COURSE STRUCTURE AND DETAILED SYLLABUS

II, III & IV - B.TECH - I & II - SEMESTERS

MECHANICAL ENGINEERING

FOR
B.TECH FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2015-2016)

ANURAG GROUP OF INSTITUTIONS
AUTONOMOUS
VENKATAPUR, GHATKESAR, HYDERABAD – 500 088, TELANGANA STATE.
## II YEAR I SEMESTER

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Note: All End Examinations (Theory and Practical) are of three hours duration.

T – Tutorial  P – Practical  D – Drawing
ANURAG GROUP OF INSTITUTIONS
(AUTONOMOUS)

II Year B.Tech – Mech - I Sem

L  T/P/D  C
3   1   3

(A53014) MECHANICS OF SOLIDS

PREREQUISITE: Engineering Mechanics – I & II

COURSE OUTCOMES:

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

1. Model and analyze the behavior of structural and machine components subject to various loadings and support conditions based on principles of equilibrium and material constitutional relationships.
2. Understand and apply the concept of stress and strain to analyze and design structural members and machine parts under axial loads, shear load, bending moment and Torsional moment.
3. Solve practical problems through evaluating the relationship between stress and strain
4. Analyse of composite bars and shafts and deflections and deformations of loaded flexural members.
5. Determine stresses in both thin and thick cylinders.

UNIT – I


UNIT – II

SHEAR FORCE AND BENDING MOMENT: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, UDL, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F, B.M and rate of loading at a section of a beam.

UNIT – III

modulus of rectangular and circular sections (solid and hollow), I, T Angle and channel sections – Design of simple beam sections.

**SHEAR STRESSES:** Derivation of formula – shear stress distribution across various beams sections like rectangular, circular, triangular I, T angle sections.

**UNIT – IV**

**DEFLECTION OF BEAMS:** Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay’s methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L, uniformly varying load, Mohr’s theorems – Moment area method – application to simple cases including overhanging beams.

**UNIT – V**

**THIN CYLINDERS:** Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

**Thick cylinders** – lame’s equation – cylinders subjected to inside & outside pressures – compound cylinders.

**TEXT BOOKS**

2. Solid Mechanics by Popov

**REFERENCES**

4. Strength of materials by S. Timshenko
COURSE OUTCOMES:

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

1. Understand and analyze processes such as isothermal, isobaric, isentropic, cyclic Processes
2. Apply equilibrium criteria to systems and thermodynamic properties via partial derivatives, Maxwell’s relations
3. Use equations of state, correlations and tables for non ideal fluids
4. Understand the Perfect Gas laws and their application in the analysis of mechanical and engineering problems
5. Calculate the Efficiencies of different Power Cycles and can be able to represent them on P-V & T-S diagrams.

UNIT – I


UNIT – II


UNIT – III

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts Phase Transformations – Triple point at critical state properties during change of phase, Dryness
Fraction – Clausius – Clapeyron Equation, Property tables, Mollier charts – Various thermodynamic processes and energy transfer – Steam calorimetry.

UNIT – IV


UNIT – V


TEXT BOOKS

1. Engineering Thermodynamics / PK Nag/TMH, III Edition
2. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH

REFERENCES:

1. An introduction to Thermodynamics – YVS Rao / University press
2. Solution Manual to introduction to Thermodynamics, YVC Rao, University press
3. Engineering Thermodynamics – Jones & Dugan
7. Fundamentals of thermodynamics – Sonntag, Borgnakke and van wylen, John wiley & sons (ASIA) Pte Ltd
COURSE OUTCOMES:

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

1. Understand the general description for types of Solid Solutions
2. Understand the Equilibrium diagrams of different alloys.
3. Select the suitable Alloy & Calculate the percentage of alloying element in Cast Irons & Steels.
4. Learn about Heat treatment methods for various alloys and understand about the Non Ferrous Alloys
5. Understand different types of composite materials

UNIT – I

STRUCTURE OF METALS: Bonds in solids – Metallic bond – crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size. CONSTITUTION OF ALLOYS: Necessity of alloying, types of solid solutions, Hume Rothery’s rules, intermediate alloy phases, and electron compounds.

UNIT – II

EQUILIBRIUM OF DIAGRAMS: Experimental methods of construction of equilibrium diagrams, isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction, Transforms in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams of Cu-Ni-Al-Cu, Bi-Cd, Cu-Au, Cu-Sn and Fe-Fe3C.

UNIT – III

CAST IRONS AND STEELS: Structure and properties of white cast iron, Malleable cast iron, grey cast iron, Spherical graphite cast iron, Alloy cast irons, classification of steels, structure and properties of plain carbon steels, low alloy steels, Hadfield manganese steels, tool and die steels.
UNIT – IV

HEAT TREATMENT OF ALLOYS: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, surface – hardening, TTT diagrams, tempering, Hardenability, surface – hardening methods, Age hardening treatment Cryogenic treatment of alloys


UNIT – V

CERAMIC MATERIALS: Crystalline ceramics, glasses, cermets, abrasive materials, nano-materials – definition, properties and applications of the above.


TEXT BOOKS:

1. Introduction to Physical Metallurgy / Sidney H. Avener

REFERENCES:

1. Material science and Metallurgy / Kodgire
2. Science of engineering materials / Agarwal
3. Materials science and engineering / William and collister
4. Elements of material science / V. Raghavan
5. An introduction to material science / W.g. vinas & HL Mancini
COURSE OUTCOMES:
After completion of this course, the students will be able to:

1. Understand fundamental physical and biological principles that govern natural processes.
2. Understand fundamental concepts from the social sciences and the humanities underlying environmental thought and governance.
3. Integrate and apply perspectives from across the natural sciences, social sciences, and the humanities in the context of complex environmental problems.
4. Communicate integrated perspectives on complex environmental problems in the form of written and oral argument to both professional and lay audiences.
5. Design and conduct independent research that contributes to environmental thought and/or problem solving.

UNIT – I
Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness.

(a) Ecosystems: Concept of an ecosystem – Classification, structure and function of different ecosystems - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids.


UNIT – II
Natural Resources: Renewable and non-renewable – Natural resources and associated problems: Forest resources – Use and over – exploitation, deforestation, – Timber extraction, mining, dams and other effects on forest and tribal people: Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. - Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of
an individual in conservation of natural resources: Equitable use of resources for sustainable lifestyles.

UNIT – III
(a) **Environmental Pollution:** Definition, Cause, effects and control measures of different kinds of pollution (Air, Water, Soil, Marine, Noise, Thermal, Nuclear, e-Waste)

(b) **Social Issues and the Environment:** From Unsustainable to Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, and watershed management. - Climate change, global warming, ozone layer depletion, nuclear accidents and holocaust.

UNIT – IV
(a) **Waste management technology:** Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. Disaster management: floods, earthquake, cyclone and landslides. 

UNIT – V
(a) **Towards sustainable future:** concept of sustainable development, threats of sustainability, population and its explosion, over exploitation of resources, strategies for achieving sustainable development. Environmental education, Conservation of resources. Urban sprawl, sustainable cities and sustainable communities, human health. Role of IT in environment, environmental ethics, concept of green building, Basic principles of Green engineering, clean development mechanism (CDM), Low carbon life cycle, Polluters-pay principle.

(b) **Field work:** Visit to a local area to document environmental assets River/forest grassland/hill/mountain Visit to a local polluted site-Urban/Rural/industrial/Agricultural Study of common plants, insects, birds, Visit to effluent treatment plant/sewage treatment plant Study of simple eco systems pond, river, hill slopes, etc.

**Mini projects by students which is mandatory.**

**TEXT BOOK:**
1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, University Press.
2. Environmental studies, From Crisis to cure by R.Rajagopalan, 2005

**REFERENCES:**
COURSE OUTCOMES:

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

1. Know and understand various types of special functions.
2. Solve potential functions, stream functions and velocity potential.
3. Understand functions of complex variables play a vital role in many areas in engineering for example the motion of fluids, the transfer of heat, the processing of signals, electromagnetic and electrostatic field theory.
4. Classify and solve the contour integration of complex functions.
5. Know the complex variable techniques and knowledge of mapping and transforms play a major role in several areas of engineering.

UNIT-I:

SOLUTION OF NON-LINEAR EQUATIONS AND LINEAR SYSTEM OF EQUATIONS:


UNIT-II:


UNIT-III:

NUMERICAL DIFFERENTIATION, NUMERICAL INTEGRATION & CURVE FITTING:

Numerical Differentiation, Generalized Quadrature (Newton’s Cote’s formula), Trapezoidal, Simpson’s and Weddle’s rules and problems. Curve fitting: Fitting a straight line – Second degree curve – exponential curve-power curve by method of least squares.
UNIT – IV:


UNIT-V:


**TEXT BOOKS:**


**REFERENCES:**

5. Schaum’s outline series on Matrices.
COURSE OUTCOMES:

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

1. Understand the operating principles of major electronic devices, circuit models and connection to the physical operation of the devices.
2. Apply this knowledge to the analysis and design of basic circuits as well as to organize, analyzes, and interprets data.
3. Identify, formulates, and solves hardware engineering problems and outcomes in the part of electronic devices and circuits.
4. Understand the categories in the field of solid state materials and energy bands and analyzing the characteristics of semiconductor components like diode.
5. Know the complete internal structure of PN junction and types of bias.

UNIT-I:
ELECTRICAL CIRCUITS: Basic definitions, types of elements, ohms law, Kirchhoff’s laws, resistive networks, inductive networks, capacitive networks, series, parallel circuits and star –delta transformations.

UNIT-II:
DC MACHINES: DC generators: Construction, basic principle, EMF equation, types of dc generators, losses & efficiency, applications.
DC Motors: Basic principle, types of dc motors, torque equation, necessity of starters, 3-point starter, characteristics, speed control of dc shunt motor, losses & efficiency, applications.

UNIT-III:

UNIT-IV:
DIODE AND TRANSISTOR: Diode: p-n junction diode, symbol, V-I characteristics, Diode Application, Rectifier-Half wave, Full wave and Bridge rectifier.
Transistor: PNP and NPN junction transistor, Transistor as an amplifier.
UNIT-V:


TEXT BOOKS:


REFERENCES:

2. Electrical and Electronics Technology - Hughes – Pearson education
1. INTRODUCTION:

The world is in need of effective and efficient professionals. To hone the skills of the students from the nascent stages, this course has been introduced. The main purpose is to acquaint students with different facets of Personality Development that are compatible with soft skills. The course aims to deliver two key characteristics – soft skills and personality development.

2. OBJECTIVES:

a. To prepare the students to understand the importance of soft skills in today’s world
b. To train the students to nurture personality traits and groom behavioural skills and help them become self-sufficient
c. To mould students to acquire professional traits

3. LEARNING OUTCOMES:

a. Apply the learning in day-to-day life
b. Manage and Implement their expertise in personal and professional life
c. Acquire requisite professional skills

UNIT-I
Soft Skills Development: An Introductory Overview, Self – Discovery & Goal Setting, Johari Window

UNIT-II
Positive Thinking & Attitude, Motivation, Emotional Intelligence

UNIT-III

UNIT-IV
Etiquette & Manners, Time Management, Matrix
UNIT-V
Problem Solving and Decision Making, Conflict & Conflict Management, Stress Management

TEXT BOOKS:

REFERENCES:
2. Alex, K (2010), Soft Skills – Know Yourself & Know the World, S.Chand & Co., New Delhi
3. ACAS (2005), Teamwork: Success through People, ACAS B14, ACAS, London
COURSE OUTCOMES:

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

1. Understand the difference types of forces by performing experiments on various metal samples.
2. Conduct experiments on stiffness of springs.
3. Understand the various types of Beams.
4. Understand the various Mechanical Properties using different tests.
5. Understand the bending strength of the beams and compression strengths of wooden and cement cube specimen.

LIST OF EXPERIMENTS:

1. To perform the Tensile test on the given specimen
2. To perform the Punch Shear test on the given rod
3. To perform the Compression test on the given Cement Cube
4. To perform the Compression test on the given Wooden specimen
5. To perform the Bending test of a Simply Supported Beam
6. To perform the Bending test on a Cantilever Beam
7. To perform the Torsion test on the given rod
8. To find out the Brinells Hardness of the given specimen
9. To find out the Rockwell Hardness of the given specimen
10. To determine the Stiffness of the Spring under Compressive loads
11. To determine the Stiffness of the Spring under Tensile loads
12. To Conduct the Charpy V-Notch test on the given specimen
13. To conduct the Izod Impact Test on the given specimen

NOTE: Any 10 experiments from the above are to be conducted
COURSE OUTCOMES:

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

1. Obtain & Observe the Micro Structures of various metal samples.
2. Calculate the hardenability of steels by conducting various experiments.
3. Understand the concept of microstructure for various non-ferrous alloys.
4. Obtain the hardness of various Steels.
5. Differentiate the properties between plain steels and heat treated Steels.

