat transfer principles (L3)
- Use analogy between fluid friction and heat transfer (L3)
- To estimate the convention heat to differentiate between forced and free convection engineering problems. (L2)

UNIT III   **7 hours**

Radiation: Radiation heat transfer – thermal radiation – laws of radiation - Black and Gray bodies – shape factor-radiation exchange between surfaces - Radiation shields - Greenhouse effect.

Learning Outcomes:

After completion of this unit, students will be able to
- Apply the principles of radiation heat transfer (L3)
- Calculate the radiation heat transfer between two bodies (L2)
- Design a radiation shield for given conditions (L3)
- Examine the effect of greenhouse gases on atmosphere (L4)

UNIT IV   **7 hours**

Heat Exchangers: Types of heat exchangers- parallel flow- counter flow- cross flow heat exchangers- overall heat transfer coefficient- LMTD and NTU methods- fouling in heat exchangers.

Learning Outcomes:

After completion of this unit, students will be able to
- Understand the working of different types of heat exchangers (L2)
- Calculate the heat transfer in heat exchangers (L2)
- Design a heat exchanger for a given application (L3)

UNIT V   **7 hours**

Boiling and Condensation: Different regimes of boiling- nucleate, transition and film boiling – condensation - filmwise and dropwise condensation.

Mass Transfer: Conservation laws and constitutive equations - Fick's law of diffusion, isothermal equi-mass - Equimolal diffusion- - diffusion of gases and liquids- mass transfer coefficient.

Learning Outcomes:

After completion of this unit, students will be able to

- Interpret the basic modes of condensation heat transfer (L2)
- Identify different regimes of boiling in design of boilers (L3)
- Understand the basic mechanism of mass transfer (L2)
- Differentiate between mass transfer due to convection and diffusion (L4)

Course Outcomes

At the end of the course, the student will be able to

- Apply the concepts of different modes of heat transfer. (l3)
- Apply knowledge of conduction heat transfer in the design of insulation of furnaces and pipes. (l3)
- Analyse free and forced convection phenomena in external and internal flows. (l4)
- Design of thermal shields using the concepts of black body and non-black body radiation. (l5)
- Apply the basics of mass transfer for applications in diffusion of gases. (l3)

Text Book(s)

1. P.K. Nag, "Heat Transfer", 3rd edition, Tata McGraw-Hill, 2011.
2. S.P. Sukhatme, "A Textbook of Heat Transfer", Universities Press, TMH publications 2005

References:

1. J.P.Holman, "Heat Transfer", 9th edition, Tata McGraw-Hill,2008.
2. Cengel. A.Yunus, "Heat Transfer", A Practical Approach, 4th edition, Tata McGraw-Hill, 2007.
3. Lienhard and Lienhard, "A Heat and Mass Transfer", Cambridge Press, 2011.
4. C.P. Kothandaraman and S. Subramanyan, "Heat and Mass Transfer databook", New Age Publications, 2014

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B.Tech (ME)– III-I Sem   **L   T   P   C**

                                                                         2   1   0   3

(19A03505) DYNAMICS OF MACHINERY

Course Objectives:

The Objectives of this course are to
- Explain the importance of friction and apply for brakes and dynamometers
- Analyze the turning moment diagrams and discuss the applications of flywheel
- Familiarizes the concept of gyroscope and its applications for aero plane, motor cycle and motor cars
- Uses of governors and its applications
- Explain the need of balancing of rotating and reciprocating masses

UNIT I

FRICTION: Inclined plane, friction of screws and nuts, pivot and collar, uniform pressure, uniform wear. Friction circle and friction axis, lubricated surfaces, boundary friction, film lubrication.
CLUTCHES: Friction clutches- Single Disc or plate clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch.
BRAKES AND DYNAMOMETERS: Simple block brakes, Band brake, internal expanding brake, braking of vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

Learning Outcomes:

At the end of this unit, the student will be able to
- Know the applications and concepts of friction. (L3)
- Understand the significance of clutches. (L2)
- Know the applications of breaks and dynamometers. (L3)

UNIT II

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aeroplanes and ships.TURNING MOMENT DIAGRAMS AND
FLY WHEELS: Turning moment diagrams for steam engine, IC Engine and multi cylinder engine. Crank effort - coefficient of Fluctuation of energy, coefficient of
Fluctuation of speed – Fly wheels and their design, Fly wheels for Punching machines.

Learning Outcomes:

At the end of this unit, the student will be able to
- To understand the concept and applications of gyroscopic couple. (L3)
- To draw the turning moment diagram for energy storage . (L2)
- To study the applications of flywheels. (L3)

UNIT III

GOVERNORS: Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung governors with auxiliary springs. Sensitiveness, isochronism and hunting. Effort and power of a governor.

Learning Outcomes:

At the end of this unit, the student will be able to
- Understand different types of governors. (L3)
- Analyse the sensitiveness and isochronisms of governors. (L2)
- Estimate the effort and power of governors. (L3)

UNIT IV

BALANCING: Balancing of rotating masses - single and multiple – single and different planes.
BALANCING OF RECIPROCATING MASSES: Primary and Secondary balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples -V-engine, multi cylinder inline and radial engines for primary and secondary balancing.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain the importance of balancing. (L3)
- Analyzing the balancing of reciprocating masses. (L2)
- Apply the balancing techniques. (L3)

UNIT V

VIBRATION: Free and forced vibration of single degree of freedom system, Role of damping, whirling of shafts and critical speeds. Simple problems on free, forced and damped vibrations.

Vibration Isolation & Transmissibility. Transverse vibrations of beams with concentrated and distributed loads. Dunkerly's method, Raleigh's method. Torsional vibrations - two and three rotor systems.

Learning Outcomes:

At the end of this unit, the student will be able to
- Formulate the equations of motion and solve single degree of freedom system with damping. (L3)
- Estimate the natural frequency of vibrating systems. (L2)

- Explain the concept of vibration isolation of transmissibility. (L3)

Course Outcomes:

At the end of the course, the student will be able to
- Understand the effect of reactive gyroscopic couple on the stability of vehicles
- Understand the power lost and power transmitted due to friction
- Identify and correct the unbalances of rotating body
- Reduce the magnitude of vibration and isolate vibration of dynamic systems
- Determine dimensions of Governors for speed control.

TEXT BOOKS:
1. S.S. Rattan, "Theory of Machines", MGH Publishers,3rd Edition,2013.
2. R.L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw Hill.

REFERENCES:
1. Thomas bevan, "Theory of machines", Pearson, 3rd edition,2012.
2. J.E. Shiegley, "The theory of machine", Mcgraw hill .
3. Shigley et.al. "Theory of machines and mechanisms" of Oxford international student edition.
4. R.S Khurm, "Theory of machines", S.Chand publications

B.Tech (ME)– III-I Sem   **L   T   P   C**
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(19A03504a) AUTOMOBILE ENGINEERING
PROFESSIONAL ELECTIVE - I

Course objectives:

- Impart the knowledge of vehicle structure and its components.
- Demonstrate various components of petrol engines and diesel engines.
- Trains various electrical system, circuits, and testing of automobiles.
- Explain the concepts of steering, suspension and braking system in automobile.

UNIT - I

Introduction to vehicle structure and engine components: Vehicle construction - Chassis and body - Specifications - Engine - Types - Construction - Location of engine - Cylinder arrangement - Construction details - Cylinder block - Cylinder head - Cylinder liners - Piston – piston rings - Piston pin - Connecting rod - Crankshaft - Valves. Lubrication system - Types - Oil pumps - Filters - Cooling system - Types - Water pumps - Radiators - Thermostats - Anti-freezing compounds.

Learning Outcomes:

At the end of the unit, the student will be able to
- Identify different parts of the automobile.(l3)
- Explain various parts of the engine.(l2)
- Describe the lubrication and cooling system in ic engines.(l2)

UNIT - II

Ignition, fuel supply and emission control system: Ignition system - Coil and Magneto - Spark plug - Distributor – Electronic ignition system - Fuel system - Carburetor - Fuel pumps - Fuel injection systems - Mono point and Multi point – UNIT Injector – Nozzle types - Electronic Fuel Injection system (EFI) – GDI, MPFI, DTSI-Automobile Emissions - Source of formation – Effects on human health and environment - Control techniques - Exhaust Gas Recirculation (EGR) - Catalytic converter - Emission tests and standards (Indian and Europe)

Learning Outcomes:

At the end of the unit, the student will be able to
- Explain the working principles of ignition, fuel supply and emission control systems.(l2)
- Compare the types of ignition systems and fuel systems.(l2)
- Interpret the   about effects of automobile emissions on human health and

environment.(l6)

UNIT - III

Transmission system: Clutches - Function - Types - Single plate, Multiple plate and Diaphragm Clutch – Fluid coupling - Gearbox - Manual - Sliding - Constant - Synchromesh - Overdrive – Automatic transmission - Torque converter - Epicylic and Hydromatic transmission – Continuously variable transmission - Universal joint - Propeller shaft - Hotchkiss drive – Final drive - Rear axle assembly - Types -Differential - Need - Construction – Non-slip differential – Differential locks – Front wheel and rear wheel drive-Four wheel drive.

Learning Outcomes:

At the end of the unit, the student will be able to
- Describe different transmission systems.(l2)
- Illustrate working principle of different gearbox transmission systems.(l2)
- Demonstrate various types of clutches and differentials.(l2)
- Explain the rear axle assembly.(l2)

UNIT - IV

Steering, suspension and braking system: Principle of steering - Steering Geometry and wheel alignment - Steering linkages – Steering gearboxes - Power steering - front axle - Suspension system - Independent and Solid axle – coil, leaf spring and air suspensions - torsion bar - shock absorbers – Wheels and Tyre - Construction - Type and specification - Tyre wear and causes - Brakes - Needs – Classification –Drum and Disc Mechanical - Hydraulic and pneumatic - Vacuum assist – Retarders – Anti-lock Braking System(ABS)

Learning Outcomes:

At the end of the unit, the student will be able to
- Describe the steering and the suspension systems.(l2)
- Classify the brakes in automobile.(l1)
- Explain power steering system in automobiles.(l2)
- Illustrate working principle of anti-lock breaking system.(l2)

UNIT - V

Automobile electrical systems, instrumentation and advances in automobile engineering: Battery-General electrical circuits-Dash board instrumentation - Passenger comfort – Safety and security - HVAC - Seat belts - Air bags - Automotive Electronics - Electronic Control Unit (ECU) - Variable Valve Timing (VVT) - Active Suspension System (ASS) - Electronic Brake

Distribution (EBD) – Electronic Stability Program(ESP) Traction Control System (TCS) - Global Positioning System (GPS) - X-by-wire - Electric - Hybrid vehicle.

Learning Outcomes:

At the end of the unit, the student will be able to
- Explain the working principles of various automobile electrical systems. (l2)
- Identify the various electrical components in automobile.(l3)
- Explain about ecu, vvt, ass, esp, ebd, tcs and gps in automobile.(l2)
- Examine the recent developments of automobile engineering.(l4)

Course Outcomes:

After successful completion of this course, the student will be able to

- Identify different parts of automobile.(l3)
- Explain the working of various parts like engine, transmission, clutch, brakes.(l2)
- Describe the working of steering and the suspension systems. (l2)
- Summarize the environmental implications of automobile emissions.(l2)
- Outline the future developments in the automobile industry.(l2)

TEXTBOOKS:

1. Kirpal Singh, "Automobile Engineering",Vol 1 & 2.
2. S.K. Gupta, "A text book of Automobile Engineering", S. Chand Publications.

REFERENCES:

1. K.K. Ramalingam, "Automobile Engineering" , 2nd edition, 2014.
2. K. Newton and W. Steeds, "The motor vehicle", 13th edition, Butterworth-Heinemann Publishing Ltd. (year).
3. Kirpal Singh, "Automobile Engineering", Vol.1&2, Standard Publications year.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech – III-I Sem   **L   T   P   C**
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(19A03504b)   MANUFACTURING METHODS IN PRECISION ENGINEERING
PROFESSIONAL ELECTIVE - I
Course Objectives:

- Familiarize with surface treatments and their industrial applications.
- Explain powder metal production sintering techniques for metal powders, glass, ceramics

and plastics.
- Explain wafer preparation, optical lithography including current best practice and perceived limits and equipment required for micro-device packaging processes.
- Demonstrate plastics processing.
- Different liquefied, solidified and particulate methods for different MMC, CMC, Polymer matrix composites.

UNIT I

Surface treatment: Scope, Cleaners, Methods of cleaning, Surface coating types, and ceramic and organic methods of coating, economics of coating. Electro forming, Chemical vapour deposition, thermal spraying, Ion implantation, diffusion coating, Diamond coating and cladding.

Learning Outcomes:

After completion of this unit, students will be able to
- Identify the phenomenon related to different surface modification by physical and chemical treatments: (L2)
- Develop the basics of CVD (Chemical Vapour Deposition) and PVD (Physical Vapour Deposition) technologies for surface coating deposition, description of thermal spraying technology for surface coating applications. (L2)
- Explain properties and characteristics of different surface coatings and their applications.(L3)

UNIT II

Processing of Powder metals, Glass and Superconductors: Introduction, production of metal powders, compaction of metal powders, sintering, secondary and finishing operations, design considerations for powder metallurgy, Process capabilities, economics of powder metallurgy, forming and shaping of Glass, techniques for strengthening and treating Glass, design considerations for Glass, processing of superconductors.

Processing of ceramics: Applications, characteristics, classification .Processing of particulate ceramics, Powder preparations, consolidation, Drying, sintering, Hot compaction, Area of application , finishing of ceramics.

Learning Outcomes:

After completion of this unit, students will be able to
- Explain powder metallurgy and ceramics applications. (l2)
- Demonstrate processing of powders and sintering techniques. (l2)
- Outline mechanism of sintering properties and characteristics of powder metals, glass and superconductors. (l3)

UNIT III

Fabrication of Microelectronic devices: Crystal growth and wafer preparation, Film Deposition oxidation, lithography, bonding and packaging, reliability and yield, Printed Circuit boards, computer aided design in microelectronics, surface mount technology, Integrated circuit economics. E-Manufacturing, nanotechnology, and micro machining, High speed Machining.

Learning Outcomes:

After completion of this unit, students will be able to
- Illustrate wafer preparation, optical lithography. (l1)
- Explain the basic packaging and its levels, different ic chip mounting and interconnect methods. (l2)
- Summarize mechanisms like e-manufacturing, nanotechnology, and micromachining, high speed machining.(l3)

UNIT IV

Processing Of Plastics, injection and blow moulding, calendaring, thermo forming, compression moulding, transfer moulding, High energy rate forming methods Rapid manufacturing: - Introduction - concepts of rapid manufacturing, information flow for rapid prototyping, classification of rapid prototyping process, sterer holography fused deposition modeling, selective laser sintering, Applications of rapid prototyping process.

Learning Outcomes:

After completion of this unit, students will be able to
- Build basic knowledge of manufacturing of plastics. (l1)
- Explain the rapid prototyping methods in plastic processing. (l2)

UNIT V

Processing of Composites: Composite Layers, Particulate and fiber reinforced composites, Elastomers, Reinforced plastics, MMC, CMC, Polymer matrix composites.

Learning Outcomes:

After completion of this unit, students will be able to
- Use of fibre-reinforced composites in engineering applications. (l1)
- Summarize the use of composite materials, micromechanics of layered composites. (l2)
- Explain different liquefied, solidified and particulate methods for mmc, cmc, polymer matrix composites. (l3)

Course Outcomes:

After completing the course, the student will be able to

- Classify different surface treatment methods.(l2)
- Explain processing of powder metals, glass and super conductors. (l2)
- Develop fabrication of microelectronic devices.(l2)
- Process plastics and composites.(l2)

TEXT BOOKS:

1. Schmid and Kalpakjin, "Manufacturing Engineering and Technology", 7th edition, Pearson Education India, 2001.
2. Rafiq Noorani, "Rapid Prototyping Principles and Applications", Illustrated edition, Wiley, 2006.

