



Jawaharlal Nehru Technological University Anantapur

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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

Semester - 5 (Theory - 7, Lab - 3)					
S.No	Course No	Course Name	Category	L-T-P	Credits
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

Semester - 6 (Theory - 7, Lab – 2)					
S.No	Course No	Course Name	Category	L-T-P	Credits
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

Semester – 7 (Theory - 5, Labs -2 & Project – 1)					
S.No	Course No	Course Name	Category	L-T-P	Credits
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	Professional Elective-IV	PE	3-0-0	3
	19A03801b	Autotronics			
	19A03801c	Robotics and Applications in Manufacturing			
	19A03801d	Mechanical Vibrations			
	19A03801e	Computational Fluid Dynamics			
2.	19A01802a	Open Elective-IV	OE	3-0-0	3
	19A01802b	Disaster Management.			
	19A02802a	Global Warming and climate changes			
	19A02802b	IoT Applications in Electrical Engineering			
	19A03802a	Smart Electric Grid			
	19A03802b	Energy conservation and management			
	19A04802a	Non destructive testing			
	19A04802b	Introduction to Image Processing			
	19A04802c	Principles of Cellular and Mobile Communications			
	19A04802d	Industrial Electronics			
	19A05802a	Electronic Instrumentation			
	19A05802b	Block Chain Technology and Applications			
	19A27802a	MEAN Stack Technology			
	19A27802b	Food Plants Utilities & Services			
	19A54802a	Nutraceuticals & Functional Foods			
19A54802a	Mathematical Modeling & Simulation				
3.	19A03803	Project	PR	-----	7
				Total	13

(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. (12)
- Evaluate the cycles used in gas turbines. (15)
- Outline the jet propulsion system (12)

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. (12)
- Classify steam turbines and applications. (14)

- Analyse the performance of steam turbines under different operating conditions. (15)

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. (12)
- Identify different refrigerants and applications.(13)
- Use properties of moist air in calculations for air-conditioning system. (13)

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. (12)
- Classify various types of chips, cutting tool materials and cutting fluids. (14)
- Calculate cutting force, speed and feed finding techniques during machining. (15)

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. (11)
- Determine cutting speeds for different machining operations. (15)
- Identify parts of drilling, boring, reaming machines. (13)

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. (13)
- Compare tool geometry for milling, shaping, slotting and planing operations. (13)
- Calculate machining times. (15)

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. (12)
- Classify different types of grinding machines and their applications. (14)
- Assess the grinding process and variables that effect the operation. (15)
- Estimate the time and power required for the grinding operation. (15)
- Explain various types of abrasive processes such as honing and lapping for final finishing operation. (12)

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. (14)
- Identify various types of work and tool holding devices. (13)
- Explain the design principles of jigs and fixtures. (12)
- Design a jig and fixture for a given application. (16)

Course Outcomes:

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

- Choose cutting processes and variables. (13)
- Relate tool wear and tool life. (11)
- Calculate the machining parameters for different machining processes. (15)
- Identify methods to generate different types of surfaces. (13)
- Explain work-holding requirements. (12)
- Design jigs and fixtures. (16)

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

(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 convection 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. (I3)
- Apply knowledge of conduction heat transfer in the design of insulation of furnaces and pipes. (I3)
- Analyse free and forced convection phenomena in external and internal flows. (I4)
- Design of thermal shields using the concepts of black body and non-black body radiation. (I5)
- Apply the basics of mass transfer for applications in diffusion of gases. (I3)

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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. Shigley, "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

(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.(13)
- Explain various parts of the engine.(12)
- Describe the lubrication and cooling system in ic engines.(12)

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.(12)
- Compare the types of ignition systems and fuel systems.(12)
- Interpret the about effects of automobile emissions on human health and

environment.(16)

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 - Epicyclic 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.(12)
- Illustrate working principle of different gearbox transmission systems.(12)
- Demonstrate various types of clutches and differentials.(12)
- Explain the rear axle assembly.(12)

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.(12)
- Classify the brakes in automobile.(11)
- Explain power steering system in automobiles.(12)
- Illustrate working principle of anti-lock breaking system.(12)

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. (12)
- Identify the various electrical components in automobile.(13)
- Explain about ecu, vvt, ass, esp, ebd, tcs and gps in automobile.(12)
- Examine the recent developments of automobile engineering.(14)

Course Outcomes:

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

- Identify different parts of automobile.(13)
- Explain the working of various parts like engine, transmission, clutch, brakes.(12)
- Describe the working of steering and the suspension systems. (12)
- Summarize the environmental implications of automobile emissions.(12)
- Outline the future developments in the automobile industry.(12)

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. (I2)
- Demonstrate processing of powders and sintering techniques. (I2)
- Outline mechanism of sintering properties and characteristics of powder metals, glass and superconductors. (I3)

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. (11)
- Explain the basic packaging and its levels, different ic chip mounting and interconnect methods. (12)
- Summarize mechanisms like e-manufacturing, nanotechnology, and micromachining, high speed machining.(13)

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. (11)
- Explain the rapid prototyping methods in plastic processing. (12)

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. (11)
- Summarize the use of composite materials, micromechanics of layered composites. (12)
- Explain different liquefied, solidified and particulate methods for mmc, cmc, polymer matrix composites. (13)

Course Outcomes:

After completing the course, the student will be able to

- Classify different surface treatment methods.(12)
- Explain processing of powder metals, glass and super conductors. (12)
- Develop fabrication of microelectronic devices.(12)
- Process plastics and composites.(12)

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.

(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. (12)
- Solve problems on the design of helical gear. (13)
- Explain the kinematics of helical, straight bevel gears and worm gears. (13)
- Predict the various forces acting on the worm gear tooth. (13)
- Select of helical, bevel and worm gears in power transmission (13)

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 rise due to friction and select materials accordingly. (L4)

Course Outcomes:

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

- Design pulleys, chain drives, rope drives and belt drives. (15)
- Determine performance requirements in the selection of commercially available transmission drives. (14)
- Design brakes and clutches (14)
- Design various types of gear boxes. (15)
- Select materials for various applications in the transmission elements. (13)

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. Conventional 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.(12)
- Explain cost factors, load and power distribution factors. (12)
- Select tariff based on load and demand factors. (13)
- Summarize the impact of power plant on the environment, pollution mitigation and regulations. (12)

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. (12)
- Explain various types of coals, coal handling operations and associated systems. (12)
- Outline and compare types of feeders, stokers, combustion systems. (12)
- Illustrate draught, dust collector, furnace, cooling tower and heat rejection systems. (12)
- Evaluate pollution levels from power plants, pollution control methods, and application of pollution recorders. (14)

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. (12)
- Outline the diesel power plant layout with its supporting equipment. (12)
- Illustrate the working principle of open cycle and closed cycle gas turbine. (12)
- Demonstrate combined cycle power plants with benefits and shortcomings. (12)

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. (12)
- Summarize working principle of hydro electric power plant. (12)
- Illustrate typical layout of hydro electric power plant, and its auxiliary equipments. (12)

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. (12)
- Explain power plant economics and environmental considerations.(12)
- Describe working components of a steam power plant.(12)
- Illustrate the working mechanism of diesel and gas turbine power plants.(12)
- Summarize types of renewable energy sources and their working principle.(12)
- Demonstrate the working principle of nuclear power plants. (14)

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.

(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.(11)
- Discuss the human biological, ergonomic and psychological capabilities in engineering.(16)
- Evaluate physical work capacity and energy expenditure.(14)
- Measure the energy expenditure, respiration, pulse rate and blood pressure during physical exertion. (14)

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. (12)
- Illustrate the physical dimensions of the human body as a working machine. (12)
- Discuss anthropometric data and its application in ergonomic design. (16)
- State the limitations of anthropometric data in ergonomic design. (14)

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.(12)
- Explain the principles of hand tool design. (12)
- Illustrate the design of major controls in automobiles and machine tools. (12)
- Design the work place and seating plane in machine controls.(16)

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.(12)
- Describe effects of color on engineering equipments.(12)
- Identify recommended illumination levels. (13)
- Explain about special purpose lighting for illumination and quality control. (12)

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.(16)
- Illustrate the effects of noise on machine tool operation. (12)
- Explain the terms noise exposure, hearing loss and hearing protectors. (12)
- Explain the terms analysis and reduction of noise in machine tools.(12)

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.(16)
- Identify recommended illumination levels. (13)
- Illustrate the design of major controls in automobiles and machine tools. (12)
- State the limitations of anthropometric data in ergonomic design. (14)
- Measure the energy expenditure, respiration, pulse rate and blood pressure during physical exertion. (14)

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.

(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.