LIST OF EXPERIMENTS:

1. Preparation and study of the Micro Structure of pure iron, Cu and Al.
2. Preparation and study of the Micro Structure of pure Copper
3. Preparation and study of the Micro Structure of pure Aluminum
4. Preparation and study of the Micro Structure of Mild steel,
5. Preparation and study of the Micro Structure of low carbon steel
6. Preparation and study of the Micro Structure of high – C steel
7. Study of the Micro Structure of Cast iron
8. Study of the Micro Structure of Non-Ferrous alloys.
10. To find out the Hardenability of steels by Jominy End Quench test.
11. To find out the hardness of Heat treated Steel
12. To find out the hardness of untreated steels.

NOTE: Any 10 experiments from the above are to be conducted.
(A54013) PRODUCTION TECHNOLOGY

COURSE OUTCOMES:

After completion of this course the students must be able to:

1. Know the different casting process and able to make a casting and preparation of the patterns for the desired parts.
2. Understand & design the gating and riser system and utilize the different special casting processes in real time.
3. Use the different welding processes for joining the parts for fabricating the final product.
4. Understand the different sheet metal working processes and their application in practical.
5. Distinguish the plastics and able to produce the plastic parts.

UNIT – I

CASTING: Steps involved in making a casting – Advantage of casting and its applications, - Patterns and pattern making – Types of patterns, Materials used for patterns, pattern allowances and their construction, principles of Gating, Gating ratio and design of Gating systems.

UNIT – II

ADVANCED CASTING PROCESSES:

Solidification of casting – Concept – Solidification of pure metal and alloys, short & long freezing range alloys, Risers – Types, function and design, casting design considerations, special casting processes 1) centrifugal, 2) Die, 3) investment.

Methods of melting: Crucible melting and cupola operation, steel making processes, special.

UNIT – III

METAL JOINING PROCESSES:

A) WELDING: Classification of welding process types of welds and welded joints and their characteristics, design of welded joints, Gas welding, Arc welding, Forge welding, Resistance welding, thermit welding and Plasma welding.

B) Cutting of Metals: Oxy – Acetylene Gas cutting, water plasma, cutting of ferrous metals.

UNIT – IV

METAL FORMING AND WORKING:

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth. Comparison of properties of cold and Hot worked parts; Rolling fundamentals – theory of rolling, types of rolling mills and product forces in rolling and power requirements.


UNIT – V

EXTRUSION OF METALS: Basic extrusion process and its characteristics, Hot extrusion and cold extrusion – Forward extrusion and backward extrusion – impact extrusion, Hydrostatic extrusion.


PROCESSING OF PLASTICS: Types of Plastics, Properties, applications and their Processing methods & Equipment (blow & injection molding)

TEXT BOOKS:

2. Manufacturing Technology – P.N Rao, TMH
3. Production Technology – Sarma P.C, S.Chand publication.

REFERENCES:

1. Production Technology / R.K Jain
4. Welding Process – Paramar
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(A54014) KINEMATICS OF MACHINERY

COURSE OUTCOMES:

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

1. Distinguish the different types of motions and represent the displacement, velocity & acceleration graphically.
2. Understand the working of types of mechanisms and their application in real life.
3. Understand and the real time applications of power transmission mechanisms and analyze the motion of bodies (static & dynamic)
4. Know the need for friction and its applications and represent the turning moment graphically and the applications of flywheel.
5. Utilize the governors for various practical applications and balance the vibrating machinery.

UNIT – I

MECHANISMS: Elements of Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained.


UNIT – II

KINEMATICS: Velocity and acceleration – Motion of link on machine – Determination of velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain.

Analysis of Mechanisms: Analysis of slider crank chain for displacement, Velocity and acceleration of slider – Acceleration diagram for a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration.
Plane motion of body: Instantaneous center of motion, centroids and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of angular velocity of points and links.


UNIT – III
CAMS : Definition of cam and followers – their uses – Types of followers and cams – Terminology- Types of follower motion – Uniform velocity – simple harmonic motion and uniform acceleration, Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.


UNIT – IV
Higher pairs, friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth, cycloidal and involute profiles, Velocity of sliding – phenomena of interferences – Methods of interference, Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – introduction of Helical, Bevel and worm gearing.

UNIT – V

Belt Rope and Chain Drives: Introduction, Belt and rope drives, selection of belt drive – types of belt drives, V-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains – length, angular speed ratio, classification of chains.

TEXT BOOKS:
1. Theory of Machines by Thomas Bevan, CBS
2. Theory of Machines – R.K Bansal

REFERENCES:
2. Theory of Machines – PL. Ballaney / kharina publishers,
3. Theory of Machines Sadhu Singh Pearsons Edn
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(A54015) THERMAL ENGINEERING – I

PREREQUISITE: Thermodynamics

COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Make students familiar with the design and operating characteristics of modern internal combustion engines.
2. Understand the thermodynamics, combustion, heat transfer, friction and other factors affecting engine power, efficiency and emissions.
3. Understand students to the environmental and fuel economy challenges facing the internal combustion engine technology and market trends.
4. Sketch the diagram of processes involved in spark ignition and compression ignition.
5. Describe the working of various compressors.

UNIT – I


UNIT – II

Combustion in S.I Engines: Normal combustion and abnormal combustion – importance of flame speed and effect of engine variables – Type of Abnormal combustion, pre-ignition and knocking (explanation of) – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types.

UNIT – III


UNIT – IV

**RECIPIROCATING & ROTARY COMPRESSORS:** Classification – positive displacement and roto dynamic machinery – Power producing and power absorbing machines, fan, blower and compressor – positive displacement and dynamic types – reciprocating and rotary types.

**Reciprocating:** Principle of operation, work required, isothermal efficiency volumetric efficiency and effect of clearance, stage compression, under cooling, saving of work, minimum work condition for stage compression.

**Rotary (Positive displacement type):** Roots blower, vane sealed compressor, Lyshoim compressor – mechanical details and principle of working – efficiency considerations.

UNIT – V

**Centrifugal Compressors:** Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation, Energy transfer impeller blade shape- losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

**Axial Flow Compressors:** Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor – isentropic efficiency – pressure rise calculations – Polytrophic efficiency.

TEXT BOOKS:

1. I.C Engines – V. GANESAN, TMH
2. IC Engines – Ramalingam, Scietech publishers
3. Thermal Engineering / Rajput / Lakshmi Publications.

REFERENCES:

2. Engineering fundamentals of IC Engines – Pulkrabek / Pearson / PHI
3. Thermal Engineering / Rudramoorhty – TMH
5. I.C Engines / Heywood / McGrawHill.
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(A54016) MECHANICS OF FLUIDS AND HYDRAULIC MACHINES

COURSE OUTCOMES:

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

1. Learn the units and dimensions and their applications,
2. Study fluid statics and fluids in motion,
3. Study fluid behavior of fluids under various flow conditions and fluid friction in pipes leading to design procedures for flow systems.
4. Study the performance of Pumps and hydraulic machines.
5. Study performance of hydraulic turbines, centrifugal and reciprocating pumps.

UNIT – I


UNIT – II

FLUID KINEMATICS: Steam line, path line and streak lines and steam tube, classification of flows-steady & unsteady, uniform & non uniform, laminar & turbulent, rational & irrational flows-equation of continuity for one dimensional flow and three dimensional flows.

FLUID DYNAMICS: Surface and body forces – Euler’s and Bernoulli’s equations for flow along a 2-D stream line, momentum equation and its application on force on pipe bend.

UNIT – III


BOUNDARY LAYER CONCEPTS: Definition, thickness, characteristics along the thin plate, laminar and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.
UNIT – IV

BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip velocity diagrams, work done and efficiency, flow over radial vanes.

HYDRAULIC TURBINES: Classification of turbines, Heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design – draft tube theory – functions and efficiency.

UNIT – V

PERFORMANCE OF HYDRAULIC TURBINES: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

CENTRIFUGAL PUMPS: Classification, working, work done – barometric head – losses and efficiencies specific speed – performance characteristic curves. NPSH

RECIPIROCATING PUMPS: Working, Discharge, slip, indicator diagrams.

TEXT BOOKS:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.

REFERENCES:

1. Fluid Mechanics and fluid power Engineering by D.S Kumar, Kotaria & sons.
2. Fluid Mechanics and machinery by D. Rama Durgaiah, New Age international.
PREREQUISITE: Engineering Graphics – I & II

COURSE OUTCOMES:
After completion of this course the students will be able to:

1. Understand various convections in machine drawings
2. Design various types of joints
3. Practice and sketch the various connections of machine parts
4. Combine and construct the assemblies of various machine parts
5. Draw various elements and simple parts of machines

Machine drawing conventions: Need for drawing conventions – introduction to IS conventions

a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views, Parts not usually sectioned.
c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
d) Title boxes, their size, location and details – common abbreviations & their liberal usage.
e) Types of Drawings – working drawings for machine parts.

I. Drawing of Machine Elements and simple parts

Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

a) Popular forms of screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
b) Keys, cottered joints and knuckle joint.
c) Rivetted joints for plates
d) Shaft coupling, spigot and socket pipe joint.
e) Journal, pivot and collar and foot step bearings.

II. Assembly Drawings:

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.
a) Engine parts – stuffing boxes, cross heads, Eccentric, Petrol Engine connecting rod, piston assembly.
b) Other machine parts – Screws jacks, Machine vices Plummer block tailstock.
c) Valves : Steam stop valve, spring loaded safety valve, feed check valve and air cock.

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

TEXT BOOKS:


REFERENCES:


Question Paper Pattern:

PART A: TWO Questions need to be answered from 4 questions from Section - I for 2 X 15 = 30 Marks

PART B: Only One question will be given from the Assembly Drawings for 45 marks. No Choice, Cumpulsary Question.
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(A54001) PROBABILITY AND STATISTICS  

PREREQUISITE: Mathematics - I  

COURSE OUTCOMES:  

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

1. Understand the basics of probability, events and random experiments.  
2. Analyze the random variables which is always a numerical quantity.  
3. Understand the multiple random variables and relate through examples to real problems.  
4. Understand of Power density spectrum and its properties and understanding the types of ANOVA.  
5. Understand the combined sample spaces and computer generation of specified random variable using MATLAB software.  

UNIT-I: Probability: Sample space and events, Classical and Statistical definition of Probability, The axioms of probability, Some Elementary theorems of Probability, Conditional probability, Baye’s theorem. Random variables, Discrete and continuous random variable,  

UNIT-II: Definitions of Probability Distribution function, Probability mass function, Probability density function and properties. Definitions of Mathematical expectation, Moments (about origin & Centre), Definition of moment generating function for discrete and continuous random variable.  
Discrete Distributions: Binomial and Poisson distributions (definition and problems) their mean, variance and moment generating function.  
Continuous Distribution: Normal and exponential distributions (definition and problems) related properties.  
Concepts of Joint Distribution function of more than one random variable, Definition of joint, marginal and conditional distribution (for two variables only).  

UNIT-III: Sampling distribution: Populations and samples - Sampling distributions of mean (σ known and unknown)  
Estimation: Concept of Point estimation and its properties (definition only), Concept of interval estimation with examples.  
Test of Hypothesis: Null & Alternative Hypothesis, Critical region, Type I and Type II errors, level of significance, one tail, two-tail tests.  
Large sample test: concerning means – proportions (One and Two samples).
**UNIT-IV:** Small sample test: Chi-Square test, Student’s t-test (Single mean, Difference of mean and Paired samples) and F-test.  
Design of Experiment: Introduction to ANOVA (one – way, two – way), Principles of Design of Experiment, completely randomized design (CRD), randomized complete block design (RBD), Latin Square Design (LSD). (No Derivations only concept, definitions and problems)

Markov Chain: Classification of States, Classification of chains, Random Walk and Gambler Ruin.

**TEXT BOOKS:**

3. Introduction to Probability by Charles M Grinstead, J Laurie Snell, American Mathematical Society.

**REFERENCES:**

8. Zivorad R. Lazic, Design of Experiments in Chemical Engineering, Wiley-VCH.
(A54018) GENDER SENSITIZATION
(An Activity-based Course)

COURSE OUTCOMES:

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.
6. Students will develop a sense of appreciation of women in all walks of life.
7. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT-I

UNDERSTANDING GENDER:
Gender: Why should we study it? (Towards a world of equals: Unit-1)
Socialization: Making Women, Making Men (Towards a world of equals: Unit-2)
Just Relationships: Being Together as Equals (Towards a world of equals: Unit-12)
Further reading: Rosa Parks-The Brae Heart.

UNIT-II

GENDER AND BIOLOGY:
Missing Women: Sex Selection and its Consequences (Towards a world of equals: Unit-4)
Declining Sex Ration. Demographic Consequences.
Gender Spectrum: Beyond The Binary (Towards a world of equals: Unit-10)
Two or many? Struggles with Discrimination.
Additional Reading: Our Bodies, Our Health (Towards a world of equals: Unit-13)
UNIT-III
GENDER AND LABOUR:
Housework: The invisible Labour (Towards a world of equals: Unit-3)
“May Mother doesn’t work”. “Share the Load”.
Women’s work: its politics and economics (Towards a world of equals: Unit-7)

UNIT-IV
ISSUES OF VIOLENCE:
Sexual Harassment: Say No! (Towards a world of equals: Unit-6)
Sexual Harassment, not Eve-teasing-coping with everyday Harassment-Further Reading: “Chupulu”.
Domestic Violence: Speaking out (Towards a world of equals: Unit-8)
Thinking about sexual Violence (Towards a world of equals: Unit-11)

UNIT-V
GENDER STUDIES:
Knowledge: Through the lens of gender (Towards a world of equals: Unit-5)
Point of View. Gender and the Structure of Knowledge. Further Reading: unacknowledged Women artists of Telangana.
Whose History? Questions for Historians and others (Towards a world of equals: Unit-9)
Reclaiming a past. Writing other Histories. Further Reading: Missing Pages from Modern Telangana History.