REFERENCE BOOKS:

1. R.K. Jain, "Production Technology", 17th edition, Khanna Publishers, 2012.
2. Roy A. Lindberg, "Process and materials of manufacturing", 2nd edition, Allyn and Bacon, 1978.
3. Sreeramulu moinkumta Production technology Voi 1, Wiley Publishes,2018.

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(19A03504c) DESIGN OF TRANSMISSION SYSTEMS
PROFESSIONAL ELECTIVE - I

Course Objectives:

● Explain the various elements involved in a transmission system.
● Focus on the various forces acting on the elements of a transmission system.
● Design the system based on the input and the output parameters.
● Produce working drawings of the system involving pulleys, gears, clutches and brakes.
● Demonstrate the energy considerations in the design of motion control elements.

UNIT I

Flexible power transmission systems: Design of Belts – Flat Belts and Pulleys – V Belts and Pulleys – Design of chain drives – Wire ropes
Design of bearing: Lubrication- hydrodynamic lubrication theory, Design of sliding contact bearing using Sommerfield number – Design using Mckee's equation – Selection of rolling contact bearings.

Learning Outcomes:

At the end of this unit, the student will be able to
• Demonstrate the importance of bearings in the transmission system. (l2)
● Design sliding contact bearing using Somerfield number (l4)
● Solve problem on design of sliding contact bearing using McKee's equation. (l3)
● Identify the factors required for the selection rolling contact bearings (l2)
● Choose various types of flexible power transmission systems. (l3)

UNIT II

Spur gear: Gear geometry – Kinematics – Forces on gear tooth – Stresses in Gear tooth – Selection of gear material based on bending stress and contact stress – Design of Spur gear – Power transmitting capacity.

Learning Outcomes:

At the end of this unit, the student will be able to
• Explain Kinematics of different types of gears. (L2)
● Predict various forces and stresses acting on the gear tooth. (L3)

- Select materials for a gear based on bending and contact stresses (L3)
- Analyze the power transmitting capacity of a gear. (L4)
- Design a spur gear (L5)

UNIT III

Helical, bevel and worm gears: Parallel Helical Gears – Kinematics – Tooth proportions – Force analysis – Stresses in Helical gear – Design of helical gear – Crossed Helical gears – Straight Bevel gears – Kinematics – Force analysis – Stresses in straight bevel gear tooth – Design of bevel gear – Worm gearing – Kinematics – Forces - Friction and Efficiencies – Stresses in worm gear tooth.

Learning Outcomes:

At the end of this unit, the student will be able to
- Identify the differences between the helical gear and a bevel gear. (l2)
- Solve problems on the design of helical gear. (l3)
- Explain the kinematics of helical, straight bevel gears and worm gears. (l3)
- Predict the various forces acting on the worm gear tooth. (l3)
- Select of helical, bevel and worm gears in power transmission (l3)

UNIT IV

Design of gear boxes: Design of Speed reducers – Design of multi speed gear boxes for machine tools – Structural and ray diagrams.

Learning Outcomes:

At the end of this unit, the student will be able to
- Select the speed reducers in power transmission (L3)
- Design speed reducers (L4)
- Design of multi speed gear boxes for various applications (L5)
- Draw ray diagrams of gear boxes (L4)

UNIT V

Elements of motion control: Internal – Expanding Rim clutches and Brakes – External – Contracting Rim clutches and Brakes – Band type Clutches – Cone clutches and Brakes – Energy considerations – Temperature rise – Friction materials.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain on elements of motion control (L2)

- Outline the importance of clutches and brakes in power transmission (L2)
- Model various types of clutches and brakes. (L3)
- Solve problems on the design of clutches and brakes (L3)
- Calculate the temperature wise due to friction and select materials according. (L4)

Course Outcomes:

At the end of this Unit the student will be able to

- Design pulleys, chain drives, rope drives and belt drives. (l5)
- Determine performance requirements in the selection of commercially available transmission drives. (l4)
- Design brakes and clutches (l4)
- Design various types of gear boxes. (l5)
- Select materials for various applications in the transmission elements. (l3)

TEXT BOOKS:

1. Joseph Edward Shigley and Charles, R. Mischke, "Mechanical Engineering Design", McGraw –Hill International Editions, 2000.
2. Robert L. Norton, "Machine Design"- an integrated approach, (5th Edition) Pearson publisher, 2000

REFERENCES:

1. "Design Data", PSG College of Technology, DPV Printers, Coimbatore, 2005.
2. Malisa, "Hand Book of Gear Design", Tata Mc Graw Hill, International Edition, 2000.
3. V.B. Bhandari , "Design of Machine Elements", Tata Mc Graw Hill, 2001.

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(19A03504d) POWER PLANT ENGINEERING
PROFESSIONAL ELECTIVE - I

Course Objective:

- Familiarize the sources of energy, power plant economics and environmental aspects.
- Outline the working components of different power plant.
- Explain renewable energy sources; characteristics, working principle, classify types, layouts, and plant operations.
- Impart types of nuclear power plants, and outline working principle and advantages and hazards.

UNIT I

Introduction to the Sources Of Energy - Resources and Development of Power in India. Convectional and non- conventional energy sources, Power Plant Economics and Environmental Considerations: Capital Cost, Investment of Fixed Charges, Operating Costs, General Arrangement of Power Distribution, Load Curves, Load Duration Curve. Definitions of Connected Load, Maximum Demand, Demand Factor, Average Load, Load Factor, Diversity Factor - Tariff - Related Exercises. Effluents from Power Plants and Impact on Environment - Pollutants and Pollution Standards - Methods of Pollution Control. Inspection And Safety Regulations.

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 cost factors, load and power distribution factors. (l2)
- Select tariff based on load and demand factors. (l3)
- Summarize the impact of power plant on the environment, pollution mitigation and regulations. (l2)

UNIT II

Steam Power Plant : Introduction to Boilers- Modern High Pressure and Supercritical Boilers - Analysis of Power Plant Cycles - Modern Trends in Cycle Improvement - Waste Heat Recovery, Fluidized Bed Boilers., Fuel and Handling Equipments, Types of Coals, Coal Handling, Choice of Handling Equipment, Coal Storage, Ash Handling Systems.

Steam Power Plant : Combustion Process : Properties of Coal - Overfeed and Under Feed Fuel Beds, Travelling Grate Stokers, Spreader Stokers, Retort Stokers, Pulverized Fuel Burning System And Its Components, Combustion Needs and Draught System, Cyclone Furnace, Design and Construction, Dust Collectors, Cooling Towers And Heat Rejection. Analysis of Pollution from Thermal Power Plants - Pollution Controls.CO2 Recorders

Learning Outcomes:

At the end of this unit, the student will be able to
- Demonstrate latest high pressure boilers, power plant cycles and their improvements. (l2)
- Explain various types of coals, coal handling operations and associated systems. (l2)
- Outline and compare types of feeders, stokers, combustion systems. (l2)
- Illustrate draught, dust collector, furnace, cooling tower and heat rejection systems. (l2)
- Evaluate pollution levels from power plants, pollution control methods, and application of pollution recorders. (l4)

UNIT III

Diesel Power Plant: Diesel Power Plant, Construction, Plant lay out with auxiliaries, fuel storage.
GAS TURBINE PLANT: Introduction - Classification - Construction - Layout with Auxiliaries - Principles of Working Closed and Open Cycle Gas Turbines. Advantages And Disadvantages Combined Cycle Power Plants.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain working principle, and compare types of diesel power plant. (l2)
- Outline the diesel power plant layout with its supporting equipment. (l2)
- Illustrate the working principle of open cycle and closed cycle gas turbine. (l2)
- Demonstrate combined cycle power plants with benefits and shortcomings. (l2)

UNIT IV

Hydro Electric Power Plant: Water Power - Hydrological Cycle / Flow Measurement - Drainage Area Characteristics - Hydrographs - Storage and Pondage - Classification of Dams and Spill Ways.
Hydro Projects And Plant: Classification - Typical Layouts - Plant Auxiliaries - Plant Operation Pumped Storage Plants.

Learning Outcomes

At the end of this unit, the student will be able to
- Explain hydrological cycle, infer flow measurements from hydrographs. (l2)
- Summarize working principle of hydro electric power plant. (l2)
- Illustrate typical layout of hydro electric power plant, and its auxiliary equipments. (l2)

UNIT V

Power from Non-Conventional Sources: Utilization of Solar Collectors- Working Principle, Wind Energy - Types of Turbines - HAWT & VAWT-Tidal Energy. MHD power Generation.

Nuclear Power Station: Nuclear Fuel - Nuclear Fission, Chain Reaction, Breeding and Fertile Materials - Nuclear Reactor -Reactor Operation.

Types of Reactors: Pressurized Water Reactor, Boiling Water Reactor, Sodium-Graphite Reactor, Fast breeder Reactor, Homogeneous Reactor, Gas Cooled Reactor, Radiation Hazards and Shielding - Radioactive Waste Disposal.

Learning Outcomes

At the end of this unit, the student will be able to
- Familiarize the source of conventional and non conventional sources in India   . (L2)
- Explain working principle of Nuclear power plants, nuclear fuels, and reactor operations. (L2)
- Outline the various types of nuclear reactors, their applications and limitations. (L2)
- Summarize the hazards of nuclear reactors and significance of nuclear waste disposal. (L2)

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)
- Explain power plant economics and environmental considerations.(l2)
- Describe working components of a steam power plant.(l2)
- Illustrate the working mechanism of diesel and gas turbine power plants.(l2)
- Summarize types of renewable energy sources and their working principle.(l2)
- Demonstrate the working principle of nuclear power plants. (l4)

TEXT BOOKS:

1. P.K. Nag, "Power Plant Engineering", 3rd edition, TMH, 2013.
2. Wakil, "Power plant technology", M.M.EI TMH Publications.

REFERENCE BOOKS:

1. Rajput, "A Text Book of Power Plant Engineering:, 4th edition, Laxmi Publications, 2012.
2. Ramalingam, "Power plant Engineering", Scietech Publishers, 2013
3. P.C. Sharma, "Power Plant Engineering", S.K. Kataria Publications, 2012.
4. Arora and S.Domakundwar, "A course in Power Plant Engineering", Dhanpat Rai & Co (p) Ltd, 2014.

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(19A03504e) ERGONOMICS AND HUMAN FACTORS IN ENGINEERING
PROFESSIONAL ELECTIVE - I

Course Objectives

- Familiarize the fundamentals of human factors in engineering.
- Explain principles Hours Anthropometry, Ergonomics and product design.
- Describe the Improvement of human work place through controls.
- Evaluate the sources of vibration and performance effect of vibration in machine tools.
- Know the Special purpose lighting for illumination and quality control.

UNIT I

Fundamentals of Human Factors Engineering: Human Biological, Ergonomic and psychological capabilities and limitations, Concepts of human factors engineering and ergonomics, Man-Machine system and Design philosophy.
Physical work and energy expenditure: Manual lifting, Work posture, Repetitive motion, Provision of energy for muscular work, Heat stress, Role of oxygen physical exertion, Measurement of energy expenditure, Respiration, Pulse rate and blood pressure during physical work, Physical work capacity and its evaluation.

Learning Outcomes:

At the end of this unit the student will be able to
- Define the fundamentals concepts of human factors in engineering.(l1)
- Discus the human biological, ergonomic and psychological capabilities in engineering.(l6)
- Evaluate physical work capacity and energy expenditure.(l4)
- Measure the energy expenditure, respiration, pulse rate and blood pressure during physical exertion. (l4)

UNIT-II

Hours Anthropometry: Physical dimensions of the human body as a working machine, Motion size relationships, Static and dynamic anthropometry, Anthropometric design principles, Using anthropometric measures for industrial design.

Ergonomics and product design: Ergonomics in automated systems, Expert systems for ergonomic design, Anthropometric data and its application in ergonomic design, Limitations of anthropometric data, Use of computerized database.

Learning Outcomes:

At the end of this unit the student will be able to
- Explain the concept of hours anthropometry. (l2)
- Illustrate the physical dimensions of the human body as a working machine. (l2)
- Discus anthropometric data and its application in ergonomic design. (l6)
- State the limitations of anthropometric data in ergonomic design. (l4)

UNIT -III

Machine controls: Improvement of human work place through controls, Displays and Controls, Shapes and sizes of various controls and displays, Multiple display and control situations, Design of major controls in automobiles and machine tools, Principles of hand tool design.

Work place and seating design: Design of office furniture, Redesign of instruments, Work process: Duration of rest periods, Design of visual displays, Design for shift work.

Learning Outcomes:

At the end of this unit the student will be able to
- Describe the concept of improvement of human work place through controls.(l2)
- Explain the principles of hand tool design. (l2)
- Illustrate the design of major controls in automobiles and machine tools. (l2)
- Design the work place and seating plane in machine controls.(l6)

UNIT-IV

Color and light: Color and the eye, Color consistency, Color terms, Reactions to color and color continuation, Color on engineering equipments.

Temperature-Humidity-Illumination and Contrast: Use of Photometers, Recommended illumination levels, The ageing eye, Use of indirect (Reflected) lighting, Cost efficiency of illumination, Special purpose lighting for illumination and quality control.

Unit Outcomes:

At the end of this unit the student will be able to
- Explain the terms color consistency, reactions to color and color continuation.(l2)
- Describe effects of color on engineering equipments.(l2)
- Indentify recommended illumination levels. (l3)
- Explain about special purpose lighting for illumination and quality control. (l2)

UNIT-V

Hours Measurement of sound: Noise exposure and hearing loss, Hearing protectors, Analysis and reduction of noise, Effects of noise, Performance annoyance of noise and interface with communication, Sources of vibration and performance effect of vibration, Vibrations in machine tools.

Learning Outcomes:

At the end of this unit the student will be able to
- Describe the sources of vibration and performance effect of vibrations in machine tools.(l6)
- Illustrate the effects of noise on machine tool opreation. (l2)
- Explain the terms noise exposure, hearing loss and hearing protectors. (l2)
- Explain the terms analysis and reduction of noise in machine tools.(l2)

Course Outcomes

After completing the course, the student will be able to
- Describe the sources of vibration and performance effect of vibrations in machine tools.(l6)
- Indentify recommended illumination levels. (l3)
- Illustrate the design of major controls in automobiles and machine tools. (l2)
- State the limitations of anthropometric data in ergonomic design. (l4)
- Measure the energy expenditure, respiration, pulse rate and blood pressure during physical exertion. (l4)

TEXT BOOK(S)

1. M. S. Sanders and E. J. McCormick, "Human Factors in Engineering Design", 7th edition, McGraw- Hill International, 1993.

REFERENCES

1. P. V. Karpovich and W. E. Sinning, "Physiology of Muscular Activity", 7th edition, Saunders (W.B.) Co Ltd., 1971.

2. "Applied Ergonomics Handbook", I.P.C. Science and Technology Press Limited, 1974.
3. M. Helander, "A Guide to the Ergonomics of Manufacturing", 2nd edition, CRC Press, 1997.
4. K. H. E. Kroemer, H. B. Kroemer and K. E. Kroemer Elbert, "Ergonomics: How to design for ease and efficiency", 2nd edition, Pearson Publications, 2001.

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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.

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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

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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.

B.Tech (ME)– III-I   **L   T   P   C**
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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.

B.Tech (ME) – III-I   **L   T   P   C**
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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.

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(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

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(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.

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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/.

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(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.

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B.Tech (ME)– III-I   **L   T   P   C**
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(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.

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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
- 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)

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.

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(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.

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(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

B.Tech (ME)– III-I Sem   **L   T   P   C**

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(19A03501P) APPLIED THERMODYNAMICS LAB

Course Objectives:

- Understand the functioning and performance of I.C. Engines
- To find heat losses in various engines

LIST OF EXPERIMENTS

1. Demonstration of diesel and petrol engines by cut models
2. Valve timing diagram of 4-stroke diesel engine
3. Port timing diagram of 2-stroke petrol engine
4. Performance of 2-stroke single cylinder petrol engine
5. Morse test on multi cylinder petrol engine
6. Performance of 4-stroke single cylinder diesel engine
7. Performance of two stage reciprocating air compressor
8. Performance of Refrigeration system
9. Performance of Air conditioning system
10. Assembly and disassembly of diesel and petrol engines
11. Performance of heat pipe
12. Performance of heat pump
13. Exhaust gas analysis of orsat apparatus.
14. Determinations of nozzle characteristics.