(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

(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:

- Understand the classification of conducting materials.
- Analyze the properties of different conducting materials
- Apply the materials where it is applicable
- Know about electron configuration of atom

UNIT-II Dielectric and High Resistivity Materials

Introduction – solid, liquid and gaseous dielectrics, leakage current, permittivity, dielectric constant, dielectric loss – loss angle – loss constant, Breakdown voltage and dielectric strength of – solid, liquid and gaseous dielectrics, effect of break down– electrical and thermal effects, Polarization – electric, ionic and dipolar polarization. Effect of temperature and Frequency on dielectric constant of polar dielectrics. High Resistivity materials – electrical / thermal / mechanical properties of Manganin, Constantan, Nichrome, Tungsten, Carbon and Graphite and their applications in electrical equipment.

Learning outcomes:

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

- Understand the classification of dielectric and high resistivity materials.
- Analyze the properties of dielectric and high resistivity materials
- Understand about concept of polarization and dipolar polarization
- Apply the materials where it is applicable

UNIT-III Solid Insulating Materials

Introduction – characteristics of a good electrical insulating materials – classification of insulating materials – electrical, thermal, chemical and mechanical properties of solid insulating materials - Asbestos, Bakelite, rubber, plastics, thermo plastics. Resins, polystyrene, PVC, porcelain, glass, cotton and paper.

Learning outcomes:

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

- Understand about various characteristics of solid insulating materials
- Understand the classification of solid insulating materials.
- Analyze the properties of solid insulating materials
- Apply the materials where it is applicable

UNIT-IV Liquid & Gas Insulating Materials

Liquid insulating materials – Mineral oils, synthetic liquids, fluorinated liquids – Electrical, thermal and chemical properties – transformer oil – properties – effect of moisture on insulation properties Gaseous insulators – classification based on dielectric strength – dielectric loss, chemical stability properties and their applications.

Learning Outcomes:

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

- Understand the classification of liquid insulating materials.
- Analyze the properties of liquid insulating materials
- Apply the materials where it is applicable
- Understand about properties and classification of gaseous insulators

UNIT-V Domestic Wiring

Wiring materials and accessories – Types of wiring – Types of Switches - Specification of Wiring – Stair case wiring - Fluorescent lamp wiring- Godown wiring – Basics of Earthing – single phase wiring layout for a residential building.

Learning Outcomes:

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

- Understand about wiring materials and accessories
- Understand about earthing and wiring layout of domestic buildings
- Design and develop Residential wiring
- Know about godown wiring

Course Outcomes:

After completing the course, the student should be able to:

- Understand the classification of materials, domestic wiring materials and

earthing.

- Analyze the properties of different electrical materials
- Apply where the materials are applicable based on properties of materials
- Design and develop Residential wiring, godown wiring and earthing.

Text Books:

1. G.K. Mithal, “Electrical Engineering Materials”, Khanna publishers, 2nd edition, 1991.
2. R.K. Rajput, A course in “Electrical Engineering Materials”, Laxmi publications, 2009.

Reference Books:

1. C.S. Indulkar and S. Thiruvengadam, “An Introduction to Electrical Engineering Materials” S Chand & Company, 2008.
2. Technical Teachers Training Institute, “Electrical engineering Materials”, 1st Edition, Madras, McGraw Hill Education, 2004.
3. by S.P. Seth, “A course in Electrical Engineering Materials Physics Properties & Applications”, Dhanapat Rai & Sons Publications, 2018.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech (ME)– III-I **L T P C**
3 0 0 3
(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

- Summarize the concepts of electrical vehicle propulsion and energy sources. (12)
- Identify the types of power sources for electrical vehicles.(13)
- Demonstrate the design considerations for propulsion system. (12)
- Solve the problems on tractive power and energy required. (13)

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.(11)
- List the various power electronic converters. (11)

- Describe the working principle dc/dc converters and buck boost convertor. (12)
- Explain about ac drives. (12)

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. (13)
- Discuss impact of modern drive trains in energy supplies. (16)
- Compare hybrid and electric drive trains.(12)
- Analyze the power flow control and energy efficiency. (16)

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. (11)
- Discuss lightly hybridized vehicle and low voltage systems.(16)
- Explain about hybrid electric heavy duty vehicles and fuel cell heavy duty vehicles. (12)

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. (12)
- Select the energy storage technology. (13)
- Select the size of propulsion motor. (13)
- Design and develop basic schemes of electric and hybrid electric vehicles. (13)

Course outcomes:

After learning the course the students will be able to:

- Explain the working of hybrid and electric vehicles. (12)
- Choose a suitable drive scheme for developing an hybrid and electric vehicles depending on resources. (13)
- Develop the electric propulsion unit and its control for application of electric vehicles.(13)
- Choose proper energy storage systems for vehicle applications. (13)
- Design and develop basic schemes of electric vehicles and hybrid electric vehicles.(13)

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.