Essential Reading: All the Units in the Textbook, “ Towards a world of Equals; A Bilingual Textbook on Gender” written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasantha, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.
Note: Since it is interdisciplinary Course, Resource Persons can be drawn from the fields of english Literature or Sociology or Political Science or any other qualified faculty who has exerite in this field.

Reference Books:


(A54206) ELECTRICAL AND ELECTRONICS ENGINEERING LAB

SECTION-A: ELECTRICAL ENGINEERING

The following 4 experiments are compulsory:

1. Swinburne’s test on DC shunt machine.
2. OC & SC tests on single phase transformer.
4. Regulation of Three phase Alternator by Synchronous Impedance Method.

In addition to the above 4 experiments any one of the experiments has to be conducted.

1. Brake test on DC shunt motor.
2. Speed control of DC Shunt Motor by
   a) Armature voltage control b) field flux control method.

SECTION-B: ELECTRONICS ENGINEERING

1. Transistor CE characteristics.
2. Full wave rectifier with and without filters.
3. CE amplifiers.
4. RC phase shift oscillators.
5. Class A power amplifier.
COURSE OUTCOMES:

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

1. Perform the casting operation by understand the steps like pattern preparation, sand molding and melting of metal.
2. Work on various types of metal joining processes.
3. Know the working processes of sheet metal operations.
4. Prepare the plastic components through different processes.

I. METAL CASTING LAB:
   1. Pattern Design and making – for one casting drawing.
   2. Sand properties testing – Exercise for strengths and permeability – 1.
   3. Moulding Melting and Casting – 1 Exercise

II. WELDING LAB:
   1. ARC Welding Lap & Butt Joint – 2 Exercises
   2. Spot Welding – 1 Exercises
   3. Gas Welding – 1. Exercise
   4. Soldering and Brazing – 2 Exercises

III. MECHANICAL PRESS WORKING

IV. PROCESSING OF PLASTICS
   1. Injection Moulding
   2. Blow Moulding

REFERANCES:


NOTE: Any 10 experiments from the above are to be conducted taking atleast 4 from each section.
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(A54208) MECHANICS OF FLUIDS AND HYDRAULIC MACHINES LAB

COURSE OUTCOMES:
After completion of this course the students will be able to:

1. Understand the basic concept of types of pumps and study their performance.
2. Analyze the impact of fluid jet on structure of vanes.
3. Study the types of turbines and their overall efficiency.
4. Determine the losses in pipes due to different pipe fittings.
5. Study the characteristics and applications of flow measuring devices.

LIST OF EXPERIMENTS:

1. Impact of jets on Vanes
2. Performance test on Pelton wheel
3. Performance test on Francis Turbine.
4. Performance test on Kaplan Turbine.
5. Performance test on single stage centrifugal pump.
6. Performance test on Multi stage centrifugal pump.
7. Performance test on Reciprocating pump.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Verification of Bernoulli’s theorems.

NOTE: Any 10 of the above experiments are to be conducted.

COURSE OUTCOMES:
After completion of this course the students will be able to:

1. Distinguish the different types of motions.
2. Represent the displacement, velocity & acceleration graphically.
3. Understand the working of types of mechanisms and their application in real life.
4. Understand and the real time applications of power transmission mechanisms.
5. Analyze the motion of bodies (static & dynamic).

UNIT – I

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships.

STATIC AND DYNAMIC FORCE ANALYSIS OF PLANAR MECHANISMS:

UNIT – II

CLUTCHES: Friction clutches – Single Disc or plate clutch, Multiple Disc clutch, Cone clutch, Centrifugal clutch.


UNIT – III

TURNING MOMENT DIAGRAM AND FLY WHEELS: Turning moment – inertia Torque connecting rod angular velocity and acceleration, crank effort and torque diagrams – Fluctuation of energy – fly wheels and their design.

GOVERNERS: Watt, Porter and Proell governors, Spring loaded governors – Hartnell and Hartung with auxiliary springs, Sensitiveness, isochronisms and hunting.
UNIT – IV


UNIT – V

**VIBRATION** : Free Vibration of mass attached to vertical spring – Forced damped vibration, Vibration isolation & Transmissibility – Whirling of shafts, critical speeds, Torsional vibrations of two and three rotor systems.

**TEXT BOOKS:**

1. Theory of Machines by T. Beven, Pearson Education
2. Theory of Machines by SS. Ratan, Mc Graw Hill.

**REFERENCES:**

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(A55024) DESIGN OF MACHINE MEMBERS-I


COURSE OUTCOMES:

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

1. Understand the concepts of stress & strain, their relation, various failure theories.
2. Design different types of riveted and welded joints including eccentric loading.
3. Design different types of bolted, keys, cotters and knuckle joints based upon the practical need.
4. Design the shafts, both aligned and misaligned shaft couplings.
5. Understand the stresses and deflections of helical springs, Springs for static and fatigue loading.

UNIT – I

INTRODUCTION: General considerations in the design of Engineering, Materials and their properties – selection – Manufacturing consideration in design.


UNIT – II


UNIT – III

**BOLTED JOINTS:** Design of bolts with pre-stresses – Design of joints under eccentric loading – bolt of uniform strength, Cylinder cover joints.

**AXIALLY LOADED JOINTS:** Keys, cotters And Knuckle joints: Design of keys-stresses in keys – cottered joints-spigot and socket, sleeve and cotter, jib and cotter joints, Knuckle joints.

UNIT – IV

**DESIGN OF SHAFTS:** Design of solid and hollow shafts for strength and rigidity – Design of shafts for complex loads – Shaft sizes – BIS code – Design of shaft for a gear and belt drives.

**DESIGN OF SHAFT COUPLINGS:** Rigid couplings – Muff, split muff and flange couplings, Flexible couplings – Pin – Bush coupling.

UNIT – V


**TEXT BOOKS:**


**REFERENCES:**

3. Machine Design by / Schaum Series

**NOTE:** USE OF MACHINE DESIGN DATA BOOK BY PSG TECH IS PERMITTED.
PREREQUISITE: Physics

COURSE OUTCOMES:

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

1. Familiar with limits and fits – tolerance system.
2. Use the instruments that are available for linear, angular, roundness and roughness measurements.
3. Understand concept of optical, flat and screw thread measuring instruments.
4. Understand the comparators – Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production.
5. Familiar with surface texture and its properties, Surface cleaning techniques, Mechanical surface treatment and coating.

UNIT – I

SYSTEMS OF LIMITS AND FITS: Introduction, normal size, tolerance limits, deviations, allowances, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – interchangeability and selective assembly, Indian standard institution system – British standard system, international standard system for plain and screwed work.

UNIT – II

LINEAR MEASUREMENT: Length standard, line and end standard, slip gauges – calibration of the gauges, Dial indicator, micrometers.

MEASUREMENT OF ANGLES AND TAPERS: Different methods – Bevel protractor – angle slip gauges – spirit levels – sine bar – sine plate, rollers and spheres used to determine the tapers.


UNIT – III

OPTICAL MEASURING INSTRUMENTS: Tool maker’s microscope and its uses – collimators, optical projector – optical flats and their uses, interferometer.

OPTICAL MEASURING INSTRUMENTS: Element of measurement – errors in screw threads – measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.

UNIT – IV

COMPARATORS: Comparators – Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production.

Coordinate Measuring Machines: Types of CMM, Role of CMM and Applications.


UNIT – V

SURFACE ENGINEERING: Surface texture and properties, Surface cleaning techniques, Surface integrity, Wear and its measurements, Lubricants and its selection for reducing wear, Laser applications for surface modifications.

SURFACE TREATMENTS: Mechanical surface treatment and coating, Electroless plating and Electro forming, Ceramic, organic and Diamond coating.

TEXT BOOKS:


REFERENCES:

1. Fundamentals of Dimensional Metrology, 4e, Connie Dotson, Thomson,2003
2. Engineering Metrology, I. C . Gupta, Dhanpat Rai
3. Surface Engineering with Lasers / Dehosson J.T.
5. Precision Engineering and Manufacturing / R.L Murty / Newage Publications,2009
PREREQUISITE: Thermal Engineering

COURSE OUTCOMES:
After completion of this course the students will be able to:

1. Understand the components of four wheeler, lubrication system and various types of cooling systems.
2. Understand the elements and functions of fuel pump and fuel supply systems in S.I. and C.I. engines
3. Know the functions of Ignition and electrical systems in engines.
4. Know the transmission and suspension systems in automobiles.
5. Understand the Steering mechanism, Braking system and analyze the pollutants from the exhaust.

UNIT – I

INTRODUCTION: Introduction about evolution of modern automobiles- Components of four wheeler automobile – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines

Engine Lubrication System: Splash and pressure lubrication systems, Dry Sump and Wet Sump Lubrication Systems- oil filters, oil pumps.

Cooling System: Cooling requirements, Air cooling, Liquid cooling , Thermo, Water and forced lubrication system—Radiators-TYPES-Cooling fans-Water pump—Thermostat—Evaporating cooling—Pressure cooling—Anti freeze solutions—coolants

UNIT--II


C.I. Engines: Requirements of diesel injection systems, types of injection systems, Common Rail Diesel injection-- fuel pump, nozzle, spray formation, injection timing.

UNIT – III

IGNITION SYSTEM: Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser
and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

**ELECTRICAL SYSTEM:** Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting system, Horn, Wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

**UNIT – IV**

**TRANSMISSION SYSTEM:** Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, construct mesh, synchromesh gear boxes, epicyclic gear box, over drive, torque converter. Propeller shaft – Hotch- Kiss drive, Torque tube drive, universal joint, differential, gear axles – types – wheels and tyres.

**SUSPENSION SYSTEM:** Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, independent suspension system.- Chassis-Types-Body of automobile

**UNIT – V**

**STEERING SYSTEM:** Steering geometry – camber, castor, King pin rake combined angle toe-in, center point steering. Steering gears – types, steering linkages.- Power steering

**BRAKING SYSTEM:** Mechanical brake system, Hydraulic brake system, Disc and Drum type Brakes- Master cylinder, wheel cylinder, Requirements of brake fluid, Pneumatic and vacuum brakes.


**TEXT BOOKS:**


**REFERENCES:**

1. Automotive Mechanics / G.B.S.Narang
2. Automotive Mechanics / Heitner
3. Automotive Engines / Srinivasan
5. Automotive Engineering / Newton steeds & Garrett.
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(A55027) WELDING TECHNOLOGY  
(PROFESSIONAL ELECTIVE-I)  

PREREQUISITE: Production Technology  

COURSE OUTCOMES:  
After completion of this course the students will be able to:  

1. Understand the different types and components of welding  
2. Learn the characteristics, limitations and applications of special welding processes.  
3. Understand the concepts of modern welding processes and welding of dissimilar metals.  
4. Learn concepts of various destructive and non-destructive welding tests.  
5. Design and automation of welding processes.  

UNIT I  

UNIT II  
Special welding processes – Power sources, equipments and accessories, application, limitation and other characteristics of: (a) Gas tungsten arfc (TIG) welding (b) Gas metal arc (MIG) welding (c) Submerged arc welding (d) Electro slag welding processes. Resistance welding processes-principle- Types (spot, seam, projection, flash), Equipment required for each application.  

UNIT III  
UNIT IV

Weldment Testing- Defects in welding in various processes-Causes and remedies; Destructive testing of weldments – strength, hardness, ductility, fatigue, creep properties etc. Non-destructive testing of weldments; Ultrasonic dye penetrant, magnetic particle inspection. X-ray testing procedures and identification of defects – case studies. Weld thermal cycle – Residual stressed distortion in welding stress relieving techniques.

UNIT V


TEXT BOOKS:


REFERENCES:

1. Little R.L., Welding Technology Tata Mcgraw – hill
4. “AWS Welding hand Book”, Volume 1 to 4, AWS
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(A55028) TURBO MACHINERY
(PROFESSIONAL ELECTIVE-I)

PREREQUISITE: Thermal Engineering-1 & II

COURSE OUTCOMES:

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

1. Understand the fundamentals of turbo machines and calculating their efficiencies
2. Design of steam nozzles, steam turbines and can calculate work done and efficiencies.
3. Understand the dynamic pressures and velocity triangles of centrifugal compressors
4. Understand the thermodynamic analysis of axial flow compressors and cascade analysis on blades.
5. Design axial flow gas turbine and can calculate work done and efficiencies.