Course Outcomes

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

- Explain different working cycles of engine
- Describe various types of combustion chambers in ic engines
- Illustrate the working of refrigeration and air conditioning systems
- Evaluate heat balance sheet of ic engine.

(19A03502P) MANUFACTURING TECHNOLOGY LAB

Course objectives:

● Familiarize the construction and working of various machine tools.
● Teach selection of parameters for different machining processes.

Contents:

1. Demonstration of construction and operations of general purpose machines : Lathe, drilling machine, milling machine, shaper, slotting machine, cylindrical grinder and surface grinder.
2. Measure the characteristic features of lathe with simple step turning operation.
3. Job on step turning, taper turning, knurling, thread cutting on lathe machine.
4. Perform drilling, reaming and tapping operations.
5. Job on milling (Groove cutting/Gear cutting).
6. Job on shaping and planning.
7. Job on slotting.
8. Job on cylindrical and surface grinding.
9. Job on grinding of tool angles.

Course outcomes:

After completion of this course the student may be able to

- Explain the concept of machining with various machine tools.
- Get hands on experience on various machine tools and machining operations.

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(19A03403P) FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

OBJECTIVE: The object of the course to make the students understand the fluid flow concepts and get familiarity with flow measuring devices.

LIST OF EXERCISES:

- Calibration of Venturi meter
- Calibration of Orifice meter
- Determination of Coefficient of discharge for a small orifice by a constant head method.
- Determination of Coefficient of discharge for an external mouth piece by variable head method.
- Calibration of contracted Rectangular Notch and /or Triangular Notch.
- Determination of Coefficient of loss of head in a sudden contraction and friction factor.
- Verification of Bernoulli's equation.
- Impact of jet on vanes.
- Study of Hydraulic jump.
- Performance test on Pelton wheel turbine.
- Performance test on Francis turbine.
- Efficiency test on centrifugal pump.

Course out comes:

At the end of the course the student will be able to know

- The various flow properties using various flow measuring devices
- The performance of various turbines and pumps

B.Tech (ME)– III-I Sem   **L   T   P   C**

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(19A03507) SOCIALLY RELEVANT PROJECT (15 HRS / SEM)

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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(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

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(19A03601) DESIGN OF MACHINE ELEMENTS

Course Objectives:

- Provide an introduction to design of machine elements.
- Familiarize with fundamental approaches to failure prevention for static and dynamic loading.
- Explain design procedures to different types of joints.
- Teach principles of clutches and brakes and design procedures.
- Instruct different types of bearings and design procedures.

UNIT I   12 hours

Mechanical Engineering Design: Design process, design considerations, codes and standards of designation of materials, selection of materials.
Design for Static Loads: Modes of failure, design of components subjected to axial, bending, torsional and impact loads. Theories of failure for static loads.
Design for Dynamic Loads: Endurance limit, fatigue strength under axial, bending and torsion, stress concentration, notch sensitivity. Types of fluctuating loads, fatigue design for infinite life. Fatigue theories of failure.Soderberg, Goodman and modified Goodman criterion for fatigue failure. Fatigue design under combined stresses.

Learning Outcomes:

After completion of this unit, students will be able to
- Identify materials suitable for machine elements. (l1)
- Apply codes and standards in design. (l3)
- Contrast the difference between static and dynamic loads. (l2)
- Apply failures theories in designing components subjected to static and dynamic loads. (l3)

UNIT II   10 hours

Design of Bolted Joints: Threaded fastiness, preload of bolts, various stresses induced in the bolts. Torque requirement for bolt tightening, eccentrically loaded bolted joints, gasketedjoints.
Riveted Joints: Design of lap, butt and eccentrically loaded joints, failure and efficiency of riveted joints.
Welded Joints: Strength of lap and butt welds, eccentrically loaded welded joints. Joints subjected to bending and torsion.

Learning Outcomes:

After completion of this unit, students will be able to
- Identify different types of joints. (l1)
- Analyse stresses induced in joints subjected to different loads. (l4)
- Design different joints subjected to combined loading. (l6)

UNIT III   10 hours

Keys: Function, types, design of sunk, saddle, Kennedy and Woodruff keys.
Power Transmission Shafts: Design of shafts subjected to bending, torsion and axial loading. Shafts subjected to fluctuating loads using shock factors.
Couplings: Design of flange and bushed pin couplings, universal coupling.
Springs: Design of helical compression, tension, torsion and leaf springs.

Learning Outcomes:

After completion of this unit, students will be able to
- Explain the functions of different keys. (l2)
- Design shafts subjected to fluctuating loads. (l6)
- Select coupling for a given application and outline the design procedure. (l3)
- Explain construction and design procedure for helical and leaf springs. (l2)

UNIT IV   10 hours

Friction Clutches: Torque transmitting capacity of disc and centrifugal clutches. Uniform wear theory and uniform pressure theory.
Brakes: Different types of brakes. Concept of self-energizing and self-locking of brake. Band and block brakes, disc brakes.

Learning Outcomes:

After completion of this unit , students will be able to
- Explain the difference between brake and clutch. (l2)
- Calculate the torque transmitting capacity in clutches. (l3)
- Compare different types of brakes and their applications. (l4)
- Explain the concepts of self-energizing and self-locking brakes. (l2)
- Discuss procedures to design different types of brakes. (l2)

UNIT V   **12 hours**

Design of Sliding Contact Bearings: Lubrication modes, bearing modulus, McKee's equations, design of journal bearing. Bearing Failures.

Design of Rolling Contact Bearings: Static and dynamic load capacity, Stribeck's Equation, equivalent bearing load, load-life relationships, load factor, selection of bearings from manufacturer's catalogue.

Design of Gears: Spur gears, beam strength, Lewis equation, design for dynamic and wear loads.

Learning Outcomes:

After completion of this unit, students will be able to
- Contrast the difference between sliding and rolling contact bearings. (l2)
- Explain the mechanics of lubrication in sliding contact bearings. (l2)
- Identify failures in bearings. (l3)
- Evaluate static and dynamic load capacity of rolling contact bearings. (l5)
- Explain the procedure to select bearings from manufacturer's catalogue. (l3)

Course Outcomes:

At the end of the course the students will be able to
- Estimate safety factors of machine members subjected to static and dynamic loads. (l5)
- Design fasteners subjected to variety of loads. (l6)
- Select of standard machine elements such as keys, shafts, couplings, springs and bearings. (l1)
- Design clutches, brakes and spur gears. (l6)

Text Book(s)

1. J.E. Shigley, "Mechanical Engineering Design", 2nd edition, Tata McGraw Hill, 1986.

2. V.B.Bhandari, "Design of Machine Elements", 3rd edition, Tata McGraw Hill, 2010.

References

1. R.L. Norton, "Machine Design an Integrated approach", 2nd edition, Pearson Education, 2004.
2. R.K. Jain, "Machine Design:, Khanna Publications, 1978.
3. M.F.Spotts and T.E.Shoup, "Design of Machine Elements", 3rd edition, Prentice Hall (Pearson Education), 2013.

Note: PSG Design data book is permitted.

B.Tech (ME)– III-II Sem   **L   T   P   C**
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(19A03602T)   INTRODUCTION TO CAD/CAM

Course Objectives:

- Understand the basics of CAD/CAM, geometric representation, transformations.
- Explain geometric modeling methods in CAD.
- Familiarize numerical control (NC), computer numerical control (CNC) and direct numerical control (DNC) machines.
- Impart knowledge on manual part programming and computer aided part programming.
- Explain the principles robotics, CIM, AR,VR and AI in CIM

UNIT I   **8hrs**

CAD/CAM: Introduction, hardware and software, I/O devices, benefits. graphics standards-Neutral file formats – IGES, STEP.

2D and 3D geometric transformations: Translation, scaling, rotation, mirroring, homogenous transformations, concatenation of transformations, viewing transformations.

Learning Outcomes:

At the end of this unit, the student will be able to
- List various input and output devices (L1)
- Apply geometric transformations in 2D and 3D (L3)
- Apply window to viewport transformation (L3)

UNIT II: Geometric Modeling: **10hrs**

Parametric representation: Representation of curves, Hermite curves, Spline, Bezier and B-spline curves in two dimensions; Geometric modelling of surfaces: Surface patch, Coons and bicubic patches, Bezier and B-spline surfaces, sweep surfaces, surface of revolution, blending of surfaces;
Geometric Modelling of Solids: Wireframe, surface modelling, solid entities, boolean operations, CSG approach and B-rep of solid modelling, geometric modelling of surfaces.

Learning Outcomes:

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

- Apply the concepts of parametric representation to curves and surfaces. (l3)
- Create surfaces such as coons, bezier and b-spline (l6)
- Differentiate wireframe, surface and solid modeling. (l4)
- Apply the solid modeling concepts. (l3)

UNIT III   8hrs

Computer Aided Manufacturing (CAM): Structure of numerical control (NC) machine tools, designation of axes, drives and actuation systems, feedback devices, computer numerical control (CNC) and direct numerical control (DNC), adaptive control system, CNC tooling, automatic tool changers and work holding devices, functions of CNC and DNC systems.

Learning Outcomes:

At the end of this unit, the student will be able to
- Identify the differences between NC, CNC and DNC. (L3)
- Use devices and activation systems. (L3)
- Apply adaptive control system. (L3)
- Apply different tooling and tool chargers, working holding devices. (L3)

UNIT IV   8 hrs

Part Programming: Part programming instruction formats, information codes, preparatory functions, miscellaneous functions (G-codes, M-codes). Tool codes and tool length offset, interpolations canned cycles.
APT Programming: APT language structure, APT geometry, Definition of point, line, circle, plane.
APT Motion Commands: set-up commands, pint to point motion commands; continuous path motion commands part programming preparation for typical examples (milling and turning operation)

Learning Outcomes:

At the end of this unit, the student will be able to
- Apply the fundamentals of part programming in CNC. (L3)
- Use G codes, M codes in CNC part programs. (L3)
- Apply the concept of canned or fixed cycles for the hole making operations. (L3)
- Identify geometric features in APT language. (L3)
- Apply motion commands in APT to generate surfaces. (L3)

UNIT V   8 hrs

Automation: Anatomy and configuration of robot, characteristics of robots, grippers, application of robots in manufacturing, robot programming languages. Computer integrated manufacturing (CIM): Elements of CIM, Virtual Reality (VR), Augmented Reality (AR), Artificial Intelligence (AI) and expert systems in CIM.

Learning Outcomes:

At the end of this unit, the student will be able to
- Summarize the fundamentals of robotics. (l2)
- Categorize the cim environment and its elements. (l4)
- Explain the role vr, ar and ai in manufacturing engineering. (l3)

Course Outcomes:

At the end of the course, the student will be able to
- Apply the basics of geometric representation and transformations in CAD/CAM. (L3)
- Choose geometric modeling methods for building CAD models. (L1)
- Compare NC, CNC and DNC. (L2)
- Develop manual and computer aided part programming for turning and milling operations. (L3)
- Summarize the principles of robotics AR,VR and AI in CIM. (L2)

Text books:

1. P. N. Rao, CAD/CAM: "Principles and applications", 3rd edition, Tata McGraw-Hill, Delhi, 2017
2. Ibrahim Zeid, R.Siva Subramanian, "CAD/CAM: Theory and Practice", 2nd edition, Tata McGraw-Hill, Delhi, 2009

Reference books:

1. Mikell P. Groover, Emory W. Zimmers , "CAD/CAM", 5th edition, Pearson Prentice Hall of India, Delhi, 2008
2. P. Radhakrishnan, S. Subramanyan & V. Raju, "CAD/CAM/CIM", 3rd edition, New Age International Publishers, 2008
3. Tien Chien Chang, "Computer Aided Manufacturing", 3rd edition, Pearson, 2008
4. SJ Martin, "Numerical control of machine tools", London, Hidden & Stoughton, 1982.
5. Solid cam, "Software packages", solid works or equivalent.

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B.Tech (ME)– III-II Sem

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(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)

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(19A03603a) ALTERNATIVE FUELS AND EMISSION CONTROL IN AUTOMOTIVES
PROFESSIONAL ELECTIVE - II

Course Objectives:

The main objectives of this course are to make the student
- Explain various alcohol and gaseous fuels and their use in SI and CI engines.
- Discuss various vegetable oils and their use in CI engines.
- Determine the formation of various emissions from SI engine and control techniques.
- Identify various emission measuring instruments and test procedures.

UNIT I

Alcohol fuels and gaseous fuels: Properties of alcohols, alcohol – gasoline blends, fuel flexible vehicle, methanol reformed gas engine, dual fuel system, Spark assisted diesel engine, surface ignition engine, ignition accelerators, performance, combustion and emission characteristics in SI and CI engines, Properties of Hydrogen, production and storage methods, safety precautions, biogas production and its properties, properties of LPG and CNG, Performance, combustion and emission characteristics of hydrogen, biogas, LPG and CNG in SI and CI engines

Learning Outcomes:

At the end of this unit, the student will be able to
- The properties of alcohols and alcohol gasoline blends (L5)
- Explain the principles of spark assisted diesel engine and surface ignition engine.(l3)
- Identify the performance, combustion and emission characteristics in si and ci engines.(l3)
- Explain production, storage methods and emission characteristics of hydrogen. (l3)

UNIT II

Vegetable oils: Various vegetable oils for diesel engines, structure and properties, problems in using vegetable oils in diesel engines, Methods to improve the engine performance using vegetable oils – preheating, Esterification , blending with good secondary fuels, Semi-adiabatic engine, surface ignition engine, ignition accelerators dual fuelling with gaseous and liquid fuels coils, Performance, combustion and emission characteristics of biodiesel fuelled diesel engines.

Learning Outcomes:

At the end of this unit, the student will be able to
- List various vegetable oils and its properties used for diesel engines (L1)
- Identify the problems in using vegetable oils in diesel engines.(L3)
- Explain the methods to improve the engine performance using vegetable oils.(L3)
- Explain the method of blending with good secondary fuels. (L3)
- Determine the performance, combustion and emission characteristics of biodiesel fuelled diesel engine (L3)

UNIT III

Emissions from SI engines and their control: Emission formation in SI engines (CO, HC and NOx), Effect of design and operating variables on emission formation, Control techniques – Thermal reactor, exhaust gas recirculation, Three way catalytic convertor and Charcoal canister control for evaporative emission, Positive crank case ventilation for blow by gas control.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain emission formation in SI engines. (L3)
- Practice the effect of design and operating variables on emission formation in SI engine.(L5)
- Classify various control techniques on SI engine emission formation.(L2)
- Choose a control technique for a given application (L1)
- Explain on positive crank case ventilation for blow by gas control. (L3)

UNIT IV

Emissions from CI engines and their control: Emission formation in CI engines (HC, CO, NOx, Aldehydes, Peroxides, hydroxides smoke and particulates), Effect of design and operating variables on emission formation, Control techniques – Exhaust gas recirculation, NOx selective catalytic reduction, Diesel oxidation catalytic convertor, Diesel particulate filter, NOx versus particulates – Trade off

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain emission formation in CI engines (L3)
- Appraise the effect of design and operating variables on emission formation in CI engine.(L5)
- Explain various control techniques on CI engine emission formation. (L3)
- Choose a control technique for a given application (L1)

UNIT V

Emission measuring instruments and test procedures: Principle of operation of emission measuring instruments used in SI and CI engines, Measurement of CO_2 and CO by NDIR, Hydrocarbon emission by FID, Chemiluminescent analyser for NOx, Liquid and Gas chromatograph Spot sampling and continuous indication type smoke meters (Bosch, AVL and Hartridge smoke meters) emission test procedures – FTP, Euro and Bharat norms

Lerning Outcomes:

At the end of this unit, the student will be able to
- Classify various emission measuring instruments for SI and CI engines (L2)
- Apply the principle of operation of emission measuring instruments used in SI and CI engines (L3)
- Explain the method of measurement of CO_2 and CO by NHIR (L3)
- Identify the emission of hydrocarbons using FID (L3)

Course Outcomes:

At the end of this course, the student will be able
- Identify various emissions from SI and CI engines (L3)
- Explain the properties of alcohol fuels and gaseous fuels. (L3)
- Predict the problems by using vegetable oils in diesel engines (L6)
- Choose the use of various emission measuring instruments (L3)

Text book

1. Thipse.S.S, "Alternative Fuels: Concepts, Technologies and Developments", Jaico Publishing House, 2010.
2. Ganesan V, " Internal combustion engines", 4th Edition, Tata McGraw Hill Education, 2012

Reference books

1. Michael F. Hrdeski, "Alternative Fuels: The Future of Hydrogen", The Fairmont Press, 2008
2. R.K.Rajput, "A textbook of Internal Combustion Engines", 2nd Edition, Laxmi Publications, 2007
3. "Society of Automotive Engineers", Alternative Fuels: Fuel Cells and Natural Gas, Society of Automotive Engineers, Incorporated, 2000

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(19A03603b) SIMULATION AND MODELLING OF MANUFACTURING SYSTEMS

PROFESSIONAL ELECTIVE - 2

Course Objectives:

- Explain the concept of modeling and simulation of manufacturing systems.
- Familiarize manufacturing simulation languages.
- Describe the various approaches to analyze the output data.
- Impart knowledge applications of simulation.
- Expose the students G P S S, SIMAN and SIMSCRIPT.