(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. (12)
- Classify different rapid prototyping processes. (12)
- Summarize rp software's and represent a 3d model in stl format, other rp data formats. (12)

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. 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 the principles, advantages, limitations and applications of powder based AM systems. (L2)
- Understand the principles, advantages, limitations and applications of other Additive Manufacturing Systems such as 3D Printing, Ballistic Particle Manufacturing and Shape Deposition Modeling. (L2)

UNIT – IV

8 Hours

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development.

Learning Outcomes:

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

- Classify Rapid Tooling methods. (L2)
- Explain the concepts of reverse engineering and scanning tools. (L2)

UNIT – V

8 Hours

Errors in RP Processes: Pre-processing, processing, post-processing errors, Part building errors in SLA, SLS, etc.

RP Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Learning Outcomes:

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

- Identify various Pre – Processing, Processing and Post – Processing errors in RP processes. (L2)
- Apply of RP in engineering design analysis and medical applications. (L3)

Course Outcomes:

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

- Use techniques for processing of CAD models for rapid prototyping. (L3)
- Understand and apply fundamentals of rapid prototyping techniques. ((L3)
- Use appropriate tooling for rapid prototyping process. (L3)
- Use rapid prototyping techniques for reverse engineering. (L3)
- Identify Various Pre – Processing, Processing and Post Processing errors in RP processes. (L3)

Text Books:

1. Chua C.K., Leong K.F. and Lim C.S., “Rapid Prototyping: Principles and Applications”, 2nd edition, World Scientific Publishers, 2003.
2. Ian Gibson, David W. Rosen, Brent Stucker, “Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing”, 1st Edition, Springer, 2010.
3. Rafiq Noorani, “Rapid Prototyping: Principles and Applications in Manufacturing”, John Wiley & Sons, 2006.

Reference Books:

1. Liou W. Liou, Frank W., Liou, “Rapid Prototyping and Engineering Applications: A Tool Box for Prototype Development”, CRC Press, 2007.
2. Pham D.T. and Dimov S.S., “Rapid Manufacturing; The Technologies and Application of RPT and Rapid tooling”, Springer, London 2001.
3. Gebhardt A., “Rapid prototyping”, Hanser Gardener Publications, 2003.
4. Hilton P.D. and Jacobs P.F., “Rapid Tooling: Technologies and Industrial Applications”, CRC Press, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– III-I

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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:

Diodes and Applications

Properties of intrinsic and extrinsic semiconductor materials. Characteristics of PN junction diode and Zener diode. Applications of PN diode 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 FETs to solve complex Engineering problems (L2).
- Analyze the functions of FETs in CS configuration (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

(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.

(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/>.

(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.

(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.

Course 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.

(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.

(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.

**(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 University 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

(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 planing.
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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME)– III-I Sem

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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

(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.

(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 of Zilla Parishath block level organization

UNIT-V

Election Commission - Election Commission- Role of Chief Election Commissioner and Election Commissionerate - State Election Commission -Functions of Commissions for the welfare of SC/ST/OBC and Women

Learning Outcomes:-

After completion of this unit student will

- Know the role of Election Commission
- Contrast and compare the role of Chief Election commissioner and Commissionerate
- Analyze the role of state election commission
- Evaluate various commissions viz SC/ST/OBC and women

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 i.e., 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

(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. (I1)
- Apply codes and standards in design. (I3)
- Contrast the difference between static and dynamic loads. (I2)
- Apply failure theories in designing components subjected to static and dynamic loads. (I3)

UNIT II

10 hours

Design of Bolted Joints: Threaded fastness, preload of bolts, various stresses induced in the bolts. Torque requirement for bolt tightening, eccentrically loaded bolted joints, gasketed joints.