UNIT-I:

FUNDAMENTALS OF TURBO MACHINES: Classifications, Applications, Thermodynamic analysis, isentropic flow. Energy transfer. Efficiencies, Static and Stagnation conditions, Continuity equations, Euler’s flow through variable cross sectional areas, unsteady flow in turbo machines

UNIT-II:


UNIT-III:

CENTRIFUGAL COMPRESSOR: Types, Velocity triangles and efficiencies, Blade passage design, Diffuser and pressure recovery. Slip factor, Stanitz and Stodolas formulas, Effect of inlet mach numbers, Pre whirl, Performance

UNIT-IV:


UNIT-V:

AXIAL FLOW GAS TURBINES: Work done. Velocity triangle and efficiencies, Thermodynamic flow analysis, Degree of reaction, Zeisel’s relation, Design cascade analysis, Soderberg, Hawthrone, Ainley, Correlations, Secondary flow, Free vortex blade, Blade angles for variable degree of reaction. Actuator disc, Theory, Stress in blades, Blade assembling, Material and cooling of blades, Performances, Matching of compressors and turbines, off design performance.

TEXT BOOKS:

1. Principles of Turbo Machines/DG Shepherd / Macmillan
2. Fundamentals of Turbomachinery/William W Perg/John Wiley & Sons
3. Element of Gas Dynamics/Yahiya/TMH

REFERENCES:

2. Turbines, Pumps, Compressors/Yahya/TMH
3. Practice on Turbo Machines/ G.Gopal Krishnan & D.Prithviraj/ Sci Tech Publishers,
4. Chennai
5. Theory and practice of Steam Turbines/ WJ Kearton/ELBS Pitman/London
7. Element of Gas Dynamics/Liepeman and Roshkow/ Dover Publications
PREREQUISITE: Production Technology

COURSE OUTCOMES:

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

1. Understand the theory of metal cutting, the formation of different types of chips in cutting, the use of cutting tools for different practical applications.
2. Know the different machine tools for different purposes of manufacturing.
3. Use these machines for producing the desired part.
4. Design and fabricate the work holding devices like jigs and fixtures for required purpose.
5. Understand and use grinding machines and Classification of jigs & fixtures.

UNIT – I


Kinematic schemes of machine tools – Constructional features of speed gear box and feed gear box.

UNIT – II

ENGINE LATHE – Principle of working, specification of lathe – types of lathe – work holders tool holders – Box tools Taper turning thread turning – for Lathes and attachments.


PRINCIPAL FEATURES OF AUTOMATIC LATHES – classification – Single Spindle and Multi-spindle automatic lathes.
UNIT – III

SHAPING SLOTTING AND PLANNING MACHINES – Principles of working – Principal parts – specification classification, operations performed, machining time calculations.


UNIT – IV


UNIT – V


FINISHING OPERATIONS: Lapping, honing and broaching machines – comparison to grinding – lapping and honing processes, Broaching Machines - Constructional features of speed and feed units, machining time calculations.

JIGS & FIXTURES: Principles of design of jigs and fixtures and uses, Classification of jigs & fixtures – Principles of location and clamping – Types of clamping & work holding devices, Typical examples of jigs and fixtures.

TEXT BOOKS

2. Production Technology by H.M.T.
3. Manufacturing Technology by P.N. Rao

REFERENCES:

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(A55030) THERMAL ENGINEERING – II

PREREQUISITE: Thermodynamics, Thermal Engineering-I

COURSE OUTCOMES:
After completion of this course the students will be able to:

1. Understand and analyze Rankine Cycle, Regeneration and Reheating
2. Classify the boilers and their Mountings & accessories & can be able to understand the functions and applications of Steam Nozzles.
3. Classify the Steam & Reaction Turbines and calculate their efficiencies.
4. Understand the Steam Condensers and Gas turbines and their application in the analysis of mechanical and engineering problems
5. Understand the working principles of Jet Propulsion and Rockets and their applications.

UNIT – I


UNIT – II


STEAM NOZZLES: Function of nozzle – applications – types, flow through nozzles, thermodynamic analysis – assumptions – velocity of nozzle at exit-ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape super saturated flow, its effects, degree of super saturation and degree of under cooling – Wilson line.

UNIT – III

STEAM TURBINES: Classification – impulse turbine, Mechanical details – velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency.
De-Laval Turbine – its features, Methods to reduce rotor speed-velocity compounding and pressure compounding, velocity and pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine.

**REACTION TURBINE:** Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction – velocity diagram – parson’s reaction turbine – condition for maximum efficiency.

**UNIT – IV**

**STEAM CONDENSERS:** Requirements of steam condensing plant – Classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects air pump – cooling water requirement.


**UNIT – V**


**TEXT BOOKS:**

1. Thermal Engineering / R.K Rajput / Lakshmi Publications
2. Gas Turbines – V. Ganesan / TMH

**REFERENCES:**

5. Thermal Engineering – P.L Bellaney / Khanna publishers.
1. INTRODUCTION:
It is a general observation that today’s techno savvy student’s interest in reading is decreasing considerably with which they fail to acquire a good sense of language. The ‘Language Skills’ have transformed into “Life Skills or Survival Skills” in the present global scenario from mere communication skills. Any skills that are useful in life can be considered as Life Skills. Life skills are not always taught directly but often learned indirectly through experience and practice.

2. OBJECTIVES:
   a. To increase the understanding of the world around and equip the learner to cope up with the challenges of life.
   b. To help the students to accomplish the Life Skills which are associated with managing and leading a better life.
   c. To equip the students with a set of Life Skills and increase their abilities for adaptive and positive behaviour.

3. LEARNING OUTCOMES:
   a. Enrichment of human skills through language and literature
   b. Building up confidence to deal effectively with the demands and challenges of everyday life.
   c. Acquisition of psychosocial competency.

UNIT-I

“Teamwork Skills” by SP Dhanavel from English and Soft Skills, published by Orient Black Swan Private Limited, Hyderabad, India.
UNIT-II


“Emotional Intelligence Skills” by SP Dhanavel from English and Soft Skills, published by Orient Black Swan Private Limited, Hyderabad, India.

UNIT-III

“Learning Skills” by SP Dhanavel from English and Soft Skills, published by Orient Black Swan Private Limited, Hyderabad, India.

UNIT-IV

“Problem-solving Skills” by SP Dhanavel from English and Soft Skills, published by Orient Black Swan Private Limited, Hyderabad, India.

UNIT-V


“Adaptability Skills” by SP Dhanavel from English and Soft Skills, published by Orient Black Swan Private Limited, Hyderabad, India.

TEXTBOOKS:


REFERENCES:

1. Life and Language, An Anthology of English Prose and Poetry published by Oxford University Press, Delhi, India
2. Fluency in English II edited by Promodinivarma and Mukti Sanyal, published by Oxford University Press, Delhi, India
3. Essential life skills Form: I, II, III, IV by E.Wachira Et al published by Oxford University Press, Delhi, India.
(A55205) PERSONALITY DEVELOPMENT AND CAREER BUILDING LAB

1. INTRODUCTION:

The world is in need of skilful employees who can contribute towards organizational growth. The professionals are expected to be confident and maintain amicable relations with clients and customers. With this backdrop, this course helps the students understand the importance of various aspects of professional life.

The course aims at making the students familiar with the corporate world and grooms them accordingly. This course is designed to improvise communication principles, interpersonal communication and public speaking of learners.

2. OBJECTIVES:

d. To prepare the students to understand and acquire different personality traits
e. To mould the students for global challenges and international careers
f. To excel the students in areas of self – management and Ethics at work place.

3. LEARNING OUTCOMES:

a. Apply the learning from the class in day-to-day life
b. Manage and Implement their expertise in personal and professional life
c. Evaluate their learning everyday and enhance the requisite skills

UNIT I
SELF – IMPROVEMENT:
Self Esteem, SWOT-Analysis, Attitude, Image Matters

UNIT – II
COMMUNICATION ESSENTIALS:
Communication Basics, Barriers to Communication, Listening Skills, Communication Styles, Fitting In and Getting Along, Communicating Electronically
UNIT – III
WORK SKILLS:
Self – Management Tools, Efficient Work Habits, Our Diverse Society, Understanding Other Cultures, Fairness in the Workplace, Right and Wrong in the Workplace

UNIT – IV
LEADERSHIP SKILLS:

UNIT - V
CAREER PLANNING:
Analyse Your Interest and Qualifications, Networking and Other Sources of Job Leads, Job Search Documents, the Job Interview, Planning Your Career, Networking – It Never Stops

TEXTBOOKS:
1. Personal Development for Life and Work by Masters Wallace, published by CENGAGE Learning

REFERENCES:
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(A55206) METROLOGY AND MACHINE TOOLS LAB

COURSE OUTCOMES:

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

1. Understand the basic concepts of geometrical measurement by using various measuring devices.
2. Observe the tool wear and thread measurement by using Tool makers microscope.
3. Calculate the surface roughness of work piece and knowing the operation of Taly surf.
4. Make the desired component by using various machines.
5. Study the various kinematic mechanisms in machine.

SECTION – A:

1. Measurement of lengths, heights, diameters by Vernier calipers, micrometers.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth Vernier calipers and checking the chordal addendum and choral height of spur gear.
4. Tool makers microscope.
5. Angle and taper measurements by Bevel protractor & sine bars.
6. Use of spirit level in finding the flatness of surface plate.
7. Thread measurement by Two wire OR Three wire method or Tool makers microscope.
8. Surface roughness measurement by Taly surf.

SECTION – B

1. Introduction of general purpose machines – lathe, Drilling machine, Milling machine, shaper.
2. Introduction of Planing machine, slotting machine, Cylindrical grinder, surface grinder and tool and cutter grinder.
3. Step turning and taper turning on lathe machine.
4. Thread cutting and knurling on lathe machine.
5. Drilling and tapping
6. Shaping
7. Planing
8. Slotting
9. Milling
10. Cylindrical Grinding
11. Surface grinding

Note: Any 14 experiments are to be conducted from the above by taking at least 6 experiments from each section
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(A55207) THERMAL ENGINEERING LAB

COURSE OUTCOMES:

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

1. Study the performance of automobile engines.
2. Conduct experiments to determine the engine friction of diesel and petrol engines.
3. Calculate COP of Refrigeration and air-conditioning units.
4. Demonstrate different types of boilers.
5. Estimate the performance of two stage reciprocating air compressor.

LIST OF EXPERIMENTS:

1. I.C. Engines valve / Port Timing Diagrams.
2. I.C. Engines Performance test (4 – Stroke Diesel Engines)
3. I.C. Engines Performance test on 2 – stroke petrol.
4. Evaluate of engine friction by conducting morse test on 4 stroke Multi cylinder petrol engine.
5. Evaluate of engine friction by conducting motoring / retardation test on 4 stroke diesel engine.
7. Determination of A/F Ratio and volumetric efficiency on IC ENGINES.
8. Determination of Economical speed test for fixed load on 4-stroke engine.
9. Determine optimum cooling water temperature on IC engine.
11. Performance test on reciprocating air-compressor unit.
12. Study of boilers.
13. Performance Test on Vapor Compression Refrigeration System.

Note: Any 10 experiments are to be conducted from the above.
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(A56022) DESIGN OF MACHINE MEMBERS – II  

PREREQUISITE: Mechanics of solids, Design of Machine Members-I  

COURSE OUTCOMES:  

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

1. Select the type of sliding contact and rolling bearing bearings based on the design calculations.  
2. Design connecting rod, crank pins, pistons, cylinder, cylinder liners, forces acting on piston.  
3. Understand the Transmission of power by Belt and Rope drives, Transmission efficiencies, Belts.  
4. Understand the Spur and Helical gears – Load concentration factor – Dynamic load factor, Surface compressive strength  

UNIT – I  


ROLLING CONTACT BEARINGS: Types of rolling contact bearings – selection of bearing type – selection of bearing life – Design for cyclic loads and speeds – Static and dynamic loading of ball & roller bearings.  

UNIT – II  

DESIGN OF IC ENGINE PARTS: Design of Connecting Rod; Thrust in connecting rod – stress due to whipping action on connecting rod ends – Cranks and Crank shafts, strength and proportions of over hung and center cranks – Crank pins, Crank shafts, Pistons, Forces acting on piston – Construction, Design and proportions of piston, Cylinder, Cylinder liners.  

UNIT – III  

DESIGN OF BELT, ROPE & CHAIN DRIVES: Transmission of power by Belt and Rope drives, Transmission efficiencies, Belts – Flat and V types – Ropes – Pulleys for belt and rope drives, Materials, Chain drives.
UNIT – IV


UNIT – V


DESIGN OF POWER SCREWS: Design of screw, Square ACME, Buttress screws, design of nut, compound screw, differential screw, ball screw – possible failures.

TEXT BOOKS:


REFERENCES:


NOTE: USE OF MACHINE DESIGN DATA BOOK BY PSG TECH IS PERMITTED.
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(A56023) HEAT TRANSFER

PREREQUISITE: Thermodynamics

COURSE OUTCOMES:

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

1. Formulate and solve mathematical models representing heat transfer problems from problem descriptions.
2. Describe the three modes of heat transfer mathematically and physically.
3. Estimate the thermal conductivity & convective heat transfer coefficient for a given application.
4. Design shell and tube and plate and frame heat exchangers and Comment on solutions in context of safety, economics, and societal impact.