UNIT – I

System – ways to analyze the system – Model – types of models – Simulation – Definition – Types of simulation models – steps involved in simulation – Advantages & Disadvantages. Parameter estimation – estimator – properties – estimate – point estimate – confidence interval estimates – independent – dependent – hypothesis – types of hypothesis- steps – types 1& 2 errors – Framing – strong law of large numbers.

Learning Outcomes:

At the end of this Unit the student will be able to
- Implement various steps involved in simulation process.(l5)
- Illustrate the advantages and disadvantages of simulation process.(l2)
- List the various types of hypothesis. (l1).
- Apply simulation models to manufacturing systems. (l2)

UNIT – II

Building of Simulation model – validation – verification – credibility – their timing – principles of valid simulation Modeling – Techniques for verification – statistical procedures for developing credible model. Modeling of stochastic input elements – importance – various procedures – theoretical distribution – continuous – discrete – their suitability in modeling.

Learning Outcomes:

At the end of this Unit the student will be able to
- Build the simulation model for manufacturing systems. (l6)

- Apply statistical procedures for developing credible model.(l2)
- Describe modeling of stochastic input elements.(l2)
- Appraise the importance of stochastic input elements. ((l5)
- Illustrate the principles of valid simulation modeling. (l2)

UNIT – III

Generation of random variates – factors for selection – methods – inverse transform – composition – convolution – acceptance – rejection – generation of random variables – exponential – uniform – weibull – normal Bernoullie – Binomial – uniform – poisson. Simulation languages – comparison of simulation languages with general purpose languages – Simulation languages vs Simulators – software features – statistical capabilities – G P S S – SIMAN- SIMSCRIPT –Simulation of M/M/1 queue – comparison of simulation languages.

Learning Outcomes:

At the end of this Unit the student will be able to
- List the various factors for selection of random variates.(l1)
- Explain how random variables can be generate. (l2)
- Compare various simulation languages used for generation of random varients.(l2)
- Select appropriate simulation software's like., gpss, siman-simscript etc,.(l3)

UNIT – IV

Output data analysis – Types of Simulation w.r.t output data analysis – warmup period- Welch algorithm – Approaches for Steady – State Analysis – replication – Batch means methods – comparisons

Learning Outcomes:

At the end of this Unit the student will be able to
- Analyze the output data in manufacturing system.(l4)
- Illustrate the types of simulation w.r.t output data analysis.(l2)
- List the approaches for steady of output data.(l1)
- Explain Welch algorithm for analyze the output data. (L2)

UNIT –V

Applications of Simulation – flow shop system – job shop system – M/M/1 queues with infinite and finite capacities – Simple fixed period inventory system – Newboy paper problem.

Learning Outcomes:

At the end of this Unit the student will be able to
- Illustrate the applications of simulation in manufacturing systems. (l2)
- Explain simple fixed period inventory system. (l2)
- Describe flow shop and job shop systems. (l2)
- Solve the manufacturing problems using newboy paper method. (l3)

Course outcomes:

After successful completion of the course, the student will be able to

- Summarizes the various approaches to modelling and simulation of manufacturing systems. (l2)
- Outline the concepts of output data analysis.(l2)
- Identify various software languages for simulation of manufacturing systems.(l3)

TEXT BOOKS:

1. Banks J. & Carson J.S., PH, "Discrete Event System Simulation", Englewood Cliffs, NJ, 1984
2. Law, A.M. & Kelton, "Simulation Modelling and Analysis", McGraw Hill, 2nd Edition, New York, 1991.
3. Narahari and M. Vishwanathan Prentice hall England wood Cliffs, "Performance modelling of automated manufacturing systems". NJ USA 1992.

REFERENCES:

1. Carrie A. / Wiley, NY, "Simulation of Manufacturing Systems", 1990.
2. Ross, S.M., McMillan, NY, "A Course in Simulation", 1990. Simulation Modelling and SIMNET / Taha H.A / PH, Englewood Cliffs, NJ, 1987.

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(19A03603c)   MECHANICAL BEHAVIOUR OF MATERIALS
PROFESSIONAL ELECTIVE - II

Course objectives:

The objectives of the course are to
- Explain the structure of material over the effects of mechanical properties.
- Familiarize the defects inside the structure and their effects on the mechanical properties.
- Train the methods for characterization of the mechanical behavior of materials.
- Impart knowledge about strengthening mechanisms of materials.
- Teach mechanisms of failures of materials (fracture, fatigue and creep) and their relationship with the different types of stress.

UNIT – I

Elastic and plastic behavior: Elastic behavior of materials – Hooke's law, plastic behavior: dislocation theory – Burger's vectors and dislocation loops, dislocations in FCC, HCP and BCC lattice, stress fields and energies of dislocations, forces on and between dislocations, slip and twinning.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain the elastic behavior of engineering materials.(l2)
- Recall Hooke's law. (l1)
- Explain the dislocation theory. (l2)
- Identify the dislocations in fcc, hcp and bcc lattice (l3)
- Determine the forces on and between dislocations.(l3)

UNIT – II

Strengthening mechanisms: Cold Working, Grain Size Strengthening, Solid Solution Strengthening, Martensitic Strengthening, Precipitation Strengthening, Dispersion Strengthening, Fibre Strengthening, Examples. Yield Point Phenomenon, Strain aging and Dynamic strain aging.

Learning Outcomes:

At the end of this unit, the student will be able to
- Describe various strengthening mechanisms.(l2)
- Discuss grain size strengthening and solid solution strengthening.(l6)
- Apply dispersion strengthening and fibre strengthening.(l2)
- Differentiate strain aging and dynamic strain aging.(l3)

UNIT – III

Fracture and fracture mechanics: Types of Fracture, Basic Mechanism of Ductile and Brittle Fracture, Griffith's Theory of Brittle Fracture, Ductile to Brittle Transition Temperature (DBTT),

Factors Affecting DBTT, Determination of DBTT. Fracture Mechanics-Introduction, Modes of Fracture, Stress Intensity Factor, Strain Energy Release Rate, Fracture Toughness and Determination of K_{IC}.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain the basic mechanism of ductile and brittle fracture. (l2)
- Identify importance of griffith's theory.(l3)
- Predict factors effecting on dbtt.(l6)
- Classify various modes of fracture.(l1)

UNIT - IV

Fatigue behaviour and testing: Stress Cycles, S-N Curves, Effect of Mean Stress, Factors Affecting Fatigue, Structural Changes Accompanying Fatigue, Cumulative Damage, HCF / LCF, Thermo-mechanical Fatigue, Application of Fracture Mechanics to Fatigue Crack Propagation-Paris law- Fatigue Testing Machines.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain fatigue behavior and testing. (l2)
- Draw the s-n curves for different materials. (l1)
- Discuss the factors affecting fatigue. (l6)
- Apply fracture mechanics in design. (l2)

UNIT - V

Creep behavior and testing: Creep Curve, Stages in Creep Curve and Explanation, Structural Changes during Creep, Creep Mechanisms, Metallurgical Factors Affecting Creep, High Temperature Alloys, Stress Rupture Testing, Creep Testing Machines.

Learning Outcomes:

At the end of this unit, the student will be able to
- Identify various stages in creep curve.(l3)
- Determine various structural changes during creep.(l4)
- Predict the metallurgical factors affecting creep.(l6)
- Demonstrate various creep testing machines.(l2)

Course outcomes:

After successful completion of this course, the student will be able to
- Apply materials based on their structure and failure modes.(l2)
- Characterize materials using different machines.(l3)
- Summarize the various strengthening mechanisms with suitable examples.(l2)
- Identify   the creep in different materials and its influence in selection of materials.(l3)

Text books:

1. Dieter, G.E., "Mechanical Metallurgy", McGraw-Hill, SI Edition, 1995.
2. Davis. H. E., Troxell G.E., Hauck.G. E. W., "The Testing Of Engineering Materials", McGraw-Hill, 1982.

References:

1. Wulff, The Structure and Properties of Materials, Vol. III "Mechanical Behavior of Materials", John Wiley and Sons, 1983.
2. Honey Combe R. W. K., "Plastic Deformation of Materials", Edward Arnold Publishers, 1984.
3. Suryanarayana, A. V. K., "Testing of Metallic Materials", Prentice Hall India, 1979.

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(19A03603d)   REFRIGERATION AND AIR CONDITIONING
PROFESSIONAL ELECTIVE - 2

Course Objective:

- Provides insights in how thermodynamic principles are applied within the refrigeration and air conditioning industry.
- Introduce the students how real systems used in commercial, industrial refrigeration and air conditioning industries are built-up.
- Expose the students on various refrigeration methods like vcr, var and latest developments.
- Know the various air conditioning methods like summer, winter and year round air conditioning and to make the student to understand the practical applications of

refrigeration and air conditioning systems.

UNIT I

INTRODUCTION TO REFRIGERATION: Necessity and Applications, Carnot Refrigerator, First and Second Law Applied to Refrigerating Machines, Unit of Refrigeration, COP, EER, Different Refrigeration Methods.
AIR REFRIGERATION: Bell-Coleman Cycle, Ideal and Actual Cycles, Open and Dense Air Systems - Numerical Problems - Refrigeration Needs of Air Crafts.

Learning Outcomes:

At the end of this unit the student will be able to
- Explain the terminologies associated with refrigeration. (l2)
- Describe the first and second law applied to refrigerating machines.(l2)
- Demonstrate the bell-coleman cycle in air refrigeration. (l2)
- Identify the various refrigeration cycles.

UNIT II

Vapour Compression Refrigeration (VCR) System - Basic Cycle - Working Principle and Essential Components of The Plant - COP - Representation of Cycle On T-S and P-h Charts - Expander Vs. Throttling, Effect of Sub Cooling and Super Heating - Cycle Analysis - Actual Cycle- Influence of Various Parameters on System Performance - Construction and Use of P-h Charts - Numerical Problems. Refrigerants - Desirable Properties - Classification of Refrigerants Used - Nomenclature- Secondary Refrigerants- Lubricants - Ozone Depletion - Global Warming- Newer Refrigerants.

Learning Outcomes:

At the end of this unit the student will be able to
- Appraise the importance of vapour compression refrigeration system. (l5)
- Draw the t-s and p-h charts for representation of cycle.(l1)
- Classify various refrigerants used in vapour compression refrigeration systems. (l1)
- Model the numerical problems on refrigeration cycles. (l3)
- Demonstrate the influence of various parameters on system performance. (l2)

UNIT - III

VAPOR ABSORPTION REFRIGERATION (VAR) SYSTEM- Description and Working of

NH3 - Water System and Li Br -Water (Two Shell & Four Shell) System -Calculation of Max COP, Principle of Operation of Three Fluid Absorption System

STEAM JET REFRIGERATION SYSTEM: Working Principle and Basic Components- Estimation of Motive Steam Unconventional refrigeration systems - Principle and Operation of: (I) Thermo-Electric Refrigerator (Ii) Vortex Tube OrHilsch Tube (iii) Acoustic refrigeration system.

Learning Outcomes:

At the end of this unit the student will be able to
- Appraise the importance of vapour absorption refrigeration system. (l5)
- Identify the latest developments of electrolux, thermo electric vortex tube methods.. (l3)
- Illustrate the working of various components of steam jet refrigeration system.(l2)
- Estimate the motive steam required for steam jet refrigeration system.(l6)
- Describe the working principle of themo- electric refrigerator and bortex tube refrigerator.(l2)

UNIT IV

INTRODUCTION TO AIR CONDITIONING: Psychrometric Properties & Processes - Characterization of Sensible and Latent Heat Loads -- Need For Ventilation, Consideration of Infiltrated Air - Heat Load Concepts.
AIR CONDITIONING SYSTEMS: Air Cooler (Evaporative Cooling) ,Window, Split, Summer , Winter, Year Round, Central Air Conditioning Systems.

Learning Outcomes:

At the end of this unit the student will be able to
- Illustrate the psychrometric properties & processes**.** (l2)
- Select the air conditioning systems for different realistic situations. (l6)
- Define the terms sensible heat load and latent heat load. (l1)
- Draw the psychrometric charts for various air conditioning environments.(l1)

UNIT V

Air Conditioning Equipment - Humidifiers - Dehumidifiers - Air Filters, Fans and Blowers.
HUMAN COMFORT: Requirements of Temperature, Humidity And Concept of Effective Temperature, Comfort Chart. Heat Pump - Heat Sources - Different Heat Pump Circuits.

Learning Outcomes:

At the end of this unit the student will be able to
- Appraise the importance of humidifiers and dehumidifiers. (l5)
- Select the requirements of temperature and humidity for human comfort. (l6)
- Demonstrate the heat pump working and its components. (l2)
- List the various air conditioning equipments. (l1)

Course Outcomes

After completing the course, the student will be able to
- Summarize the various refrigeration and air conditioning equipments and it's working.
- Apply the basic knowledge to operate the refrigeration systems.
- Evaluate the cop for vapour absorption system.

TEXT BOOKS:
1. CPArora, "Refrigeration and Air Conditioning" , TMH, 15th edition, 2013.
2. S.CArora&Domkundwar, "A Course in Refrigeration and Air conditioning", Dhanpatrai

REFERENCE BOOKS:
1. Manohar Prasad, " Refrigeration and Air Conditioning", New Age, 2nd edition, 2013
2. Dossat, " Principles of Refrigeration", Pearson Education, 4th edition, 2007
3. P.L.Ballaney, "Refrigeration and Air Conditioning", 2nd edition, 2012.
4. P.N.Ananthanarayanan / TMH, "Basic Refrigeration and Air-Conditioning", 4th edition, 2013.

NOTE: Tables/Codes: Thermal Engineering Data Book containing refregerent and Psychrometricproperty Tables and charts are permitted in Exam

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(19A03603e) PRODUCTION AND OPERATIONS MANAGEMENT
PROFESSIONAL ELECTIVE - 2

Course Objectives:

At the end of the course, the student will be able to learn
- Introduction to the technical design and manufacturing operations and supply management to the sustainability of an enterprise.
- Need for forecasting and types of forecasting.
- Import the basic principles of project management and other business functions such as value engineering, purchasing, marketing, finance etc.
- Analyze the new demands of the globally competitive business environment that supply chain managers face today.
- Knowledge on various scheduling algorithms applicable to single machine, parallel machines, flow shop and job shop models.

UNIT – I
                                                          10 Hours

Introduction: Operations Management – Definition, Objectives, Types of Production System, Difference between OM & PM, Historical Development of Operations Management, Current Issues in Operation Management, Product Design – Requirements of Good Product Design, Product Development – Approaches, Concepts in Product Development, Standardization, Simplification, Speed to Market, Introduction to Concurrent Engineering.