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. (11)
- Analyse stresses induced in joints subjected to different loads. (14)
- Design different joints subjected to combined loading. (16)

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. (12)
- Design shafts subjected to fluctuating loads. (16)
- Select coupling for a given application and outline the design procedure. (13)
- Explain construction and design procedure for helical and leaf springs. (12)

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. (12)
- Calculate the torque transmitting capacity in clutches. (13)
- Compare different types of brakes and their applications. (14)
- Explain the concepts of self-energizing and self-locking brakes. (12)
- Discuss procedures to design different types of brakes. (12)

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. (12)
- Explain the mechanics of lubrication in sliding contact bearings. (12)
- Identify failures in bearings. (13)
- Evaluate static and dynamic load capacity of rolling contact bearings. (15)
- Explain the procedure to select bearings from manufacturer's catalogue. (13)

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. (15)
- Design fasteners subjected to variety of loads. (16)
- Select of standard machine elements such as keys, shafts, couplings, springs and bearings. (11)
- Design clutches, brakes and spur gears. (16)

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.

(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. (13)
- Create surfaces such as coons, bezier and b-spline (16)
- Differentiate wireframe, surface and solid modeling. (14)
- Apply the solid modeling concepts. (13)

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 changers, 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. (12)
- Categorize the cim environment and its elements. (14)
- Explain the role vr, ar and ai in manufacturing engineering. (13)

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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

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 should be 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 – Azim Premji

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)

(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.(13)
- Identify the performance, combustion and emission characteristics in si and ci engines.(13)
- Explain production, storage methods and emission characteristics of hydrogen. (13)

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 NO_x), 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, NO_x, Aldehydes, Peroxides, hydroxides smoke and particulates), Effect of design and operating variables on emission formation, Control techniques – Exhaust gas recirculation, NO_x selective catalytic reduction, Diesel oxidation catalytic convertor, Diesel particulate filter, NO_x 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 CO₂ and CO by NDIR, Hydrocarbon emission by FID, Chemiluminescent analyser for NO_x, 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 CO₂ and CO by NDIR (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

(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.(15)
- Illustrate the advantages and disadvantages of simulation process.(12)
- List the various types of hypothesis. (11).
- Apply simulation models to manufacturing systems. (12)

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. (16)

- Apply statistical procedures for developing credible model.(12)
- Describe modeling of stochastic input elements.(12)
- Appraise the importance of stochastic input elements. ((15)
- Illustrate the principles of valid simulation modeling. (12)

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.(11)
- Explain how random variables can be generate. (12)
- Compare various simulation languages used for generation of random variates.(12)
- Select appropriate simulation software's like., gpss, siman-simscript etc.,(13)

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.(14)
- Illustrate the types of simulation w.r.t output data analysis.(12)
- List the approaches for steady of output data.(11)
- 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. (12)
- Explain simple fixed period inventory system. (12)
- Describe flow shop and job shop systems. (12)
- Solve the manufacturing problems using newboy paper method. (13)

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. (12)
- Outline the concepts of output data analysis.(12)
- Identify various software languages for simulation of manufacturing systems.(13)

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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech (ME)– III-II Sem **L T P C**
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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.(12)
- Recall Hooke’s law. (11)
- Explain the dislocation theory. (12)
- Identify the dislocations in fcc, hcp and bcc lattice (13)
- Determine the forces on and between dislocations.(13)

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.(12)
- Discuss grain size strengthening and solid solution strengthening.(16)
- Apply dispersion strengthening and fibre strengthening.(12)
- Differentiate strain aging and dynamic strain aging.(13)

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. (12)
- Identify importance of Griffith's theory.(13)
- Predict factors affecting on dbtt.(16)
- Classify various modes of fracture.(11)

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. (12)
- Draw the s-n curves for different materials. (11)
- Discuss the factors affecting fatigue. (16)
- Apply fracture mechanics in design. (12)

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.(13)
- Determine various structural changes during creep.(14)
- Predict the metallurgical factors affecting creep.(16)
- Demonstrate various creep testing machines.(12)

Course outcomes:

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

- Apply materials based on their structure and failure modes.(12)
- Characterize materials using different machines.(13)
- Summarize the various strengthening mechanisms with suitable examples.(12)
- Identify the creep in different materials and its influence in selection of materials.(13)

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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B.Tech (ME)– III-II Sem	L	T	P	C
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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. (12)
- Describe the first and second law applied to refrigerating machines.(12)
- Demonstrate the bell-coleman cycle in air refrigeration. (12)
- 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. (15)
- Draw the t-s and p-h charts for representation of cycle.(11)
- Classify various refrigerants used in vapour compression refrigeration systems. (11)
- Model the numerical problems on refrigeration cycles. (13)
- Demonstrate the influence of various parameters on system performance. (12)