UNIT – I

INTRODUCTION: Modes and mechanisms of heat transfer – Basic laws of heat transfer – General discussion about applications of heat transfer.

CONDUCTION HEAT TRANSFER: Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates.

SIMPLIFICATION AND FORMS OF THE FIELD EQUATION – steady, unsteady and periodic heat transfer – initial and boundary conditions.

UNIT – II


Variable thermal conductivity – systems with heat sources or Heat generation, Extended surface (Fins) Heat Transfer – Long Fin, Fin with insulated tip and short Fin, Application to error measurement of temperature.

ONE DIMENSIONAL TRANSIENT CONDUCTION HEAT TRANSFER: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers – Chart solutions of transient conduction systems – Concept of Functional body.
UNIT – III

CONVECTIVE HEAT TRANSFER: Classification of systems based on causation of flow, condition of flow, medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham Pi Theorem and method, application for developing semi-empirical non-dimensional correlation for convection heat transfer – Significance of non-dimensional numbers – Concepts of Continuity, Momentum and Energy equations.

FORCED CONVECTION: EXTERNAL FLOWS: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer - Flat plates and cylinders.

INTERNAL FLOWS: Concepts of hydrodynamic and thermal entry lengths – Division of internal flow based on this – Use of empirical relations for Horizontal Pipe Flow and annulus flow.

FREE CONVECTION: Development of Hydrodynamic and thermal boundary layer along a vertical plate – Use of empirical relations for Vertical plates and pipes.

UNIT – IV


Condensation: Film wise and drop wise condensation on vertical and horizontal cylinders using empirical correlations.


UNIT – V


TEXT BOOKS:


REFERENCES:

1. Heat Transfer / HOLMAN / TMH
5. Heat and Mass Transfer – Christopher A Long / Pearson Education.
7. Heat and Mass Transfer – Kondandaraman

**NOTE:** HEAT AND MASS TRANSFER DATA BOOK IS PERMITTED.
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(A56024) RENEWABLE ENERGY SOURCES
(PROFESSIONAL ELECTIVE –II)

PREREQUISITE: Environmental Studies

COURSE OUTCOMES:

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

3. Understand the concepts of converting wind energy and Biomass for producing power.
4. Utilize the Geo Thermal & Ocean Energies for producing electricity.
5. Understand the Principles & Limitations of Direct Energy Conversion.

UNIT – I

PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT – II

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, Sensible, latent heat and stratified storage, solar pondsm Solar Applications – solar heating / cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT – III

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

UNIT – IV

GEO THERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

OCEAN ENERGY: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles, Tidal and wave energy, Potential and conversion techniques, mini – hydel power plants and their economics.

UNIT – V

DIRECT ENERGY CONVERSION: Need for DEC, Carnot Cycle, Limitations, principles of DEC, Thermo – electric generators, seebeck, peltier and joule – Thomson effects, Figure of merit, materials, applications, MHD generators, principle, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects, Fuel cells, principles, faraday’s law’s, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:

1. Renewable energy resources / Tiwari and Ghosal / Narosa.

REFERENCES:

1. Renewable Energy Sources / Twidell & Weir
2. Solar Energy / Sukhatme
5. Non-Conventional Energy / Ashok V.Desai / Wiley Eastern
7. Renewable Energy Technologies / Ramesh & Kumar / Narosa
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(A56025) COMPUTATIONAL FLUID DYNAMICS
(PROFESSIONAL ELECTIVE –II)

PREREQUISITE: Fluid Mechanics, Heat transfer

COURSE OUTCOMES:

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

1. Understand the concepts of Numerical Techniques & Computational Methods.
2. Apply the CFD techniques to solve the Heat Transfer applications.
4. Solve different solution algorithms for Navier-Stokes equations.
5. Understand Steady flow, dimensionless form of Momentum and energy equations, Stokes equation and conservative body force fields.

UNIT – I

ELEMENTARY DETAILS IN NUMERICAL TECHNIQUES: Number system and errors, representation of integers, fractions, floating point arithmetic, loss of significance and error propagation, condition for instability, computational methods for error estimation, convergence of sequences.


UNIT – II

Finite Difference Applications in Heat conduction and convection – Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

UNIT – III

Finite Differences, discretization, consistency, stability and Fundamentals of fluid flow modeling, introduction, elementary finite difference quotients, implementation aspects of finite – difference equations, consistency, explicit and implicit methods.

UNIT – IV

Introduction to first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

UNIT – V

Steady flow, dimensionless form of Momentum and energy equations, Stokes equation, conservative body force fields, stream function – Vorticity formulation.

FINITE VOLUME METHOD: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, linear interpolation and quadratic interpolation.

TEXT BOOKS:

2. Computational fluid flow and heat transfer / Muralidharan – Narosa Publications

REFERENCES:

ANURAG GROUP OF INSTITUTIONS  
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(A56026) TOOL DESIGN  
(PROFESSIONAL ELECTIVE –II)  

PREREQUISITE: Machine tools, Production Technology.  

COURSE OUTCOMES:  

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

1. Able to design single point and multi point cutting tools.  
2. Describe the principles of clamping, clamping force analysis.  
3. Identify the various considerations in design of jigs, their types.  
4. Design fixtures for milling, boring, lathe, grinding, welding machines.  
5. Explain the principles of dies and design of simple progressive and compound die sets.  

UNIT - I  
DESIGN OF CUTTING TOOLS: Metal cutting process - Selection of tool materials - Design of single point and multipoint cutting tool - Form tools, Drills, Milling cutters, broaches and chip breakers – Problems on design of single point cutting tools only.  

UNIT - II  

UNIT - III  
DESIGN OF JIGS: Types of drill jigs - General considerations in the design of drill jigs - Drill bushings - Types, methods of construction - Simple designs of Plate, Channel, Boxes, Post, Angle plate, Turnovers and Pot Jigs.  

UNIT - IV  
DESIGN OF FIXTURES: Design principles - Types of fixtures - Fixtures for machine tools: Lathe, Milling, Boring, Broaching and grinding - Assembly fixtures - Inspection and Welding fixtures.  

UNIT - V  
DESIGN OF DIES: Press tools - Fundamentals of die-cutting operations - Cutting action in punch and die operations - Die clearance - Blanking and Piercing Die construction – Pilots - Strippers and
Pressure Pads - Press work materials - Strip layout - Design of simple progressive and compound die sets - Forging Die – Flow lines, parting lines, open and close die forging; Materials for die block.

TEXT BOOKS:

REFERENCES:
ANURAG GROUP OF INSTITUTIONS
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(A56027) REFRIGERATION AND AIR CONDITIONING
(PROFESSIONAL ELECTIVE –III)

PREREQUISITE: Thermal Engineering-I & II

COURSE OUTCOMES:

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

1. Understand and analyze processes such as isothermal, isobaric, isentropic, air standard cycles, refrigeration cycles,
2. Use p-h and t-s diagrams and understand expansion devices and refrigerants and their properties.
3. Recognize VAR, VCR and steam jet refrigeration systems.
4. Understand the need for air conditioning and their application in industry.
5. Calculate RSHF, GSHF – Problems & Concepts of ESHF and ADP.

UNIT - I


AIR REFRIGERATION: Bell Coleman cycle and Brayton cycle, Open and Dense air systems – Actual air refrigeration system problems – Refrigeration needs of Air crafts.

UNIT – II


PRINCIPLES OF EVAPORATORS: Classification – working Principles Expansion devices – Types – working principles

UNIT – III

VAPOR ABSORPTION SYSTEM: Calculation of max COP – description and working of NH3 – water system and Li Br – water (Two shell & four shell) system. Principle of operation Three Fluid absorption system, salient features.

STEAM JET REFRIGERATION SYSTEM: Working Principle and Basic Components, Principle and operation of i) Thermoelectric refrigerator, ii) Vortex tube or Hilsch tube.

UNIT – IV

INTRODUCTION TO AIR CONDITIONING: Psychometric Properties & Processes – Characterization of Sensible and latent heat loads – Need for Ventilation, Consideration of infiltration – Load concepts of RSHF, GSHF – Problems, Concept of ESHF and ADP.

UNIT – V


AIR CONDITIONING SYSTEMS: Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, fans and blowers, Heat Pump – Heat sources – different heat pump circuits.

TEXT BOOKS:

1. Refrigeration and Air Conditioning / CP Arora / TMH.
2. A Course in Refrigeration and Air conditioning / SC Arora & Domkundwar / Dhanpatrai

REFERENCES:

1. Refrigeration and Air Conditioning / Manohar Prasad / New Age.
3. Refrigeration and Air Conditioning - P.L. Bellaney
4. Basic Refrigeration and Air Conditioning – Ananthanarayan / TMH.
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(A56028) MECHANICAL VIBRATIONS
(PROFESSIONAL ELECTIVE – III)

PREREQUISITE: Dynamics of machinery

COURSE OUTCOMES:

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

1. Understand the need and importance of vibration analysis in mechanical design of machine parts that operate in vibratory conditions
2. Analyze the mathematical model of a linear vibratory system to determine its response
3. Determine vibratory responses of SDOF and MDOF systems to harmonic, periodic and non-periodic excitation
4. Understand the General notion on frequency and time response of vibratory systems
5. Understand the Critical speeds without and with damping, secondary critical speeds.

UNIT-I

SINGLE DEGREE OF FREEDOM SYSTEMS-I: Undamped and damped free vibrations, force vibration coulomb damping, response to extension, rotating unbalance and support extension, vibration isolation and transmissibility.

UNIT-II

SINGLE DEGREE OF FREEDOM SYSTEMS-II: Response to non periodic excitations, unit impulse, unit step and unit ramp functions, response to arbitrary excitations, The convolution integral; shock spectrum, system response by the Laplace Transformation method.

UNIT-III

VIBRATION MEASURING INSTRUMENTS: Vibrometers, velocity meters and accelerometers.

UNIT-IV

TWO DEGREE FREEDOM SYSTEM: Principal modes-undamped and damped free and forced vibrations, undamped vibration absorbers.

UNIT-V

CRITICAL SPEED OF SHAFTS: Critical speeds without and with damping, secondary critical speeds.
TEXT BOOKS:

1. Elements of vibrations analysis by Meirovitch, TMH, 2001

REFERENCES:

2. Mechanical Vibrations by Rao V.Dukkipati and J.Srinivas, PHI,2010
3. Mechanical Vibrations-V.Ram Murthy
5. Mechanical Vibrations- S Graham Kellyk, Schaum’s Outlines, TMH
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(A56029) TRIBOLOGY  
(PROFESSIONAL ELECTIVE-III)  

PREREQUISITE: Engineering Mechanics-I, Mechanics of fluids & Hydraulic machines, Design of  
machine members-II  

COURSE OUTCOMES:  
After completion of this course the students will be able to:  

1. Understand the theory of Viscosity, temperature and pressure effect on viscosity,  
properties of mineral oils.  
2. Analyze the circumferential flow, Design of bearing.  
3. Determine film thickness, Grubin type solution, calculate different regimes in EHL  
contact.  
4. Understand surface topology, surface characterization, Reynolds equation for partially  
lubricated surface.  
5. Understand theories of friction, effect of sliding speed on friction. Also classify wear  
mechanism.  

UNIT – I  
Historical background - Viscosity - Viscometry - Effect of temperature on viscosity - Effect  
of pressure in viscosity - Other physical properties of mineral oils - The generalized Reynolds  
equation - Flow and shear stress - The energy equation - The equation of state - Mechanism  
of pressure development.  

UNIT – II  
Circumferential Flow - Oil flow through a bearing having a circumferential oil groove – Heat  
generation and lubricant temperature - Heat balance and effective temperature - Bearing  
design: Practical considerations - Design of journal bearings - Parallel surface bearing - Step  
bearing - Some situations under squeeze film lubrication - The mechanism of hydrodynamic  
instability - Stiffness and damping coefficients - Stability.  

UNIT – III  
ELASTOHYDRODYNAMIC LUBRICATION: Theoretical consideration - Grubin type  
solution - Accurate solution - Point contact - Dimensionless parameters - Film thickness  
equations - Different regimes in EHL contact - Deep-groove radial bearings - Angular contact  
bearings - Thrust ball bearings - Geometry - Kinematics - Stress and deformations - Load  
capacity.
UNIT – IV
Surface Topography - Surface characterization - Apparent and real area of contact - Derivation of average Reynolds equation for partially lubricated surface - Effect of surface roughness on journal bearings

UNIT – V

TEXT BOOKS:
1. Introduction to Tribology of Bearings / Majumdar, B.C.
2. Introduction to Tribology / Bharat Bhushan / Wiley / 2nd Edition
3. Engineering Tribology / Prasanta Sahoo / PHI Learning

REFERENCES:
2. Engineering Tribology / John Williams / Cambridge University Press / 2005

COURSE OUTCOMES:

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

2. Calculate stiffness matrix for different types of elements.
4. Understand the dynamic analysis of bars and beams.
5. Calculate stiffness matrix for fin elements, composite slabs, and bars.