Learning Outcomes:

At the end of the unit, the student will be able to
- Understand the concepts of operations management, production systems.(L1)
- Analyze steps in design a new product.(L4)

UNIT – II
                                                     8 Hours

Forecasting: Introduction, Statistical Forecasting Techniques, Moving Average, Exponential Smoothing Technique, Errors in Forecasting and Evaluation of Forecasting Techniques.

Learning Outcomes:

At the end of the unit, the student will be able to
- Understand the concept of forecasting.(L1)

- Understand and analyze the various methods of forecasting.(L1)

UNIT – III

8 Hours

Value Engineering and Plant Layout: Value Engineering – Objectives, Types of Values, Function and Cost, Product Life Cycle, Steps in Value Engineering, Methodology in Value Engineering, FAST Diagramand Matrix Method. Facility Location and Layout – Factor Considerations in Plant Location, Comparative Study of Rural and Urban Sites, Methods of Selection of Plant Layout, Objectives of Good layout, Principles, Types of Layout, Line Balancing.

Learning Outcomes:

At the end of the unit, the student will be able to
- Understand the concepts of value engineering.(L1)
- Identify the factors for locating a Plant Layout.(L3)
- Understand types of plant layout and line balancing.(L1)

UNIT – IV

8 Hours

Aggregate Planning and MRP: Aggregate Planning – Definition, Different Strategies, Various Models of Aggregate Planning- Transportation and Graphical Models, Master scheduling, Material Requirement Planning(MRP)- Terminology, Types of Demands, Inputs to MRP, Techniques of MRP, Lot Sizing Methods, Benefits and Drawbacks of MRP, Manufacturing Resources Planning (MRP II), Just in Time (JIT) Philosophy, Kanban System, Calculation of Number of Kanbans, Pull Systems vs. Push Systems, Requirements for Implementation of JIT, JIT Production Process, Benefits of JIT.

Learning Outcomes:

At the end of the unit, the student will be able to
- Understand the concepts of aggregate planning, material requirement planning and JIT.(L1)
- Implement the concepts of JIT.(L5)

UNIT – V   8 Hours

Scheduling: Policies, Types of Scheduling, Scheduling Strategies, Scheduling and Loading Guidelines, Forward and Backward Scheduling, Grant Charts, Priority Decision Rules, Flow Shop Scheduling, Job Shop Scheduling, Line of Balance.

Learning Outcomes:

At the end of the unit, the student will be able to
- Understand types and policies of scheduling.(L1)
- Analyze and implement single machine, parallel machine, flow shop, and job shop scheduling algorithms.(L6)

Course Outcomes:

At the end of the course, the student will be able to
- Demonstrate the operations and supply management to the sustainability of an enterprise.(L2)
- Identify the need for forecasting and understand different forecasting methods.(L3)
- Identify various production and plant layouts.(L3)
- Examine the quality control of the production.(L4)
- Apply Just in Time (JIT) basic principles and applications.(L2)
- Recommend the production schedule for productivity.(L4)
- Design, analyze and implement single machine, parallel machine, flow shop and job shop scheduling algorithms.(L6)

Text Books:

1. Buffa E.S. and Sarin R.K., "Modern Production / Operations Management", 8th Edition, Wiley India Pvt. Ltd., New Delhi, 2009.
2. Joseph G. Monks, "Operations Management-Theory and Problems", 3rd Edition, McGraw Hill Education, 1987.
3. Dipak Kumar Bhattacharyya, "Production and operations Management", University press, 2012.

Reference Books:

1. James L. Riggs, Jim Rigs, "Production Systems: Planning, Analysis and Control", 4th Edition, Wave Land Press, 1992.
2. Chary S.N., "Production and Operations Management", 5th Edition, McGraw Hill Education, 2017.
3. Richard B.Chase, Ravi Shankar, Robert Jacobs F., "Operations and Supply Chain Management", 15th Edition, McGraw Hill Education, 2018.

4. Pannerselvam R., "Production and Operations Management", 3rd Edition, PHI Learning Pvt. Ltd., New Delhi, 2012.

5. Steven Nahmias, Tava Lennon Olsen, "Production and Operation Analysis: Strategy – Quality – Analytics – Applications", 7th Edition, Waveland Press Inc., 2015.

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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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(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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(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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(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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(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 ω_o, 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 Resistance R_S and its concept to MOS, Area Capacitance Units, Calculations, The delay unit T, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and 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.

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(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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(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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(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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(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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(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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(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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(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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)–III-II	L	T	P	C
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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

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B.Tech (ME)– III-II   **L   T   P   C**
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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.

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(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 ethicsBasics of business ethics Corporate Social Responsibi lity – Issues of Management – Crisis Management

Learning Outcomes:

After completion of this unit student will
- Understand the meaning of loyalty and ethical Behavior
- Explain various types of Ethics
- 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 –
 Virtue of humility – Promote happiness – karma yoga – proactive – flexibility and purity of mind. The
Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom
of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures, Culture and Individual
Ethics.

Learning Outcomes:

After completion of this unit student will
- 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,
Social Responsibilities of Business – Environmental Protection, Fair Trade Practices, Fulfilling all Nation
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 governance - 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", HPH
2. H.R.Machiraju: "Corporate Governance"
3. K. Venkataramana, "Corporate Governance", SHBP.
4. N.M.Khandelwal : "Indian Ethos and Values for Managers"

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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

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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

(19A03503P)   HEAT TRANSFER LAB

Course Objectives:

Students undergoing this course would
- Understand different modes of heat transfer
- Gain knowledge about natural and force convection phenomenon
- Estimate experimental uncertainty in measurements

LIST OF EXPERIMENTS

1. Determine the overall heat transfer coefficient across the width of composite wall
2. Determine the thermal conductivity of a metal rod
3. Determine the thermal conductivity of insulating powder material through concentric sphere apparatus
4. Determine the thermal conductivity of insulating material through lagged pipe apparatus
5. Determine the efficiency of a pin fin in natural and forced convection.
6. Determine the heat transfer coefficient for a vertical cylinder in natural convection
7. Determine the heat transfer coefficient in forced convection of air in a horizontal tube.
8. Determine the heat transfer coefficients on film and drop wise condensation apparatus.
9. Determine the effectiveness of a parallel and counter flow heat exchanger.
10. Study the pool boiling phenomenon and different regimes of pool boiling.
11. Experiment on pool boiling
12. Determine the emissivity of the test plate surface.
13. Experiment on Stefan-Boltzmann apparatus
14. Determine the heat transfer rate coefficient in fluidized bed apparatus

Course Outcomes

Upon the successful completion of course, students will be able to
- Explain different modes of heat transfer
- Identify parameters for measurement for calculating heat transfer
- Determine effectiveness of heat exchanger
- Design new equipment related to heat transfer
- Apply principles of heat transfer in wide application in industries.

(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 I

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 II

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 III
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

UNIT IV
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 V
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

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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 (ME)– IV-I Sem

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(19A03701)   OPERATIONS RESEARCH

Course Objectives:

- To impart the basic concepts of modeling, models and statements of the operations research.
- Formulate and solve linear programming problem/situations.
- Model strategic behaviour in different economic situations.
- To solve transportation problems to minimize cost.
- Apply Queuing theory to solve problems of traffic congestion, counters in banks, railway bookings etc.
- Explain scheduling and sequencing of production runs and develop proper replacement policies.

UNIT I

Introduction to Operations Research (OR): OR definition - Classification of Models, modeling – Methods of solving OR Models, limitations and applications of OR models
Linear Programming(LP): Problem Formulation, Graphical Method, Simplex Method, Big-M Method, Two–Phase Simplex Method, Special Cases of LP- Degeneracy, Infeasibility and Multiple Optimal Solutions; Concept of dual theorem

Learning Outcomes:

At the end of this unit, the student will be able to
- Formulate practical problems given in words into a mathematical model. (l6)
- Quantify or models to solve optimization problems. (l5)
- Formulate linear programming problems and appreciate their limitations. (l6)

UNIT II

Transportation and Assignment Problems: Transportation Problem – Formulation; Different Methods of Obtaining Initial Basic Feasible Solution –North West Corner Rule, Least Cost Method, Vogel's Approximation Method; Optimality Method – Modified Distribution (MODI) Method; Special Cases – Unbalanced Transportation Problem, Degenerate Problem. Assignment

Problem – Formulation, Hungarian Method for Solving Assignment Problems, Traveling Salesman problem.

Learning Outcomes:

At the end of the this unit, the student will be able to
- Model linear programming problems like the transportation. (l3)
- Solve the problems of transportation from origins to destinations with minimum time and cost. (l6)

UNIT III

Game theory: Optimal solution of two person zero sum games, the max min and min max principle. Games without saddle points, mixed strategies. Reduction by principles of dominance, arithmetic, algebraic method and graphical method.
Sequencing: Introduction to Job shop Scheduling and flow shop scheduling, Solution of Sequencing Problem, Processing of n Jobs through two machines, Processing of n Jobs through m machines, graphical method.

Learning Outcomes:

At the end of this unit, the student will be able to
- Identify strategic situations and represent them as games. (l3)
- Solve simple games using various techniques. (l6)
- Solve problems of production scheduling and develop inventory policies. (l6)

UNIT IV

Queuing Theory: Introduction – Terminology, Arrival Pattern, Service Channel, Population, Departure Pattern, Queue Discipline, Birth & Death Process, Single Channel Models with Poisson Arrivals, Exponential Service Times with finite queue length and non-finite queue length; Multichannel Models with Poisson Arrivals, Exponential Service Times with finite queue length and non finite queue length.

Learning Outcomes:

At the end of this unit, the student will be able to
- Model a dynamic system as a queuing model to compute performance measures. (l3)
- Apply optimality conditions for single- and multiple-variable constrained and unconstrained nonlinear optimization problems. (l3)

UNIT V

Replacement and Maintenance Analysis: Introduction – Types of Maintenance, Make or buy decision. Types of Replacement Problems, Determination of Economic Life of an Asset, and Simple Probabilistic Model for Items which completely fail-Individual Replacement Model, Group Replacement Model.
Dynamic Programming (DP): Introduction –Bellman's Principle of Optimality – Applications of Dynamic Programming – Capital Budgeting Problem – Shortest Path Problem – Solution of Linear Programming Problem by DP.

Learning Outcomes:

At the end of this unit, the student will be able to
- Solve problems using dynamic programming. (l3)
- Apply the concept of replacement model. (l3)

Course Outcomes:

At the end of the course, the student will be able to
- Develop mathematical models for practical problems. (l3)
- Apply linear programming to transportation problems. (l3)
- Solve games using various techniques. (l3)
- Solve production scheduling and develop inventory policies. (l6)
- Apply optimality conditions for constrained and unconstrained nonlinear problems. (l3)
- apply dynamic programming methods. (L3)

Text books:

1. Sharma S.D., "Operations Research: Theory, Methods and Applications", 15th Edition, Kedar Nath Ram Nath, 2010
2. Taha H.A., "Operations Research", 9th Edition, Prentice Hall of India, New Delhi, 2010.

Reference books:

1. Hiller F.S., and Liberman G.J., "Introduction to Operations Research", 7th Edition, Tata McGraw Hill, 2010.
2. Sharma J.K., :Operations Research: Theory and Applications", 4th Edition, Laxmi Publications, 2009.

3. Prem kumar Gupta and Hira, "Operations Research", 3rd Edition, S Chand Company Ltd., New Delhi, 2003.
4. Pannerselvam R., "Operations Research", 2nd Edition, Pentice Hall of India, New Delhi, 2006.
5. Sundaresan.V, and Ganapathy Subramanian.K.S, "Resource Management Techniques: Operations Research", A.R Publications, 2015.

Web References:

- http://www2.informs.org/Resources/
- http://www.mit.edu/~orc/
- http://www.ieor.columbia.edu/
- http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.htm
- http://www.wolfram.com/solutions/OperationsResearch/
- http://nptel.iitm.ac.in/video.php?subjectId=112106134
- http://www.youtube.com/watch?feature=player_detailpage&v=ug7O1lSZyg0
- http://www2.ensc.sfu.ca/undergrad/courses/ENSC201/Unit09/lecture9.html
- http://pakaccountants.com/what-is-depreciated-replacement-cost/
- http://www.youtube.com/watch?feature=player_detailpage&v=H58TPQNr2kM
- http://www.youtube.com/watch?feature=player_detailpage&v=h0bdo06qNVw
- http://www.youtube.com/watch?feature=player_detailpage&v=xGkpXk-AnWU#t=104s
- http://nptel.iitm.ac.in/video.php?subjectId=112106134,
- http://www. Math.harvard.edu/archive/20_spring_05/handouts

B.Tech (ME)– IV-I Sem   **L   T   P   C**

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(19A03702T)   METROLOGY AND MEASUREMENTS

Course Objectives:

- Introduce the basic concepts of metrology and measurement methods.
- Demonstrate the importance of metrology in manufacturing
- Explain the concepts of transducers and its practical applications.
- Expose with various measuring instruments
- Familiarize calibration methods of various measuring instruments.

UNIT I   10 hrs

Concept of Measurement: General concept-generalized measurement system, units and standards, measuring instruments, sensitivity, readability, range of accuracy, precision, static and dynamic response, repeatability, systematic and random errors, correction, calibration, terminology and limits fits and tolerances, hole basis and shaft basis system, interchangeability.

Linear and Angular Measurement: Linear measuring instruments: Vernier instruments, micrometers, slip gauges, tool makers microscope. Comparators: Mechanical, pneumatic and electrical. Angular measurements: Sine bar, bevel protractor and angle dekkor, rollers and spheres used to determine the tapers.

Learning Outcomes:

At the end of this unit the student will be able to
- Identify important parameters in metrology. (l3).
- Differentiate interchangeability and selective assembly. (l4).
- Select limits and tolerances for different assemblies. (l1)
- Explain the principles of measurement of various comparators. (l2).
- Discuss about the principles of slip gauges, micrometers and vernier height gauges. (l2)

UNIT II   8 hrs

Flatness Measurement: Measurement of flatness – straight edges – surface plates, optical flat and autocollimators, interferometers and their applications.

Surface Roughness Measurement: Terminology systems, differences between surface roughness and surface waviness- Numerical assessment of surface finish - CLA, R,M,S Values-

Ra , Rz values, Methods of measurement of surface finish-profilograph, talysurf, BIS symbols for indication of surface roughness, classification of automatic inspections systems, co-ordinate-measuring machines, non-contact inspection techniques-machine vision, laser scanning systems.

Learning Outcomes:

At the end of this unit, the student will be able to
- Inspect the flatness of surfaces. (l4)
- Recall the terms used in surface roughness measurement. (l1)
- Explain the factors affecting the surface finish in machining. (l2)
- Demonstrate the application of different surface measuring instruments. (l2)

UNIT III   8 hrs

Metrology of Screw Threads:
Screw thread measurements: Elements of threads, errors in screw threads, various methods for measuring external and internal screw threads, screw thread gauges.
Gear Measurement: Gear tooth terminology, measurement of gear elements-runout, lead, pitch backlash, profile, pressure angle, tooth thickness, diameter of gear, constant chord and base tangent method.

Learning Outcomes:

At the end of this unit, the student will be able to
- Identify the errors in screw threads. (l3)
- Explain the principles of gear measuring instruments. (l2)
- Select the tools and methods for measuring screw thread, gear profiles. (l1)

UNIT IV   8 hrs

Measurement of Displacement: Theory and construction of various transducers to measure displacement - Piezo electric, inductive, capacitance, resistance, ionization and photoelectric transducers, calibration procedures.
Measurement of Speed: Mechanical tachometers - Electrical tachometers - Stroboscope, Noncontact type of tachometer.
Measurements of Strain: Various types of electrical strain gauges, gauge factor, method of usage of resistance strain gauge for bending, compressive and tensile strains, usage for measuring torque, strain gauge rosettes.