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. (15)
- Identify the latest developments of electrolux, thermo electric vortex tube methods.. (13)
- Illustrate the working of various components of steam jet refrigeration system.(12)
- Estimate the motive steam required for steam jet refrigeration system.(16)
- Describe the working principle of themo- electric refrigerator and bortex tube refrigerator.(12)

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. (12)
- Select the air conditioning systems for different realistic situations. (16)
- Define the terms sensible heat load and latent heat load. (11)
- Draw the psychrometric charts for various air conditioning environments.(11)

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. (15)
- Select the requirements of temperature and humidity for human comfort. (16)
- Demonstrate the heat pump working and its components. (12)
- List the various air conditioning equipments. (11)

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 refrigerant and Psychrometric property Tables and charts are permitted in Exam

(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 Diagram and 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, Gantt 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech (ME) – III-II

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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.

(19A01604b) BUILDING SERVICES AND MAINTAINANCE
OPEN ELECTIVE-II

Course Objectives:

- To impart knowledge in concepts of building maintenance
- To insist 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-characteristics of fire resisting materials- fire resistant construction-heat and smoke detectors-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”, Charoathar publishing house.

REFERENCE BOOKS:

1. David V Chaddrton, “Building services engineering”, Outledge
2. P.C Varghees “Building construction”, Printice hall india

(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. Stamatis 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.

(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 Publications.

(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.(12)
- Identify the application of mechatronics in automation industry.(13)

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. (12)
- Choose sensors for particular application. (13)
- Measure different quantity's using sensors. (14)

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 mechatronics systems, Mechatronics design elements, Traditional mechatronics systems, Embedded systems, Procedure for designing a mechatronic systems.

Learning Outcomes:

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

- Understanding design of mechatronics . (L2)
- Various Mechatronics systems. (L4)
- Design Aspects of Mechatronic systems. (L2)

Course Outcomes

Upon successful completion of this unit, the student will be able to:

- Explain mechatronics systems in industry. (12)
- Identify mechatronic systems encountered in practice. (13)
- Examine the components of a typical mechatronic system. (14)
- Compare the various techniques used for development of mems. (14)
- Develop programs using plc. (16)

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.

(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 MATLAB: 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. (11)
- Solve various optimization problems(13)
- Compare convex and concave programming (14)

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. (12)
- Develop codes in matlab for different methods. (13)
- Identify methods for solving a single variable optimization problem. (13)

UNIT- IV

Multi Variable Optimization: Conjugate gradient method, Newton's method, Powell's method, Fletcher- 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. (12)
- Develop codes in matlab for solving various multi variable optimization problems. (13)
- Choose methods for solving a multi variable optimization problem. (13)

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. (13)
- Model optimization problems using genetic algorithms in matlab. (13)
- Compare different genetic algorithms for performance. (15)

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.(14)
- Apply optimization methods to engineering problems.(13)
- Implement optimization algorithms.(13)
- Compare different genetic algorithms. (15)
- Solve multivariable optimization problems. (14)

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.

(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 BiCMOS technologies, 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_0 , Pass transistor, 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 of MOS 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, Serial/Parallel multiplier, Parity generator, Comparators, Zero/One Detectors, Up/Down Counter, 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”, EshraghianDouglasand 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.

(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, carrier modulation and frequency division multiplexing (L1).
- Apply the concept of amplitude modulation to 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

(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, portability 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.

(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 Learning, 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 Grammar 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

(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 allergenicity 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 allergenicity 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.

(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-cream 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-cream 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.

(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 and 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. Raghuvver Rao, "Wavelet Transforms", Pearson Education, Asia.

(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

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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 of 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 of 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.Rizwanal “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>

(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 HI “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.

(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 in Management. Types of Ethics – Characteristics – Factors influencing , Business Ethics – Importance of Business Ethics - Arguments for and against business ethics Basics of business ethics Corporate Social Responsibility – Issues of Management – Crisis Management

Learning Outcomes:

After completion of this unit student will

- Understand the meaning of loyalty and ethical Behavior
- Explain various types of Ethics
- 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 National 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. Bholanath 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

(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.

Learning 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 - CPFRRP - 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 in 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