UNIT – I

INTRODUCTION TO FEM: Basic concepts, Historical background, application of FEM, general description, comparison of FEM with other methods. Basic equations of elasticity, Stress – Strain and strain – displacement relations. Rayleigh – Ritz method, weighted residual methods.

UNIT – II


UNIT – III


UNIT – IV


Two dimensional four noded isoparametric elements – Numerical integration – Finite element modeling of Axisymmetric solids subjected to Axisymmetric loading with triangular elements – Introduction to 3 D problems with Tetrahedron Brick elements.

UNIT – V


TEXT BOOKS:


REFERENCES:

1. Finite Element Methods / Alavala / TMH
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(A56031) PRODUCTION PLANNING AND CONTROL
(PROFESSIONAL ELECTIVE-IV)

PREREQUISITE: Production Technology

COURSE OUTCOMES::

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

1. Understand the concepts of objectives and functions of production planning and control, forecasting and forecasting techniques.
2. Know the concepts of inventory management, ABC analysis, VED analysis, EOQ models.
3. Prepare the bill of material, route sheets and factors affecting routing procedure.
4. Know the need for material requirement planning, enterprise resource planning, line of balance, just in time technique etc.

UNIT – I


Forecasting – importance of forecasting – types of forecasting, their uses – general principles of forecasting techniques – Qualitative methods and quantitative methods.

UNIT – II


Introduction to MRP And ERP, LOB (Line of balance), jit inventory, Japanese concepts.

UNIT – III

UNIT – IV

UNIT – V
Dispatching – Activities of dispatcher – Dispatching procedure – follow up – definition – reasons for existence of functions – types of follow up, applications of computer in production planning control.

TEXT BOOKS:

2. Production Planning and Control Jain & Jain – Khanna publications

REFERENCES:

1. Production Planning and Control – Text & cases / SK Mukhopadhyaya.
3. Operations Management by Chase / phi
5. Operations Management – Heizer – Pearson
COURSE OUTCOMES:

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

1. Understand the types of production. How to design plant layout and work in progress inventory.
2. Should be able to understand the formation of part families, part classifications and coding system opitz.
3. Get knowledge on flexible manufacturing systems and analysis methods for FMS benefits and limitations.
4. Introduction - Cell description and classifications - Unattended machining - Component handling and storage system.
5. Introduction - General Structure and requirements - Functional descriptions - Operational overview - Computer simulation

UNIT - I

PRODUCTION SYSTEMS: Types of production-Job Shop, Batch and Mass production - Functions in manufacturing - Organization and information processing in manufacturing - Plant layout - Work in progress inventory - Scheduling, problems.

UNIT - II

GROUP TECHNOLOGY: Formation of part families - Part classification - Coding system - Opitz, Multi Class, Production flow analysis - Machine cell design - Clustering methods – Modern algorithms - Benefits - System planning - Objective, guide line, system definition and sizing - Human resources - Objective, staffing, supervisor role.

UNIT - III

UNIT - IV


UNIT - V

FMS SOFTWARE: Introduction - General Structure and requirements - Functional descriptions - Operational overview - Computer simulation - FMS installation - Objective - Acceptance testing - Performance goals - Expectations - Continued support.

TEXT BOOKS:


REFERENCES:

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(A56033) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

COURSE OUTCOMES:

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

1. Understand the economic environment and to give an idea on various accounting concepts
2. Understand the financial management techniques
3. Understand effective utilization of economic resources.
4. Understand Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements

UNIT – I


ELASTICITY OF DEMAND: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

UNIT – II

THEORY OF PRODUCTION AND COST ANALYSIS: Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of inputs, Laws of Returns, internal and External Economics of scale.

COST ANALYSIS: Cost concepts, Opportunity cost, Out of pocket costs vs. Imputed costs. Break – even Analysis (BEA) – Determination of Break – Even Point (simple problems) – Managerial Significance and limitations of BEA.

UNIT – III

INTRODUCTION TO MARKETS & PRICING POLICIES:

MARKET STRUCTURES: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, Price – Output determination in case of Perfect Competition
OBJECTIVES AND POLICIES OF PRICING – METHODS OF PRICING: Cost
Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit
Pricing, Market Skimming Pricing, Penetration Pricing, Two – Part Pricing, Block
Pricing, Peak Load Pricing, Cross Subsidization.

UNIT – IV
CAPITAL AND CAPITAL BUDGETING: Capital and its significance, Types of
Capital, Estimation of Fixed and Working capital requirements,
Nature and scope of capital budgeting, features of capital budgeting proposals, Methods
of capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net
Present Value Method, Profitability Index, Internal rate of return (simple problems)

UNIT – V
INTRODUCTION TO FINANCIAL ACCOUNTING: Double – Entry Book Keeping,
Journal, Ledger, and Trial Balance – Final Accounts (Trading Account, Profit and Loss
Account and Balance Sheet with simple adjustments).
FINANCIAL ANALYSIS THROUGH RATIOS: Computation, Analysis and
interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (inventory
turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt –
Equity, interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit
ratio, Operating Profit Ratio, P/E Ratio and EPS).

TEXT BOOKS:

REFERENCES:
1. Raghunatha Reddy & Narasimhachary; Managerial Economics & Financial Analysis,
Scitech, 2009.
2. V. Rajasekarn & R.Lalitha, Financial Accounting, Pearson Education, New Delhi,
2010.
4. Domnick Salvatore; Managerial Economics in a Global Economy, 4th Edition,
5. Subhash Sharma & M.P.Vittal, Financial Accounting for Management, Text & Cases,
9. M. Kasi Reddy, S.Saraswathi; Managerial Economics and Financial Accounting, PHI,
2007.

Codes / Tables: Present Value Tables need to be permitted into the examinations Hall.
(A56205) HEAT TRANSFER LAB

COURSE OUTCOMES:

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

1. Estimate the heat transfer of various devices.
2. Calculate experimental heat transfer coefficients in composite slab apparatus.
3. Estimate the thermal conductivity of a metal rod.
4. Conduct experiments on parallel and counter flow heat exchangers.
5. Estimate the emissivity of surface of specimen.

LIST OF EXPERIMENTS:

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat Transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin.
6. Experiment on Transient Heat Conduction
7. Heat Transfer in forced convection apparatus
8. Heat Transfer in natural convection
9. Parallel and counter flow heat exchanger.
11. Stefan Boltzman Apparatus

Note: Any 12 Experiments are to be conducted from the above.
1. INTRODUCTION
The introduction of the English Language Lab is considered essential at 3rd year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be an integrated theory and lab course to enable students to use good English and perform the following:

- Gather ideas and information, to organize ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice versa.
- To take part in social and professional communication.

2. OBJECTIVES:
This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

To improve the students’ fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.

Further, they would be required to communicate their ideas relevantly and coherently in writing.
3. SYLLABUS:

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


3. **Writing Skills** – Structure and presentation of different types of writing - Resume Writing /E-Correspondence/Statement of Purpose.


6. **Presentation Skills** – Oral presentations (individual and group) through JAM sessions/Seminars, Written Presentations through Projects/ PPTs/e-mails etc.

7. **Interview Skills** – Concept and Process, Pre-Interview Planning, Opening Strategies, Answering Strategies, Interview through Telephone and Video-Conferencing.

4. MINIMUM REQUIREMENT: The English Language Lab shall have two parts:

   i) The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.
   ii) The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

**System Requirement (Hardware component):** Computer network with Lan with minimum 60 multimedia systems with the following specifications:

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

5. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

**Suggested Software:**

- Clarity Pronunciation Power – part II
- Oxford Advanced Learner’s Compass, 7th Edition
- DELTA’s key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dreamtech.
• TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

• The following software from _train2success.com’
  i. Preparing for being Interviewed,
  ii. Positive Thinking,
  iii. Interviewing Skills,
  iv. Telephone Skills,
  v. Time Management
  vi. Team Building,
  vii. Decision making

• English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

6. BOOKS RECOMMENDED:

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(A57025) CAD/CAM


COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Understand the basic structure of computer, CAD/CAM Hardware.
2. Understand the basic geometric commands by using solid modeling and surface modeling to design a component.
3. Find coding and classification of various types of elements, CNC part programming for manufacturing the elements.
4. Understand the concepts of Computer Aided Quality Control, Contact & Non-contact methods of Inspection.
5. Understand the types of Computer Integrated Manufacturing systems, Machine tools and related equipment, material handling systems.

UNIT – I

INTRODUCTION: Computers in industrial Manufacturing, Product cycle, CAD/CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, storage devices.

COMPUTER GRAPHICS: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT – II

GEOMETRIC MODELING: Requirements, geometric models, curve representation methods, surface representation methods, modeling facilities desired.

DRAFTING AND MODELING SYSTEMS: Basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling.

UNIT – III

**GROUP TECHNOLOGY**: Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Panning, Retrieval type and Generative type

**UNIT – IV**

**COMPUTER AIDED QUALITY CONTROL**: Terminology in quality control, the computer in QC, contact inspection methods, noncontact inspection methods – optical, noncontact, inspection methods – non optical, computer aided testing, integration of CAQC with CAD/CAM.

**UNIT – V**

**COMPUTER INTEGRATED MANUFACTURING SYSTEMS**: Types of Manufacturing systems, Machine tools and related equipment, material handling systems, computer control systems, human labor in the manufacturing systems, CIMS benefits.

**TEXT BOOKS**:

1. CAD / CAM A Zimmers & P.Groover / PE / PHI
2. CAD / CAM Theory and Practice / ibrahim Zeid / TMH

**REFERENCES**:

1. Automation, Production systems & Computer integrated Manufacturing / Groover / P.E
3. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age
4. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson
5. CAD / CAM : Concepts and Applications / Alavala / PHI
PREREQUISITE: Metrology and Surface Engineering

COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Understand the basic principles of measurements & Methods of measuring displacement.
2. Understand the concepts & methods of Measuring Temperature & Pressure
3. Identify different methods and instruments to Measure Speed & levels of Fluids
4. Study different simple instruments – Principles of Seismic instruments.
5. Measure the Moisture content of gases & able to Measure the force, Torque & Power.

UNIT – I


MEASUREMENT OF DISPLACEMENT: Theory and construction of various transducers to measure displacement – Piezo electric, inductive capacitance, resistance, ionization and Photo electric transducers Calibration procedures.

UNIT – II


UNIT – III

MEASUREMENT OF LEVEL: Direct method – indirect methods – capacitive, ultrasonic, magnetic, cryogenic fuel level indicators – Bubbler level indicators.
FLOW MEASUREMENT: Rotameter, magnetic, ultrasonic, Turbine flow meter, Hot – wire anemometer, Laser Doppler Anemometer (LDA).

MEASUREMENT OF SPEED: Mechanical Tachometers – Electrical tachometers – Stroboscope, Non – contact type of tachometer.

UNIT – IV

MEASUREMENT OF ACCELERATION AND VIBRATION: Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle

STRESS STRAIN MEASUREMENTS: Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque, strain gauge Rosettes

UNIT – V

MEASUREMENT OF HUMIDITY: Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter.

MEASUREMENT OF FORCE, TORQUE AND POWER: Elastic force meters, load cells, Torsion meters, Dynamometers.

TEXT BOOKS:

2. Instrumentation, measurement & analysis by B.C.Nakra & K.K.Choudhary, TMH

REFERENCES:

1. Instrumentation and Control systems / S.Bhaskar / Anuradha Agencies
2. Experimental Methods for Engineers / Holman
4. Mechanical Measurements / Sirohi and Radhakrishna / New Age
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(A57027) OPERATION RESEARCH

PREREQUISITE: Mathematics – I & II

COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Solve linear programming problems by simplex method and other techniques.
2. Transportation problems and assignment problems including travelling salesman problems
4. Solve the Sequencing of jobs on various machines and decides optimum replacement time for machines
5. Understand Applications of several simulation techniques in solving inventory and queuing problems including dynamic programming.

UNIT – I

INTRODUCTION: Development – Definition – Characteristics and phases – Types of operation Research models – applications. Allocation:


UNIT – II


UNIT – III


UNIT – IV


REPLACEMENT: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, group replacement.

INVENTORY: Introduction – Single item – Deterministic models – Purchase inventory models with one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be discrete variable or continuous variable – instantaneous production, instantaneous demand and continuous demand and no set up cost – Single period model.

UNIT – V


SIMULATION: Definition – Types of simulation models – phases of simulation – applications of simulation – inventory and Queuing problems – Advantages and Disadvantages – Brief introduction of simulation languages.

TEXT BOOKS:

2. Operations Research / J.K. Sharma 4e / MacMilan

REFERENCES:

3. Introduction to O.R / Taha 8e / PHI
5. O.R / Wayne L.Winston / Thomson Brooks / cole
6. Introduction to O.R / Hiller & Libermann (TMH)
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(A57028) ENERGY MANAGEMENT AND CONSERVATION
(OPEN ELECTIVE – I)

PREREQUISITE: Environmental Studies

COURSE OUTCOMES:
After completion of this course, the students will be able to:

1. Understand the general principles and objectives of energy management.
2. Understand the concept of energy auditing, preliminary and detailed auditing.
3. Identifying the opportunities, technologies, schemes and measures for energy conservation.
4. Analyze the generation of steam, distribution and utilization of thermal systems.
5. Understand the different methods for heat recovery system.