Learning Outcomes:

At the end of this unit, the student will be able to
- List various types of transducers used for the measurement of displacement and speed. (L1)
- Explain the static and dynamic characteristics of transducers. (L3)
- Classify the transducers with respect to change in resistance, capacitance and inductance. (L4)
- experiment with measurement of strain (L3)

UNIT V   **8 hrs**

Measurement of Force: Direct method - analytical balance, platform balance; elastic members – load cells, cantilever beams and proving rings.
Measurement of Torque: Torsion bar dynomometer, servo controlled dynamometer and absorption dynamometer.
Measurement of Temperature: Standards and calibration, thermal expansion methods, thermo electric sensors (thermocouples), Electrical Resistance sensors, Junction semiconductor sensors, Digital thermometers, Radiation methods.
Measurement of Pressure and Sound: Standards and calibration, basic methods of pressure measurement, dead weight gauges and manometers, Elastic transducers, vibrating cylinder, resonant transducers, High and low pressure measurement.

Learning Outcomes:

At the end of this unit, the student will be able to
- Identify various types of transducers used for the measurement of force, torque, temperature, pressure and sound. (l3)
- Explain methods of measurement of force, torque, temperature, pressure and sound. (l2)
- Develop the techniques for calibration of force, torque, temperature, pressure and sound measuring devices. (l3)

Course Outcomes:

- List various measuring instruments used in metrology. (L4)
- Examine geometry of screw threads and gear profiles. (L4)
- Measure force, torque, temperature, pressure and sound. (L5)
- Calibrate various measuring instruments. (L4)

Textbooks:

1. Thomas G.Beckwith, Marangoni, Linehard, "Mechanical Measurements", 6th edition, PHI, 2013.
2. R.K. Jain, "Engineering Metrology", 20th edition, Khanna Publishers, 2013.

Reference Books:

1. Mahajan, "Engineering Metrology", 2nd edition, Dhanpat Rai, 2013.
2. S.Bhaskar, Basic Principles - Measurments and Control Systems, Anuradha Publications, 2014.
3. Anand K Bewoor & Vinay A Kulkarni, "Metrology & Measurement", 15th edition, McGrawHill, 2015

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– IV-I Sem
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(19A03703a) AUTOMOTIVE TRANSMISSION SYSTEM
PROFESSIONAL ELECTIVE - III

Course Objectives:

- Explain operation and performance of various clutches and gear boxes.
- Familiarize hydrodynamic drives.
- Teach various types of gear boxes used for automotive transmission
- Impart principle of operation and performance of various hydrostatic and electric drives provide.
- Identify the applications of automatic transmission

UNIT – I

Clutch & gear box: Requirements of transmission system and role of clutch in driving system, Types of Clutches, Construction and Working of Single Plate, Multi Plate, Cone Clutch, Centrifugal and Semi Centrifugal clutch and its operating characteristics, Equation for torque capacity of a single plate clutch. Need for a gear box in an automobile and types of Gear boxes – Construction and working of Sliding mesh, Constant mesh gear box, Synchromesh gear box and principle of synchronizers.

Learning Outcomes:

At the end of this unit, the student will be able to
- Identify the requirements of transmission system (L2)
- Recognize the role of clutch in driving system (L1)
- List various types of clutches. (L1)
- Explain the need of gear box in an automobile (L2)
- Discuss the construction and working principles of gear boxes (L3)

UNIT II:

Gear trains: Construction and working Principle of Epi-cyclic gear train, Planetary gear box, Ford T Model gear box, Wilson gear box, Cotal electromagnetic transmission and Automatic over drive. Gear ratios for Wilson gear box and Automatic Over drive. Hydraulic control system for Automatic transmission.

Learning Outcomes:

At the end of this unit, the student will be able to
- Illustrate working of epic cyclic and planetary gear boxes. (l2)
- Explain electromagnetic transmission.(l2)
- Demonstrate hydraulic control system for automatic transmission. (l2)

UNIT – III

Hydrostatic drives: Introduction to hydrostatic drives, Working principle, types, Advantages and limitations of Hydrostatic drives, Comparison of hydrostatic drive with hydro dynamic drive, Construction and working of Janny Hydrostatic drive.

Hydrodynamic and hydrokinetic drives: Introduction to fluid coupling, Fluid coupling – Construction, Principle of operation and Performance characteristics, Drag torque and various drag reducing devices of fluid coupling, Problems on design and torque capacity of fluid coupling, Construction and working of Torque converter, converter coupling, Multistage torque converter, and Poly phase torque converter - Performance characteristic of multistage and poly phase torque converters.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain hydrostatic drives. (l2)
- Differentiate hydrostatic and hydrodynamic drives. (l2)
- Summarize construction and working of janny hydrostatic drive. (l2)
- Give the advantages and limitations of hydrostatic drives.
- Solve the problems on fluid coupling and will be able to predict the torque capacity.

UNIT IV:

Automatic transmission: Layout of Automatic transmission system, construction and working of Turbo glide transmission, Power glide transmission, ECT- intelligent transmission , Automatic transmission with intelligent electronic control systems, Hydraulic clutch actuation for Automatic transmission.

Learning Outcomes:

At the end of this unit, the student will be able to
- Draw layout of automatic transmission system. (l3)

- Compare construction and working different types of transmission. (l4)
- Explain the working of turbo glide transmission and power glide transmission(l3)
- Identify the importance of intelligent electronic control systems in automatic transmission.(l2)
- Demonstrate hydraulic clutch activation for automatic transmission. (l2)

UNIT V:

ELECTRIC DRIVES: Introduction to Electric drive: Layout Advantages, limitations and performance characteristics of Electric drive, Principle of Early Ward Leonard control system of electric drive. Principle of Modified Ward Leonard control system of electric drive.

Course Outcomes:

At the end of this course, the student will be able to
- Understand the working principles of clutches and gearboxes
- Analyze the working of planetary gear box systems.
- Identify the differences between the hydrostatic and hydrodynamic drives.
- Discuss various types of automatic transmission systems
- Design the automatic transmission system.

Text books

1. Harald Naunheimer , Bernd Bertsche , Joachim Ryborz , Wolfgang Novak "Automotive Transmission: Fundamentals, Selection, Design and Application", 2nd Edition, Springer, 2011.

Reference books

1. Heldt P.M, "Torque converters", Chilton Book Co., 1992.
2. Newton Steeds & Garrot, "Motor Vehicles", SAE International and Butterworth Heinemann, 2001.
3. CDX Automotive, "Fundamentals of Automotive Technology, Principles and practice", Jones & Barlett Publishers, 2013.
4. SAE Transactions 900550 & 930910.
5. Crouse W.H, Anglin D.L, "Automotive Transmission and Power Train construction", McGraw Hill, 1976.

B.Tech (ME)– IV-I Sem   **L   T   P   C**
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(19A03703b) ADDITIVE MANUFACTURING
PROFESSIONAL ELECTIVE - III

Course Objectives:

● Familiarize of additive manufacturing / rapid prototyping and its applications in various fields.
● Impart reverse engineering technologies.
● Explain different processes available in additive manufacturing.
● Bring awareness on 3d printing materials and geometric issues related to additive manufacturing applications.

UNIT – I   **10 Hours**

Introduction to Additive Manufacturing (AM) Systems: History and Development of AM, Need of AM, Difference between AM and CNC, Classification of AM Processes: Based on Layering Techniques, Raw Materials and Energy Sources, AM Process Chain, Benefits and Applications of AM, Representation of 3D model in STL format, RP data formats: SLC, CLI, RPI, LEAF, IGES, CT, STEP, HP/GL.

Learning Outcomes:

At the end of the unit, the student will be able to
- Identify the applications for additive manufacturing processes. (l3)
● Explain the process of additive manufacturing. (l2)
● Represent a 3d model in stl format and other rp data formats to store and retrieve the geometric data of the object. (l3)

UNIT – II   **8 Hours**

CAD & Reverse Engineering: Basic Concept, Digitization techniques, Model Reconstruction, Data Processing for Additive Manufacturing Technology: CAD model preparation, Part Orientation and support generation, Model Slicing, Tool path Generation, Software's for Additive Manufacturing Technology: MIMICS, MAGICS. Reverse Engineering (RE) –Meaning, Use, RE – The Generic Process, Phase of RE Scanning, Contact Scanners, Noncontact Scanners, Point Processing, Application Geometric Model, Development.

Learning Outcomes:

At the end of the unit, the student will be able to
- Apply various digitalization techniques. (l3)
- Explain the concept of reverse engineering and scanning tools. (l2)

UNIT – III   8 Hours

Solid and Liquid Based AM 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. (L3)

UNIT – IV   8 Hours

Powder Based AM 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.

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)
- Apply SLS, LENS and EBM 3D printing methods. (L3)

UNIT – V   8 Hours

Other Additive Manufacturing Systems: Three Dimensional Printing (3DP): Principle, Process, Advantages, Limitationsand Applications. Ballistic 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 principles and limitation of 3D printing using BPM and SDM. (L2)
- Use BPM and SDM 3D printing methods. (L3)

Course Outcomes:

At the end of the course, the student will be able to

- Demonstrate various additive manufacturing and rapid prototyping techniques applications.
- Describe different additive manufacturing processes.
- Apply methods in rapid prototyping.
- Use powder based am system.
- Model 3d printing using sdm and bpm methods.

Text Books:

1. Ian Gibson, David W. Rosen, Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", 1st edition, Springer, 2010.
2. Chua C.K., Leong K.F. and Lim C.S., "Rapid Prototyping: Principles and Applications", 2nd edition, World Scientific Publishers, 2003.
3. Liou W. Liou, Frank W., Liou, "Rapid Prototyping and Engineering Applications: A Tool Box for Prototype Development", CRC Press, 2007.

Reference Books:

1. Pham D.T. and Dimov S.S., "Rapid Manufacturing; The Technologies and Application of RPT and Rapid Tooling", Springer, London 2001.
2. Gebhardt A., "Rapid prototyping", Hanser Gardener Publications, 2003.
3. Hilton P.D. and Jacobs P.F., "Rapid Tooling: Technologies and Industrial Applications", CRC Press, 2005.
4. RafiqNoorani, "Rapid Prototyping: Principles and Applications in Manufacturing", John Wiley & Sons, 2006.

B.Tech (ME)– IV-I Sem   **L   T   P   C**
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(19A03703c) MECHANICS OF COMPOSITE MATERIALS
PROFESSIONAL ELECTIVE -III

Course Objectives:

- Understand the properties of composite materials.
- Familiarize the manufacturing methods for composites.
- Teach the practical requirements associated with joining and manufacturing

UNIT-1

Introduction To Composite Materials

Introduction To Composite Materials: Definition, classification and characteristics of composite Materials – fibrous composites, laminated composites, particulate composites. **Applications:** Automobile, Aircrafts. missiles. Space hardware, Electrical and electronics, Marine, recreational and sports equipment, future potential of composites.

Fiber Reinforced Plastic Processing: Lay up and curing, fabricating process, open and closed mould process, hand layup techniques; structural laminate bag molding, production procedures for bag molding; filament winding, pultrusion, pulforming, thermo-forming, injection molding, blow molding.

Learning Outcomes:

At the end of this student, the student will be able to
- Define Composite Materials. (L1)
- List the applications of composite materials. (L1)
- Compare open and closed mould process. (L3)
- Demonstrate the processing methods of ceramic materials. (L3)

UNIT-2

Micro Mechanical Analysis of a Lamina:

Micro Mechanical Analysis of a Lamina: Introduction, Evaluation of the four elastic moduli by Rule of mixture, Numerical problems.

Macro Mechanics of a Lamina: Hooke's law for different types of materials, Number of elastic constants, Two - dimensional relationship of compliance and stiffness matrix. Hooke's law for

two-dimensional angle lamina, engineering constants - Numerical problems. Stress-Strain relations for lamina of arbitrary orientation, Numerical problems.

Learning Outcomes:

At the end of this student, the student will be able to
- Solve numerical problems on evaluation of the four elastic moduli by rule of mixture.. (L4)
- Understand the hooke's law for different types of materials. (L2)
- Explain the two dimensional relationship of compliance and stiffness matrix. (L2)
- Discuss the stress strain relationship for lamina of arbitrary orientation. (L2)

UNIT-3

Biaxial Strength Theories
Maximum stress theory, Maximum strain theory, Tsai-Hill theory, Tsai, Wu tensor theory, Numerical problems.
Macro Mechanical Analysis of Laminate
Introduction, code, Kirchoff hypothesis, CL T, A, B, and D matrices (Detailed derivation) , Special cases of laminates, Numerical problems.

Learning Outcomes:

At the end of this student, the student will be able to
- Discuss the maximum stress theory and maximum strain theory. (L2)
- Differentiate between CL, T, A, B and D matrices. (L4)
- List the special cases of macro mechanical analysis of laminates (L1)
- Solve problems on Kirchoff hypothesis. (L4)

UNIT-4

Metal Matrix Composites: Metal Matrix Composites: Reinforcement materials, types, characteristics and selection base metals selection. Need for production MMC's and its application.
Fabrication Process For MMC's: Powder metallurgy technique, liquid metallurgy technique and secondary processing, special fabrication techniques.
Study Properties Of Mmc's: Physical Mechanical, Wear, machinability and Other Properties. Effect of size, shape and distribution of particulate on properties.

Learning Outcomes:

At the end of this student, the student will be able to
- Identify the importance of metal matrix composites. (L2)
- Give the applications of metal matrix composites (L1)
- Recall the fabrication processes for MMC's. (L1)
- Demonstrate on the various properties of MMC's. (L2)

UNIT-5

Failure Theories: Micromechanics of Failure of Unidirectional Lamina, Anisotropic Strength and Failure Theories, Importance of Shear Strength, Choice of Failure Criteria, Examples.

Learning Outcomes:

At the end of this student, the student will be able to
- Discuss the failure theories of unidirectional lamina. (L2)
- Explain the anisotropic strength of unidirectional lamina . (L2)
- Understand the choice of failure criteria with help of examples. (L2)

Course Outcomes:

At the end of the course, the student will be able to
- Design and manufacture composite materials for various applications. (L5)
- Conduct mechanical testing of composite structures and analyse failure modes. (L4)
- Synthesize structures for environmental effects. (L5)
- Analyse economic aspects of using composites. (L4)

Text Books
1. K.K. Chawla, "Composite Materials", Springer-Verlag, New York. (1998),
2. Madhujit Mukhopadhya, "Mechanics of composite materials and structures",. Universities Press 2004.

References

1. B.T. Astrom "Manufacturing of Polymer Composites", Chapman & Hall. , (1997),
2. Stuart M Lee, J. Ian Gray, Miltz, "Reference Book for Composites Technology", CRC press. (1989),
3. Frank L Matthews and R D Rawlings, "Composite Materials: Engineering and Science", Taylor and Francis. (2006),
4. D. Hull and T.W. Clyne, "Introduction to Composite Materials", Cambridge University Press. (1996),
5. M.R. Piggott, "Load Bearing Fibre Composites", Pergamon press, Oxford. (1998),
6. F. Ashby and D.R.H. Jones, (1999), Engineering Materials, Pergamon press.
7. R.W. Davidge and A. Kelly, (1999), Mechanical behavior of ceramics, Cambridge University press.
8. Andrew C. Marshall, (1998), Composite Basics, Marshall Consulting. Mode of Evaluation Quiz/Assignment/ Seminar/Written Examination.

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B.Tech (ME)– IV-I Sem
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(19A03703d) SOLAR AND WIND ENERGY
PROFESSIONAL ELECTIVE - III

Course Objectives:

The main objectives of this course are to make the student

- Familiarize with basics of solar radiation, available solar energy and its measurement.
- Familiarize with solar collectors, construction and operation of solar collectors.
- Understand solar energy conversion systems, applications and power generation.
- Familiarize the wind energy sources assessment
- Explain basics of designing aerofoil

UNIT – I:

Solar radiation and collectors: Solar angles – Sun path diagrams – Radiation - extra terrestrial characteristics - measurement and estimation on horizontal and tilted surfaces - flat plate collector thermal analysis - testing methods-evacuated tubular collectors - concentrator collectors – classification - design and performance parameters - tracking systems - compound parabolic concentrators - parabolic trough concentrators - concentrators with point focus - Heliostats – performance of the collectors.
Solar thermal technologies: Principle of working, types, design and operation of - Solar heating and cooling systems - Thermal Energy storage systems – Solar Desalination – Solar cooker : domestic, community – Solar pond – Solar drying.

Learning Outcomes:

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

- Explain the basic concepts of solar radiation and solar collectors (L2)
- Develop sun path diagrams (L3)
- Explain the concepts of tracking systems (L2)
- Discuss the working principles of solar thermal technologies (L6)
- Develop design and operation of solar heating and cooling systems (L3)
- Explain the principles of thermal storage systems (L2)

UNIT – II

Solar PV fundamentals: Semiconductor – properties - energy levels - basic equations of semiconductor devices physics. Solar cells - p-n junction: homo and hetro junctions - metal-semiconductor interface - dark and illumination characteristics - figure of merits of solar cell - efficiency limits - variation of efficiency with band-gap and temperature - efficiency measurements - high efficiency cells – Solar thermo-photovoltaics.

SPV system design and applications: Solar cell array system analysis and performance prediction- Shadow analysis: reliability - solar cell array design concepts - PV system design - design process and optimization - detailed array design - storage autonomy - voltage regulation - maximum tracking - centralized and decentralized SPV systems - stand alone - hybrid and grid connected system - System installation - operation and maintenances - field experience - PV market analysis and economics of SPV systems.

Learning Outcomes:

At the end of this course, the student will be able to
- Explain the properties of a semiconductor (L2)
- Apply the principles of solar thermo photovoltaics (L3)
- Outline the applications of SPV system (L2)
- Analyze the performance of a solar cell array system (L4)
- Utilize centralized and decentralized SPV systems (L3)

UNIT III

Introduction: Historical Perspectives on Wind Turbines- Indian Energy Scenario - Global Energy Scenario - Introduction to Indian Wind Industry - Wind Energy potential of India and Global Wind Installations.

Basics of Wind Resource Assessment: Power in the wind –Wind Characteristics - Measurement of wind using anemometers (cup anemometer, propeller anemometer, pressure plate anemometer, pressure tube anemometer, sonic anemometer and other remote wind speed sensing techniques) –Turbulence-Wind Power Density –Average wind speed calculation - Statistical models for wind data analysis (Weibull and Rayleigh distribution). Energy estimation of wind regimes – Wind Rose, Wind Monitoring Station Siting and Instrumentation.

Learning Outcomes:

After completion of this unit, students will be able to

- Recall historical perspective of wind turbines(L1)
- Relate Indian and globalenergy requirements(L1)
- Interpret power in the wind (L2)
- Classify different wind speed measuring instruments(L2)
- Apply different statistical models for wind data analysis (L3)

UNIT - IV

Wind Energy Conversion Systems: Types - Components of Modern Wind Turbine (HAWT and VAWT) - Fixed and Variable Speed operations - Power Control (Passive stall, Active pitch, Passive pitch and Active stall) - Electrical aspects of wind turbine, Safety of wind turbines.

Learning Outcomes:

After completion of this unit, students will be able to
- Utilize different wind parameters for design of rotor (L3)
- Make use of power curve for energy estimation (L3)
- List different components of modern wind turbine (L1)
- Explain how to control the power of a wind turbine (L2)
- Name different safety measures of wind turbine (L1)

Wind Farm Design and Health (Condition) Monitoring: Planning of wind farm, Site selection, Micro siting, Grid Integration, Power evacuation, Wind Farm Feasibility Studies, Preparation of DPR, Environmental Benefits and Impacts.
Small Wind Turbines: Water pumping wind mills, offshore wind energy, Wind turbine testing, future developments.

Learning Outcomes:

After completion of this unit, students will be able to
- Plan the wind farm(L3)
- Analyze the feasibility of wind farm(L4)
- List the environmental benefits and impacts (L1)
- Explain about small wind turbines(L2)

Text Book(s)

1. Goswami D.Y., Kreider, J. F. and Francis., "Principles of Solar Engineering', Taylor and Francis, 2000.
2. Chetan Singh Solanki, "Solar Photovoltatics – Fundamentals, Technologies and Applications", PHI Learning Private limited, 2011.
3. Sukhatme S.P.,. Nayak.J.P, 'Solar Energy – Principle of Thermal Storage and collection", Tata McGraw Hill, 2008.
4. Sathyajith Mathew, "Wind Energy Fundamentals, Resource Analysis and Economics", Springer Publications, (2006).
5. Wei Tong, "Wind Power Generation and Wind Turbine Design", WIT Press, (2010).

References:

1. Farm, and Business, Paul Gipe, "Wind Power, Revised Edition: Renewable Energy for Home", Chelsea Green Publishing, 2004,.
2. A. R. Jha, "Wind Turbine Technology", CRC Press, (2010).

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– IV-I Sem   **L   T   P   C**
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(19A03703e)   PRODUCT MARKETING
PROFESSIONAL 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 Packaging (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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B.Tech (ME)– IV-I   **L   T   P   C**
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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

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B.Tech (ME)– IV-I   L   T   P   C
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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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(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.

B.Tech (ME) – 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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(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:

3. Philip Kotler, "Principles of Marketing", Prentice – Hall.
4. Philip Kotler, "Marketing Management", Prentice – Hall.

Reference Books:

4. Wiliam J Stanton, "Fundamentals of Marketing", McGraw Hill
5. R.S.N. Pillai and Mrs.Bagavathi, "Marketing", S. Chand & Co. Ltd
6. Rajagopal, "Marketing Management Text & Cases", Vikas Publishing House

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– IV-I Sem   **L   T   P   C**
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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 (ME) – IV-I Sem   **L   T   P   C**

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(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.

B.Tech (ME)– 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.

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B.Tech (ME)– IV-I Sem   **L T P C**
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(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 (ME)– IV-I Sem

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(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 (ME)– 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 (ME)– IV-I   L   T   P   C
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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 (ME)– IV-I   **L   T   P   C**

3   0   0   3

<u>HUMANITIES ELECTIVE-II</u>

(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 (ME)– IV-I   L   T   P   C
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(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 (ME)– IV-I   **L T P C**
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(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 (ME) – 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 (ME)– IV-I   L   T   P   C
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(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:

3. C.S.V Murthy "E-Commerce", Himalaya publication house, 2002.
4. P.T.S Joseph, "E-Commerce" , 4th Edition, Prentice Hall of India 2011

REFERENCES:

5. KamaleshKBajaj,DebjaniNa, **"**E-Commerce", 2nd Edition TataMcGrwHills 2005
6. Dave Chaffey – "E-Commerce E-Management", 2nd Edition, Pearson, 2012.
7. Henry Chan, "E-Commerce Fundamentals and Application", Raymond Lee,Tharm Wiley India 2007
8. S. Jaiswall **"**E-Commerce", Galgotia Publication Pvt Ltd 2003.

B.Tech (EEE)– IV-I Sem

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(19A03702P) METROLOGY AND MEASUREMENT LABORATORY

Course objectives:

- To experiment with measuring equipments used for linear and angular measurements.
- To find common types of errors in measurement equipment.
- To experiment with different types of sensors, transducers and strain gauges equipment.
- To make use of instruments for measurement of temperature, speed and vibrations

Any 4 experiments from each section

Section A:

1. Measurement of bores by internal micrometers and dial bore indicators.
2. Use of gear teeth vernier calipers and checking the chordal addendum and chordal height of spur gear.
3. Alignment test on the lathe and milling machine using dial indicators
4. Study of Tool makers microscope and its application
5. Angle and taper measurements by Bevel protractor, Sine bars, spirit level etc.
6. Thread measurement by Two wire/ Three wire method.
7. Surface roughness measurement by Talysurf instrument.
8. Use of straight edge and sprit level in finding the flatness of surface plate.

Section B:

1. Calibration of Pressure Gauges
2. Study and calibration of Mcleod gauge for low pressure.
3. Calibration of transducer or thermocouple for temperature measurement.
4. Calibration of LVDT transducer for displacement measurement.
5. Calibration of capacitive transducer for angular measurement.
6. Calibration of photo and magnetic speed pickups for the measurement of speed.
7. Study and use of a Seismic pickup for the measurement of vibration amplitude of an

engine bed at various loads.

Course outcomes:

At the end of course the students will be able to:

- Apply different instruments to measure length, width, depth, bore diameters, internal and external tapers, tool angles, and surface roughness. (l3)
- Measure effective diameter of thread profile. (l5)
- Conduct different machine alignment tests.(l6)
- Measure temperature, displacement, and pressure. (l3)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– IV-I Sem   **L   T   P   C**
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(19A03602P)   INTRODUCTION TO CAD/CAM LAB

Course Objectives:

- To write program for CAD modeling.
- To learn part programming and path generation from a CAD model.
- To train on machining of various parts in CNC machines.

GEOMETRIC MODELING

Introduction to 3D Modeling (4 or 5 exercises).

1. Write program for translation, scaling and rotation.
2. Write program for generating spline Bezier and B-spline.
3. Write program for sweep surfaces and surface of revolution.
4. Blend surfaces using any software.
5. Create wireframe, surface and solid models.
6. Introduction to CNC Machines and G-Code, M-Codes
7. CNC part programming for operations like turning, step turning, taper turning, threading.
8. CNC program for plane milling, drilling operations.
9. Generation of CNC part programming with CAM packages for a given 3D models.
10. Development of APT programming for 2D objects
11. Programming for Robot pick and place and continuous path.

Course Outcomes:

After successful completion of this lab the student will be able to
- Generate CAD models.
- Write CNC programs for various machining operations.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– IV-I Sem   **L   T   P   C**
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(19A05406P)   INTERNET OF THINGS LABORATORY

Practicals:

1. Select any one development board (Eg., Arduino or Raspberry Pi) and control LED using the board.
2. Using the same board as in (1), read data from a sensor. Experiment with both analog and digital sensors.
3. Control any two actuators connected to the development board using Bluetooth.
4. Read data from sensor and send it to a requesting client. (using socket communication)
   Note: The client and server should be connected to same local area network.

5. Create any cloud platform account, explore IoT services and register a thing on the platform.
6. Push sensor data to cloud.
7. Control an actuator through cloud.
8. Access the data pushed from sensor to cloud and apply any data analytics or visualization services.
9. Create a mobile app to control an actuator.
10. Design an IoT based air pollution control system which monitors the air pollution by measuring carbon monoxide, ammonia, etc and gives alarm or sends message when the pollution level is more than permitted range.
11. Design an IoT based system which measures the physical and chemical properties of the water and displays the measured values.
12. Identify a problem in your local area or college which can be solved by integrating the things you learned and create a prototype to solve it (Mini Project).
13. Design a business model canvas for a digital display

Course outcomes:

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

- Choose the sensors and actuators for an IoT application (L1)
- Select protocols for a specific IoT application (L2)
- Utilize the cloud platform and APIs for IoT application (L3)
- Experiment with embedded boards for creating IoT prototypes (L3)
- Design a solution for a given IoT application (L6)

Text Book:

1. Adrian McEwen, Hakim Cassimally – "Designing the Internet of Things", Wiley Publications, 2012.
2. Alexander Osterwalder, and Yves Pigneur – "Business Model Generation" – Wiley, 2011

Reference Books:

1. Arshdeep Bahga, Vijay Madisetti – "Internet of Things": A Hands-On Approach, Universities Press, 2014.
2. Pethuru Raj, Anupama C. Raman, "The Internet of Things, Enabling technologies and use cases" –CRC Press.

Reference sites:

 https://www.arduino.cc/

https://www.raspberrypi.org/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– IV-II Sem

L   T   P   C
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(19A03801a)   AUTOTRONICS
PROFESSIONAL ELECTIVE - IV

Course Objectives:

- Familiarize automotive systems.
- Introduce role of Automotive Grade Microcontrollers in ECU design and choice of appropriate Hardware and Software.
- Explain sensors and sensor monitoring mechanisms aligned to automotive systems, different signal conditioning techniques, interfacing techniques and actuator mechanisms.
- Facilitate design and model various automotive control systems using Model based development technique.
- Impart safety standards, advances in autonomous vehicles, and vehicle on board and off board diagnostics.
- Demonstrate the various display devices those are used in automobiles.

UNIT I

Introduction to Automotive Systems: Need for electronic control in automobiles; various sub-systems of automobile: Engine, Transmission System, Steering and Brake Systems; Classification and working of IC engine: Gasoline, Diesel engines, 2-stroke, 4-stroke engines; Engine Control methods: Air-fuel ratio control, Spark timing, Start of fuel injection, etc.

Learning Outcomes:

After completion of this unit, the students will be able to
- Classify working of various types of IC engines. (L2)
- Explain need for electronic controls in automobiles. (L2)
- Impart engine control methods. (L1)

UNIT II

Introduction to microcomputer: Microcomputer: Buses, memory, timing, CPU registers; Microprocessor architecture: Initialization, operation codes, program counter, branch and jump instructions, subroutine. Analog to digital converters and Digital to analog converters, sampling, polling and interrupts, digital filters, lookup table.

Learning Outcomes:

After completion of this unit, students will be able to
- Explain role of automotive grade microcontrollers. (l2)
- Identify various components of microcomputer. (l1)
- Use different types of microcontrollers. (l3)

UNIT III

Sensors and actuators: Speed sensors, Pressure sensors: Manifold Absolute Pressure sensor, knock sensor, Temperature sensors: Coolant and Exhaust gas temperature, Exhaust Oxygen level sensors, Position sensors: Throttle position sensors, accelerator pedal position sensors and crankshaft position sensors, Air mass flow sensors. Solenoids, stepper motors and relays.

Learning Outcomes:

After completion of this unit, students will be able to
- Explain sensors, actuators and sensor monitoring mechanisms aligned to automotive systems. (l3)
- Use different signal conditioning techniques, interfacing techniques and actuator mechanisms. (l3)

UNIT IV

Electronic engine and vehicle management system: Electronic engine control: Input, output and control strategies, electronic fuel control system, fuel control modes: open loop and closed loop control at various modes, EGR control, Electronic ignition systems–Spark advance correction schemes, fuel injection timing control. Cruise control system, Antilock braking system, electronic suspension system, electronic steering control, traction control system, Transmission control, Safety: Airbags, collision avoiding system, low tire pressure warning system.

Learning Outcomes:

After completion of this unit, the students will be able to
- Summarize the advancements in the fuel injection systems. (l2)
- Illustrate the electronic engine control systems in automobile engines.(l2)
- Explain the electronic fuel injection system in si and ci engines. (l2)
- Contrast direct fuel injection and indirect fuel injection system. (l2)
- Apply sensors in the management of the vehicle control (l3)
- Outline active and passive safety systems in automobiles.(l2)

● Compare various types of advanced braking systems.(L2)

UNIT V

Automotive instrumentation system: Input and output signal conversion, multiplexing, fuel quantity measurement, coolant temperature and oil pressure measurement, display devices- LED, LCD, VFD and CRT, On-board diagnostics (OBD), OBD-II, off-board diagnostics.

Learning Outcomes:

After completion of this unit, students will be able to

● Identify input and output signal conversion. (l3)
● Explain the basic mechanism off board diagnostics. (l3)
● Differentiate between led, lcd, vfd and crt, on-board diagnostics(obd). (l3)

Course outcomes:

After completion of this course the student can be able to:

● Explain need for automotive electronic systems. (l2)
● Illustrate automotive components, like sensors, actuators, communication protocols and safety systems. (l2)
● Interface automotive sensors and actuators with microcontrollers. (l4)
● Model various automotive control systems. (l4)
● Utilize various display devices that are used in automobiles. (l3)
● Justify importance of safety standards and vehicle on board and off board diagnostics. (l1)

Text Books:

1. William BRibbens, "Understanding Automotive Electronics", NewneButterworth -Heinermann, 2003.
2. Crouse W H, "Automobile Electrical Equipment", McGraw Hill, New York 2005.

References:

1. Bechhold "Understanding Automotive Electronics", SAE, 1998.
2. Robert Bosch "Automotive Hand Book", SAE 5/e, 2000.

3. Tom Denton, "Automobile Electrical and Electronic Systems" 3/e, Edward Arnold, London, 2004.
4. Eric Chowanietz, "Automotive Electronics", SAE International, USA, 1995.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– IV-II Sem

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(19A03801b)   ROBOTICS AND APPLICATIONS IN MANUFACTURING PROFESSIONAL ELECTIVE - IV

Course Objectives:

The objectives of this course are to
- 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 .

UNIT – I   **10 hrs**

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.

Learning Outcomes:

at the end of this unit the student will be able to
- Define a robot and homogeneous transformations.(L1)
- Compare the types of robot manipulators based on applications.(L2)
- List out the various advantages, disadvantages and applications of robot.(L1)
- Explain the robot characteristics.(L2)

UNIT – II   **8 hrs**

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.

Learning Outcomes:

at the end of this unit the student will be able to
- Evaluate D-H notations for simple robot manipulator.(L4)
- Identify the position of robot gripper within work volume.(L3)
- Use the Jacobian, Lagrange-Euler and Newton- Euler formations to solve manipulator dynamic problems.(L5)
- Explain the concepts of manipulator kinematics and dynamics.(L2)

UNIT – III   8 hrs

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.

Learning Outcomes:

at the end of this unit the student will be able to
- Understand the basic concepts of robot controlling systems.(L2)
- Describe PD and PID control schemes.(L2)
- Use the force control strategies to determine the forces in robot.(L5)
- Explain the force control and torque control techniques.(L2)

UNIT – IV   8 hrs

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.

Learning Outcomes:

at the end of this unit the student will be able to
- Identify the components of robot vision system.(L3)
- Understand the concept of image enhancement, segmentation and transformation.(L2)

- List the various components of robot vision system.(L1)
- Illustrate the industrial applications of robot vision system.(L2)

UNIT – V   **8 hrs**

Robot Applications In Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection.

Learning Outcomes:

at the end of this unit the student will be able to
- Understand the use of robot for material transferring system.(L2)
- List the various industrial applications of robotics.(L1)

Course Outcomes:

at the end of the course, the student will be able to
- Illustrate the industrial applications of robot vision system.(L3)
- Understand the basic concepts of robot controlling systems.(L2)
- Evaluate D-H notations for simple robot manipulator.(L4)
- Define a robot and homogeneous transformations.(L1)

TEXT BOOKS

1. Mikell P. Groover and Mitchell Weiss, Roger N. Nagel,Nicholas G.Odrey , "Industrial Robotics" — Mc Graw Hill, 1986.
2. John.J.Craig Addison, "Introduction to Robotics: Mechanics and Control", Wesley, 1999.
3. K.S. FU, R.C. Gonzalez and C.S.G Lee, "Robotics: Control, sensing, vision, and intelligence" . Mc Graw Hill, 1987.

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.
4. Mohsen shahinpoor, "A robot Engineering text book", Harper & Row Publishers,1987.
5. Richard D. Klafter, "Thomas Robotic Engineering an integrated approach", PHI publications 1988.
6. R K Mittal and I J Nagrath, "Robotics and control", Illustrated Edition, Tata McGraw Hill India 2003.
7. Ashitava Ghoshal, "Robotics, Fundamental concepts and analysis", Oxford University Press,2006

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– IV-II Sem **L T P C**

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(19A03801c)   MECHANICAL VIBRATIONS
PROFESSIONAL ELECTIVE - IV

Course Objective:

● Demonstrate basic concepts and definitions of mechanical vibrations. To write equation of motion for discrete spring-mass systems with different configuration using classical and energy methods.

● To train the students about basic concepts of forced vibrations, vibration transmissibility and isolation and seismic instruments. Further to understand about various vibration control methods.

● To familiarize the students about two degree freedom system and various types of vibration absorbers.

● To analyze the two degree and multi degree of freedom systems.

UNIT I

Single Degree Freedom Systems: Un-damped free vibration: Classical method, Energy method, equivalent systems, torsional systems. Damped free vibration- Viscous damping, under damping, critical damping, over damping. Coulomb damping, equivalent damping coefficient. Simple problems.

Learning Outcomes:

After completion of this unit student will able to
* Find natural frequency of un-damped single degree freedom systems.(l4)
● Find the behavior of single degree freedom systems with damping.(l4)

UNIT II

Forced vibrations of Single Degree Freedom Systems : Steady state forced vibration, sources of excitation, impressed harmonic force, resonance impressed force due to unbalance, motion excitation, transmissibility and isolation, performance of different type of isolators, power absorbed by viscous damping.

Learning Outcomes:

After completion of this unit, students will be able to
* Solve vibration problems with forcing function.(l4)

- Calculate transmissibility and isolation.(l4)
- Explain different types of isolators and power absorbers.(l3)

UNIT III

Two Degree Freedom Systems: Formulation of Equation of motion, Natural frequencies and modes of vibration by classical method, coupled pendulum, forced vibration, dynamic vibration absorber.

Learning Outcomes:

After completion of this unit the students will be able to
- Analyze the two degree freedom systems with and without damping.(l4)
- Solve problems on vibration absorber.(l5)

UNIT IV

Multi Degree Freedom Systems: Lagrangian method for formulation of equation of motion Influence co- efficient method, Lumped mass and distributed mass systems, Stodola method, Holzer's method, model analysis of free and forced vibrations.

Whirling of shafts: Critical speed of shafts, Rayleigh's upper bound approximation, Dunkerley's lower bound approximation, critical speed of shafts with damping.

Learning Outcomes:

After completion of this unit the student will be able to
- Analyze the multi degree freedom systems using Stodola method, Holzer‟s method and Matrix iteration method.(L5)
- Calculate natural frequencies with Rayleighs method and Dunkerleys method.(L4)

UNIT V

Vibration measurement and Applications: Transducers: variable resistance transducers, Piezoelectric transducers, electrodynamic transducers and linear variable differential transformer transducer; Vibration pickups: vibrometer, accelerometer, velometer and phase distortion; Frequency-measuring instruments; Vibration exciters- Mechanical exciters and electrodynamic shaker.

Learning Outcomes:

After completion of this unit the students will be able to
- Identify various transducers.(l3)

- Use different vibration pickups.(l4)
- Explain mechanical exciters and electrodynamic shaker.(l2)

Course outcomes:

after successful completion of the course, the student will be able to

- Find natural frequency of un-damped single degree freedom systems(L4)
- Analyze the two degree freedom systems with and without damping.(L4)
- Calculate transmissibility and isolation.(L4)
- Solve problems on vibration absorber.(L5)
- Calculate natural frequencies of multi degree freedom system.(L4)
- Measure vibration parameters.(L4)
- Use mechanical exciters and electrodynamic shaker.(L5)

Text books:

1. Singrasu S. Rao, "Mechanical Vibrations", 6th edition, Pearson Education, 2018.
2. William Thomson, "Theory of Vibrations with Applications", 5th edition, Pearson, 2008

Reference books:

1. L. Meirovich, "Elements of Vibrations Analysis", Tata McGraw Hill, 1986
2. S. Graham Kelly, "Mechanical Vibrations", Tata McGraw Hill, 1996
3. William Weaver, "Timeoshenko, and Young, Vibration Problems in Engineering", 5th edition, John Wiley, 2013.
4. C. Nataraj, "Vibration of Mechanical Systems", 1st edition, Cenage Learning, 2012.
5. G.K.Groover, "Mechanical Vibrations", 1st edition, Nem Chand 1977

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B.Tech (ME)– IV-II Sem	L	T	P	C
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(19A03801d) COMPUTATIONAL FLUID DYNAMICS
(PROFESSIONAL ELECTIVE- 4)

Course Objectives:

The course is intended to
- Understand the basics of computational fluid dynamics (CFD).
- Differentiate between finite difference and finite volume methods applied in CFD.
- Provide the necessary background in discretization methods, accuracy, stability and Convergence aspects of numerical solutions.
- Develop an understanding of the capabilities and limitations of various numerical and Mathematical models of fluid flow.
- Introduce some of the models required to compute turbulent and incompressible fluid Flow problems
- Apply CFD to heat transfer problems.

UNIT - I:

Introduction to Numerical Methods - Finite Difference, Finite Element and Finite Volume Methods – Classification of Partial Differential Equations – Solution of Linear Algebraic Equations – Direct and Iterative Approaches
Finite difference methods: Taylor's series – FDE formulation for 1D and 2D steady state heat transfer problems – Cartesian, cylindrical and spherical co-ordinate systems – boundary conditions – Unsteady state heat conduction – Errors associated with FDE - Explicit Method – Stability criteria – Implicit Method – Crank Nickolson method – 2D FDE formulation – ADI – ADE

Learning Outcomes:

At the end of this unit, the student will be able to
- Apply the numerical methods to finite differential methods. (L3)
- Understand different types of finite difference methods. (L2)

UNIT-II:

Finite Volume Method: Formation of Basic rules for control volume approach using 1D Steady heat conduction equation – Interface Thermal Conductivity - Extension of General

Nodal Equation to 2D and 3D Steady heat conduction and unsteady heat conduction

Learning Outcomes:

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

- Understand the finite volume methods. (l2)
- Apply the finite volume methods for steady state and unsteady state heat conduction. (l3)
- Analyze the interface thermal conductivity. (l4)

UNIT -III:

Finite Volume Method to Convection and Diffusion: Concept of Elliptic, Parabolic and Hyperbolic Equations applied to fluid flow – Governing Equations of Flow and Heat transfer – Steady 1D Convection Diffusion – Discretization Schemes and their assessment – Treatment of Boundary Conditions

Learning Outcomes:

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

- Understand the governing equation for fluid flow and heat transfer. (l2)
- Solve the coupled convection and diffusion terms using fvm. (l3)
- Compare different methods of solving convection and diffusion. (l4)

UNIT - IV:

Calculation of Flow Field: Vorticity & Stream Function Method - Staggered Grid as Remedy for representation of Flow Field - Pressure and Velocity Corrections – Pressure Velocity Coupling - SIMPLE & SIMPLER (revised algorithm) Algorithm.

Learning Outcomes:

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

- Solve the vorticity based momentum equation. (L2)
- Apply the velocity and pressure correction terms. (L3)
- Apply the SIMPLE and SIMPLER algorithms. (L4)

UNIT - V:

Turbulent Flows: Direct Numerical Simulation, Large Eddy Simulation and RANS Models
Compressible Flows: Introduction - Pressure, Velocity and Density Coupling.

Learning Outcomes:

At the end of this unit, the student will be able to
- Understand the turbulent models. (l2)
- Apply the fvm for compressible fluids. (l3)
- Couple the density, pressure and velocity components. (l4)

TEXT BOOKS:

1. S.V. Patankar, "Numerical heat transfer and fluid flow", (Hemisphere Pub. House)
2. Muralidharan & Sundarajan , "Computational Fluid Flow and Heat Transfer",– (Narosa Pub.)
3. H.K. Versteeg, W. Malalasekhara , "An Introduction to Computational Fluid Dynamics", FVM   Methods, (PHI)

REFERENCE BOOKS:

1. Hoffman and Chiang,"Computational Fluid Dynamics",   Engg Education System
2. Anderson, "Computational Fluid Dynamics", (TMH)
3. Ferziger, Peric , "Computational Methods for Fluid Dynamics", (Springer)
4. T.J. Chung, "Computational Fluid Dynamics", Cambridge University
5. Tu, Yeoh, Liu, "Computational Fluid Dynamics", A Practical Approach – (Elsevier)
6. Frank Chorlton, "Text Book of Fluid Dynamics", CBS Publishers

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– IV-II Sem	L	T	P	C
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(19A03801e)   TOTAL QUALITY MANAGEMENT
PROFESSIONAL ELECTIVE - IV

Course Objectives:

The Objectives of this course are to
- Introduce the students, the basic concepts of Total Quality Management.
- Expose with various quality issues in Inspection.
- Gain Knowledge on quality control and its applications to real time.
- Know the extent of customer satisfaction by the application of various quality concepts.
- Understand the importance of Quality standards in Production.

UNIT I   **10 hrs**

Introduction: Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management.

Learning Outcomes:

At the end of this unit, the student will be able to
- Define what is quality. (l2)
- Explain the principles of quality planning. (l2)
- Explain the techniques of quality costs.(l2)
- Interpret the concepts of total quality management. (l2)
- Contrast the present quality issues with the past. (l2)

UNIT II   **8 hrs**

Historical Review: Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain the importance of Quality council. (L2)
- Identify the barriers of TQM Implementation. (L3)
- Discuss the benefits of TQM. (L6)
- Summarize the essential characteristics of successful quality leader. (L2)
- Outline the contributions of TQM Gurus. (L2)

UNIT III   **8 hrs**

TQM Principles: Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure Case studies

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain the importance of customer satisfaction, Service Quality and Customer Retention. (L2)
- Apply the principles of motivation and Empowerment. (L3)
- Compare the perfection and continuous improvement. (L2)
- Measure the Process improvement using Juran Trilogy.(L5)
- Demonstrate the concepts of performance measures using a case study. (L2)

UNIT IV   **8 hrs**

TQM Tools: Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.

Learning Outcomes:

At the end of this course, the student will be able to
- Infer the benefits of benchmarking. (L2)
- List the benefits of QFD Process. (L1)
- Identify various zones in House of Quality. (L3)
- Apply Six sigma towards quality improvement. (L3)
- List the seven tools of quality. (L1)

UNIT V   **8 hrs**

Quality Systems: Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits, Case Studies.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain the importance of ISO Standards. (L2)
- Discuss the need of ISO9000 and Other Quality systems. (L6)
- Build awareness on the services of ISO9000. (L6)
- Infer the process of documentation. (L2)
- Compare ISO 9000 and ISO 14000. (L2)

Course Outcomes:

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

- Develop an understanding on quality Management philosophies and frameworks
- Adopt TQM methodologies for continuous improvement of quality
- Measure the cost of poor quality, process effectiveness and efficiency to identify areas for improvement
- Apply benchmarking and business process reengineering to improve management processes.
- Determine the set of indications to evaluate performance excellence of an organization.

Textbooks:

1. Dale H Besterfield, "Total Quality Management", 4th Edition, Pearson Education, 2015
2. Subburaj Ramaswamy, "Total Quality Management", Tata Mcgraw Hill Publishing Company Ltd., 2005
3. Joel E.Ross , "Total Quality Management", 3rd edition, CRC Press, 2017

Reference books:

1. Narayana V and Sreenivasan N.S, "Quality Management – Concepts and Tasks", NewAge International, 1996
2. Robert L.Flood, "Beyond TQM, First Edition", John Wiley & Sons Ltd, 1993
3. Richard S. Leavenworth & Eugene Lodewick Grant, "Statistical Quality Control, Seventh Edition", Tata Mcgraw Hill, 2015
4. Samuel Ho , TQM, "An Integrated Approach", Kogan Page Ltd, USA, 1995.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– 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 (ME)– IV-II   **L T P C**
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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 (ME)– IV-II Sem   **L   T   P   C**

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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

B.Tech (ME)– IV-II Sem   **L   T   P   C**
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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 (ME) – IV-II Sem   L   T   P   C
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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.

B.Tech (ME)– 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

11. Solid waste conversion into energy (Gasification)
12. Plastic waste into fuel.
13. Bio-gas digester.
14. Development of mechanisms for farmers.
15. Smart irrigation for saving water.
16. Mechanized water segregation.
17. Applications of solar technologies for rural purpose.
18. Power generation from wind turbine.
19. Applications of drones for agriculture.
20. Solar drying.

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B.Tech (ME)– 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 (ME)– 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", 2ndEdition, McGraw-Hill International, 1995.
3. Theodore S. Rappaport, "Wireless Communications – Principles and Practice", 2ndEdition, 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 (ME)– 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, 3rdedition, 2004.
3. G. M. Chute and R. D. Chute, "Electronics in Industry", McGraw Hill Ltd,Tokyo, 1995.

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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:

- H. S. Kalsi, "Electronic Instrumentation", McGraw Hill, 3rd Edition, 2012, ISBN:9780070702066.
- A. D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measuring Techniques", Pearson, 1st Edition, 2015, ISBN: 9789332556065.

REFERENCE BOOKS:

- David A. Bell, "Electronic Instrumentation & Measurements", Oxford University Press PHI 2nd Edition, 2006 ISBN 81-203-2360-2.
- A. K. Sawhney, "Electronics and Electrical Measurements", Dhanpat Rai &Sons. ISBN - 81-7700-016-0

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B.Tech (ME)–IV-II   **L   T   P   C**
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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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(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

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(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.

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(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.

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(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.