UNIT-I


UNIT-II

ENERGY AUDITING: Energy Surveying, Energy Audit - Purpose, Definition and Objectives, Types of Energy Audit-Preliminary and Detailed, Questionnaire Energy Audit Instruments, Thermal Energy measurements, observations, and Data analysis, Energy saving potential.

UNIT-III


UNIT-IV

ENERGY EFFICIENCY IMPROVEMENT OF THERMAL SYSTEMS: Steam Generation, Distribution and Utilization, Furnaces, Fans and Blowers, Compressors Pumps, Case Studies, analysis and recommendation
UNIT-V

HEAT RECOVERY SYSTEMS: Sources of waste heat, Guidelines to identify waste heat, Grading of waste heat, Feasibility study of waste heat recovery, Gas to Gas and Liquid to liquid heat recovery, waste heat boilers.

TEXT BOOKS:


REFERNCES:

5. Energy Management Principles / Craig B. Smith /Pergamon Press
6. Process Heat Transfer by D.Q.Kern
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(A57029) DISASTER RECOVERY AND BUSINESS CONTINUITY
(OPEN ELECTIVE-I)

PREREQUISITE: Environmental Studies

COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Capacity to integrate knowledge and to analyze, evaluate and manage the different public health aspects of disaster events at a local and global levels.
2. Capacity to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
3. Capacity to work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery) and relate their interconnections, particularly in the field of the Public Health aspects of the disasters.
4. Capacity to manage the Public Health aspects of the disasters.
5. Capacity to obtain, analyze, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.

UNIT - I:

INTRODUCTION - Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation). Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.);

UNIT - II:

MANMADE DISASTERS (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT - III:

DISASTER IMPACTS - Disaster impacts - environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate-change and urban disasters. Disaster Risk Reduction (DRR) - Disaster management cycle – its phases;
prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems

UNIT - IV:

POST-DISASTER ENVIRONMENTAL RESPONSE - water, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT - V:

DISASTERS, ENVIRONMENT AND DEVELOPMENT - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental-friendly recovery; reconstruction and development methods.

TEXT BOOKS:


REFERENCES:

PREREQUISITE: Engineering Physics-I&II, Production Technology

COURSE OUTCOMES:

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

1. Describe and explain the properties, structures and quantum mechanical phenomenon of Nanotechnology.
2. Describe Nanomaterials based on their dimensionality.
3. Understand the nano scale characterization techniques, nano devices, nano medicine and their applications.
4. Understand the nano and molecular electronics and their applications.
5. Describe the nanolithography and nanomanipulation.

UNIT – I

INTRODUCTION TO NANOTECHNOLOGY: Importance of nano scale, Nanostructure types, electronic, magnetic, optical Properties of Nano materials, top-down and bottom – up approach to nanostructures.

QUANTUM MECHANICAL PHENOMENON IN NANO STRUCTURES: Quantum confinement of electrons in semiconductor Nano structures, one dimensional confinement (Quantum wires), two dimensional conformations (Quantum Wells), three dimensional conformations (Quantum dots).

UNIT – II

CARBON NANO STRUCTURES: Carbon Nano tubes (CNT’s), Fullerenes, C60, C80 and C240 Nanostructures, Properties (mechanical, optical and electrical) and applications.

FABRICATION OF NANO MATERIALS: Physical methods; inert gas condensation, Arc discharge, RF PLASMA, Plasma arc technique, ion sputtering, Laser ablation, Laser pyrolysis, Molecular beam epitaxy, Chemical vapour deposition method.

UNIT – III

NANO SCALE CHARACTERIZATION TECHNIQUES: Scanning probe techniques (AFM, MFM, STM, SEM, TEM), XRD
NANODEVICES AND NANOMEDICINE: Lab on chip for bioanalysis, Core / shell Nanoparticles in drug delivery systems (site specific and targeted drug delivery), cancer treatment, and bone tissue treatment.

UNIT- IV


UNIT – V


TEXT BOOKS:

2. Springer Handbook of Nanotechnology – Bharat Bhusan
3. Phani Kumar, Principles of nanotechnology, scitech publications.

REFERENCES:

4. Encyclopedia of Nanotechnology – Hari Singh Nalwa
5. Carbon Nanotubes; Properties and Applications – Micheal J.O’ Connell
PREREQUISITE: Kinematics of Machinery, Dynamics of Machinery

COURSE OUTCOMES:

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

1. Understand how to select a Gripper and end effectors & their Design
2. Analyze Robot motion using Forward and Inverse kinematics of Robots, and D-H representation of Robot kinematics
4. Analyze Robot dynamics and Forces using Lagragian mechanics & Understand the methods of path and trajectory planning.
5. Identify Internal and External sensors, encoders, and different types of Robot Actuators & Motors for different material handling applications.

UNIT – I

INTRODUCTION: Automation and Robotics – An over view of Robotics – classification by coordinate system and control systems – Components of the industrial Robotics: Degrees of freedom – End effectors; Mechanical gripper – Magnetic – Vacuum cup and other types of grippers – General consideration on gripper selection and design.

UNIT – II


UNIT – III


UNIT – IV


UNIT – V

ROBOT actuators and Feed back components: Actuators; Pneumatic and Hydraulic actuators, Electric Actuators: DC servo motors – stepper motors.


TEXT BOOKS:

1. Industrial Robotics / Groover M.P / Pearson Edu.

REFERENCES:

5. Robotics and control / Mittal R.K & Nagrath IJ / TMH.
PREREQUISITE: Electrical and Electronics Engineering

COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Develop a simulation model for simple physical systems and explain mechatronics design process.
2. Understand the precision mechanical systems and their applications.
3. Understand the electronic interface sub systems and electromechanical drives.
4. Describe the overview of micro controllers and programmable logic controllers.
5. Understand the different programmable motion controllers and their applications

UNIT – I

INTRODUCTION: Definition – Trends – Control Methods; Stand alone, PC Based ( Real Time Operating Systems, Graphical User interface, simulation) – Applications; SPM, Robot, CNC, FMS, CIM.


UNIT – II


UNIT – III


UNIT – IV

MICROCONTROLLERS OVERVIEW: 8051 Microcontroller, micro processor structure – Digital interfacing – Analog interfacing – Digital to analog convertors – Analog to Digital convertors – Applications, Programming – Assembly, C ( LED Blinking, Voltage measurement using ADC)

PROGRAMMABLE LOGIC CONTROLLERS: Basic structure programming; Ladder diagram – Timers internal Relays and counters – Shift registers – Master and jump controls – Data handling – Analog input / output – PLC Selection – Application.

UNIT – V


TEXT BOOKS:


REFERENCES:

ANURAG GROUP OF INSTITUTIONS  
(AUTONOMOUS)

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(A57033) COMPOSITE MATERIALS  
(PROFESSIONAL ELECTIVE-V)


COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Understand the properties of long fiber and short fiber composites C-C composites, and applications
2. Choose the fabrication methods of composite materials and their analysis.
3. Design of a laminate for a given load condition using Stress- Strain Relations for a Laminate,
4. Analyze the laminate and determine their strength, Thermal & Moisture Expansion coefficients.

UNIT-I

INTRODUCTION TO COMPOSITE MATERIALS: Introduction, classification, polymer matrix composites, metal matrix composites, ceramic matrix composites, carbon-carbon composites, fiber, reinforced composites and nature-made composites and applications.


UNIT – II

MANUFACTURING METHODS: Autoclave, tape production, moulding methods, filament winding, man lay up, pultrusion, RTM.

UNIT – III


UNIT – IV


UNIT - V


Failure Analysis and Design of Laminates: Introduction Special Cases of Laminates, Failure Criterion for a Laminate, Design of a Laminated Composite, Other Mechanical Design Issues

TEXT BOOKS:


REFERENCES:

ANURAG GROUP OF INSTITUTIONS  
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(A57034) CNC TECHNOLOGIES  
(PROFESSIONAL ELECTIVE-VI)  

PREREQUISITE: Machine Tools, CAD/CAM  

COURSE OUTCOMES:  
After completion of this course, the students will be able to:  

1. Identify different axes, machine zero, home position, systems and controls CNC machines.  
2. Select, mount and set cutting tools and tool holders on CNC.  
3. Prepare part programmes for given simple components.  
4. Understand the Micro Controllers, their applications & programming.  
5. Apply maintenance practices for CNC machines and Applications of PLC.  

UNIT – I  

FEATURES OF NC MACHINES: fundamentals of numerical control, advantage of NC systems, classification of NC systems, point to point, NC and CNC, incremental and absolute, open and closed loop systems, features of NC machine tools, design consideration of NC machine tool, methods of improving accuracy.  


UNIT – II  

TOOLING FOR CNC MACHINES: interchangeable tooling system, preset and qualified tools, coolant fed tooling system, modular fixturing, quick change tooling system, automatic head changers.  

NC PART PROGRAMMING: Manual programming – Basic concepts, point to point contour programming, canned cycles, parametric programming.  

UNIT – III  

COMPUTER – AIDED PROGRAMMING: General information, APT programming, Examples APT programming problems (2D machining only). NC programming on
CAD/CAM systems, the design and implementation of post processor s, introduction to CAD/CAM software, Automatic Tool Path generation.

**DNC SYSTEMS AND ADAPTIVE CONTROL:** introduction, type of DNC systems, advantages and disadvantages of DNC, adaptive control of optimization, Adaptive control with constraints, Adaptive control of machining processes like turning, grinding.

**UNIT – IV**

**MICRO CONTROLLERS:** introduction, Hardware components, I/O pins, ports external memory, counters, timers and serial data I/O interrupts, selection of micro controllers, embedded controllers, Applications and programming of micro controllers.

**UNIT – V**

**PROGRAMMING LOGIC CONTROLLERS ( PLC’S):** introduction, hardware components of PLC, system, basic structure, principle of operations, Programming mnemonics timers, internal relays and counters applications of PLC’s in CNC Machines.

**TEXT BOOKS:**

2. CAD/CAM – Michel P. Groover, TMH

**REFERENCES:**

2. Mechatronics - HMT,TMH.
ANURAG GROUP OF INSTITUTIONS
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(A57035) POWER PLANT ENGINEERING
(PROFESSIONAL ELECTIVE-VI)

PREREQUISITE: Thermal Engineering – II, Heat Transfer

COURSE OUTCOMES:

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

1. Understand the concepts of Generation of power by using various types of fuels, Layout of power plant, coal, Fuel & Ash handling equipments
2. Understand of Diesel power plant, Construction, plant lay out with Auxiliaries and lubrication system, fuel supply system and Cooling system, its equipments.
3. Understand Hydro electric Power plants, Classify the dams & Their layouts.
4. Acquire Basic knowledge of different types of Nuclear power plants, Reactors its operations, Nuclear fuel sand its properties, advantages, disadvantages &Applications.
5. Discuss environmental and safety aspects of power plant operation & understand the concepts of Direct Energy Conversion.

UNIT – I

Introduction to the Sources of Energy – Resources and Development of Power in india.


STEAM POWER PLANT: Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems

UNIT – II


UNIT III


HYDRO PROJECTS AND PLANT: Classification – Typical layouts – Turbines and Generator-Types-plant auxiliaries – plant operation pumped storage plants.

UNIT IV


UNIT V

DIRECT ENERGY CONVERSION: solar energy, Fuel cells, Thermo electric and thermo ionic, MHD generation.

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 – related numerical exercises, Effluents from power plants and impact on environment – pollutants and pollution standards – Methods of Power plant Pollution control.

TEXT BOOKS:

REFERENCES:
(A57036) UNCONVENTIONAL MACHINING PROCESSES
(PROFESSIONAL ELECTIVE-VI)


COURSE OUT COMES:

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

1. Know the mechanics of metal removal parameters – applications and limitations of ultrasonic machining.
2. Understand the principle, mechanism of metal removal of AJM, WJM, MAF, ESD, STEM
3. Know the various process parameters and their effect in Electro-Chemical Processes
4. Understand the applications of different Thermal Metal Removal processes like EDM, Wire EDM
5. Understand the advanced machining processes like EBM, LBM, PAM and applications & Concepts of Powder metallurgy technology.

UNIT – I

INTRODUCTION: Need for non-traditional machining methods – classification of modern machining processes – considerations in process selection materials applications.

ULTRASONIC MACHINING – Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development.

UNIT – II

Abrasive jet machining, water jet machining and abrasive water jet machine: Basic principles, equipments process variables, mechanics of metal removal, MRR, application and limitations.

Magnetic abrasive finishing, Abrasive flow finishing, electro stream drilling, shaped tube electrolytic machining.

UNIT – III

ELECTRO – CHEMICAL PROCESSES: Fundamentals of electro chemical machining, electromechanical grinding, electro chemical honing and deburring process, metal removal
rate in ECM, Tool design, surface finish and accuracy economic aspects of ECM – Simple problems for estimation of metal removal rate.

FUNDAMENTALS OF CHEMICAL MACHINING, principle – maskants – etchants, advantages and applications.

UNIT – IV

THERMAL METAL REMOVAL PROCESSES: General Principle and applications of Electric Discharge Machining, Electric discharge grinding and electric discharge wire cutting processes – Power circuits for EDM, mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection, wire EDM, principle applications.

UNIT – V


Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

POWDER METALLURGY TECHNOLOGY: Concepts of PM Technology, Production process & Applications.

TEXT BOOKS:

1. Advanced machining processes / VK Jain/ Allied publishers.

REFERENCES:

1. Modern machining process / Pandey P.C and shah H.S / TMH
ANURAG GROUP OF INSTITUTIONS
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(A57207) COMPUTER AIDED DESIGN AND MANUFACTURING LAB

PREREQUISITE: Engineering Drawing – I & II, Machine Drawing

COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Understand the softwares, associated with designing and manufacturing.
2. Model the components by using various design softwares.
3. Use finite element analysis software to perform static analysis of 2D and 3D trusses, static and dynamic analysis of beams, steady state heat transfer.
4. Use the simulation of NC programming for doing milling and turning operation.
5. Understand the quality control concepts and Inspection.

1. Drafting: Development of part drawings for various components in the form of orthographic and isometric, Representation of dimensioning and tolerances scanning and plotting, study of script DXE AND IGES FILES.
3. (a) Determination of deflection and stresses in 2D and 3D trusses and beams.
   (b) Determination of deflections component and principal and von-mises stresses in plane stress, plane, plane strain and Axisymmetric components.
   (c) Determination of stresses in 3D and shell structures (at least one example in each case)
   (d) Estimation of natural frequencies and mode shapes, harmonic response of 2D beam.
   (e) Steady state heat transfer analysis of plane and Axisymmetric components.
4. (a) Development of process sheets for various components based on tooling Machines.
   (b) Development of manufacturing and tool management systems.
(c) Study of various post processors used in NC Machines.

(d) Determination of CNC part program for turning components and milling components.

(e) Machining of simple components on NC lathe and Mill by transferring NC code from a CAM package. Through RS 232.

(f) Quality control and inspection.

Any Six Software Packages from the following: Use of Auto CAD Micro Station, CATIA, Pro-E, I-DEAS, ANSYS, NISA CAEFEM, Gibbs CAM, Master CAM etc.
ANURAG GROUP OF INSTITUTIONS
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IV Year B.Tech. MECH – I Sem

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(A57208) PRODUCTION DRAWING PRACTICE AND INSTRUMENTATION LAB


COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Understand basic drawing concepts of manufacturing process.
2. Calibrate the pressure, Strain and displacement measuring instruments.
3. Use the magnetic & speed pickups for the speed measurement.
4. Calibrate of flow measurement by rotameter.
5. Calibrate different instruments used for temperature measurement

a) PRODUCTION DRAWING PRACTICE

PRACTICE – I


PRACTICE – II

Limits and Fits: Types of fits, exercises involving selection / interpretation of fits and estimation of limits from tables.

PRACTICE – III

Form and Positional Tolerances: introduction and indication of the tolerances of from and position on drawings, deformation of runout and total runout and their indication.

PRACTICE – IV

Surface roughness and its indication: Definitions – finishes obtainable from various manufacturing processes, recommended surface roughness on mechanical components.

PRACTICE – V

Heat treatment and surface treatment symbol used on drawings.
PRACTICE – VI

Detailed and Part drawings: Drawing of parts from assembly drawings with indications of size, tolerances, roughness, from and position errors etc.

PRACTICE – VII

Part drawing using computer aided drafting by CAD software.

TEXT BOOKS:

1. Production drawing – K.L.Narayana & P.Kannaiah / New Age

REFERENCES:


(b) INSTRUMENTATION LAB

1. Calibration of pressure gauges
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for load measurement.
5. Calibration of thermocouple for temperature measurement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rota meter for flow measurement.
10. Study and use of a seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of McLeod gauge for low pressure.

Note: Any 8 experiments are to be conducted from the section B
1. INTRODUCTION:

Communication is an important aspect for any business to flourish. The evolution of communication over the years has turned it to a much specialized domain worth studying. In business contexts, effective communication plays a crucial role. The course aims to expose the students to the finesse of Business Communication and to prepare them to handle both verbal and non-verbal communication effectively at the workplace.

2. OBJECTIVES:

   g. To prepare the students to understand the fundamental principles of effective Business Communication
   h. To train the students to apply the concepts of Business Communication in real-time business contexts
   i. To impart verbal and non-verbal communication expertise at the workplace.

3. LEARNING OUTCOMES:

   d. Application of fundamental principles of Business Communication at the workplace
   e. Usage of Business Communication concepts in day-to-day life
   f. Apply verbal and non-verbal expertise at the workplace.

Textbooks Prescribed:

Business Communication (Second Edition) by Meenakshi Raman, Prakash Singh, Oxford University Press

UNIT-I

Effective Business Communication
Introduction, Definition, Business Communication, Role of a Manager, Communication Basics, Effective Managerial Communication, Case Studies

Cross-Cultural Communication
Introduction, Concept of Cross-Cultural Communication - Do’s and Don’ts, Case Studies

UNIT-II

Business Correspondence
Introduction, Business Letter Writing, Effective Business Correspondence- Basic Principles,

UNIT-III
Technology –enabled Business Communication


UNIT-IV
Business Reports and Proposals


UNIT-V
Ethics in Business Communication

Introduction, Ethical Communication, Strategic Approaches to Corporate Ethics, Crisis Management/Communication, Case Studies.

REFERENCES:

PREREQUISITE: CAD/CAM

COURSE OUTCOMES:

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

1. Understand the introduction and different input devices and output primitives.
2. Understand the 2-D viewing and operate 2-D geometrical transformations.
3. Understand the 3-D object representations and geometrical transformations.
4. Identify the various visible surface detection methods.
5. Design the sequence of computer animation.

UNIT - I:
Introduction, Application area of Computer graphics, overview of graphic system, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices.
Output primitives: Points and lines, line drawing algorithms, mid-point circle algorithm, Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm.

UNIT - II:
2-D geometrical transformations: Translation, scaling, rotation, reflection and shear transformation matrix representations and homogeneous co-ordinates, composite transformations, transformations between coordinates.
2-D viewing: The viewing pipe-line, viewing co-ordinate reference frame, window to view-port co-ordinate transformations, viewing function, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland Hodgegen polygon clipping algorithm

UNIT – III:
3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curve, Bezier and B-spline surfaces, Basic illumination models, shading algorithms.
3-D geometric transformations: Translation, rotation, scaling, reflection and shear transformation and composite transformations.

UNIT – IV:
Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting.
UNIT - V:
Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation language, key frame system, motion specification.

TEXT BOOKS:

REFERENCES:
5. Computer Graphics, Steven Harrington, TMH
COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Understand the Need for Maintenance Management & Control Methods.
2. Distinguish & Use the different types of Maintenance
3. Use the Inventory control models.
4. Understand the Industrial Maintenance, safety measurements in Engineering.
5. Understand reliability, reliability centered maintenance, RCM, maintainability.

UNIT – I


UNIT – II


UNIT – III

INVENTORY CONTROL IN MAINTENANCE: Inventory Control Objectives and Basic inventory Decisions, ABC inventory Control Models Two – Bin inventory Control and Safety Stock, spares Determination Factors spares calculation methods.

UNIT – IV

QUALITY AND SAFETY IN MAINTENANCE: Needs for Quality Maintenance Processes, Maintenance Work Quality, Use of Quality Control Charts in Maintenance Work


**UNIT – V**

**RELIABILITY, RELIABILITY CENTERED MAINTENANCE, RCM:** Goals and Principles, RCM Process and Associated Questions, RCM Program Components Effectiveness Measurement indicators, RCM Benefits and Reasons for its Failures, Reliability Versus Maintenance and Reliability Measures and Formulas, Reliability Networks, Reliability Analysis Techniques.

**MAINTAINABILITY:** Maintainability importance and Objective, Maintainability in Systems Life Cycle, Maintainability Design Characteristics, Maintainability Functions and Measures, Common Maintainability Design Errors.

**TEXT BOOKS**

1. Reliability, Maintenance and Safety Engineering by Dr. A.K Guptha / Laxmi Publications.
2. Industrial Safety Management by L.M.Deshmukh / TMH

**REFERENCES:**

1. Maintenance Engineering & Management by R.C.Mishra / PHI
2. Reliability Engineering by Elsayed / Pearson
ANURAG GROUP OF INSTITUTIONS
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(A58015) INDUSTRIAL MANAGEMENT
(OPEN ELECTIVE-III)

COURSE OUTCOMES:

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

1. Understand the functions and importance of management, and theory’s in management.
2. Know the different types of Organizations & their functions, concepts and fuctions of HRM.
3. Understand the concepts of EOQ, ABC analysis in materials management and functions of marketing.
4. Understand the PERT/CPM techniques in project management.
5. Know about the strategic management, ERP, TQM and BPO in contemperory management practices

UNIT – I


DESIGNING ORGANIZATIONAL STRUCTURES: Departmentation and Decentralization, Types of Organization structures – Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual organization, Cellular organization, team structure, boundaryless organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability

UNIT – II


UNIT – III

MATERIALS MANAGEMENT: Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records – Supply Chain Management.


UNIT – IV

PROJECT MANAGEMENT (PERT / CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Crashing (simple problems)

UNIT – V

STRATEGIC MANAGEMENT: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, SWOT Analysis, steps in strategy Formulation and implementation, Generic Strategy Formulation and implementation, Generic Strategy alternatives


TEXT BOOKS:

REFERENCES:
1. Stoner, Management, Pearson, 2009
2. Kotler Philip & Keller Kevin Lane; Marketing Management PHI, 2009
7. Schermerhorn; Management, Wiley, 2009

Codes / Tables: Normal Distribution Function Table need to be permitted into the examination Hall.
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(A58016) TOTAL QUALITY MANAGEMENT
(OPEN ELECTIVE-III)

PREREQUISITE: Managerial Economics & Financial Analysis, Production Planning & Control

COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Understand the history and concepts of TQM.
2. Recognize the customer needs and satisfaction by buyer-supplier relation.
3. Understand the different approaching systems for organizing TQM.
4. Understand the accounting systems and quality management
5. Understand the certification and documentation by using different ISO standards

UNIT – I:

INTRODUCTION: The concept of TQM, Quality and Business performance, attitude and involvement of top management, communication, culture and management systems. Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs, Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

UNIT – II:

CUSTOMER FOCUS AND SATISFACTION: The importance of customer satisfaction and loyalty- Creating satisfied customers, Understanding the customer needs, Process Vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships. Bench Marketing: Evolution of Bench Marketing, meaning of Bench marketing, benefits of bench marketing, the bench marketing process, pitfalls of bench marketing.

UNIT – III:

ORGANIZING FOR TQM: The systems approach, Organizing for quality implementation, making the transition from a traditional to a TQM organizing, Quality Circles. Productivity, Quality and Reengineering: The leverage of Productivity and Quality, Management systems Vs. Technology, Measuring Productivity, Improving Productivity Re-engineering.

UNIT – IV:

UNIT – V:

ISO9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQCQ-90. Series Standards, benefits of ISO9000 certification, the third party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

TEXT BOOKS:

1. Total Quality Management / Joel E.Ross/Taylor and Franscis Limited
2. Total Quality Management/P.N.Mukherjee/PHI
3. Beyond TQM / Robert L.Flood

REFERENCES:

1. Statistical Quality Control / E.L. Grant.
4. Total Engineering Quality Management/Sunil Sharma/Macmillan
COURSE OUTCOMES:

After completion of this course, the students will be able to:

1. Understand the ethics, social responsibility and role of entrepreneurship in economic development
2. Recognize the nature, scope of business plan and evaluating and implementing of business plan.
3. Understand the new venture Expansion Strategies and Issues Features and evaluation of joint ventures
4. Understand the selection of production Techniques, plant utilization and maintenance
5. Understand the labour legislation, Salient Provision under Indian Factories Act etc.,

UNIT – I:


Creating and Starting the Venture, Sources of new Ideas, Methods of generating ideas, creating problem solving, product planning and development process.

UNIT – II:


Financing and Managing the new venture Sources of capital, Record keeping, recruitment, motivating and leading teams, financial controls . Marketing and sales controls. E-commerce and entrepreneurship, Internet advertising.

UNIT – III:

Institutional support to Entrepreneurship Role of Directorate of Industries, District Industries, Centres (DICs), Industrial Development Corporation (IDC), State Financial corporation (SFCs), Small Scale Industries Development Corporations (SSIDCs), Khadi and village Industries Commission (KVIC), Technical consultancy Organisation (TCO), Small Industries Service Institute (SISI), National Small Industries Corporation (NSIC), Small Industries Development Bank of India(SIDBI)

UNIT – IV:
Production and Marketing Management Thrust of production management, Selection of production Techniques, plant utilization and maintenance, Designing the work place, Inventory control, material handling and quality control. Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing.

UNIT – V:
This course replaces the course offered in earlier years as 'Entrepreneurship& Management'

TEXT BOOKS:

REFERENCES: