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.

Anurag Group of Institutions

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II YEAR I SEMESTER **COURSE STRUCTURE**

Subject code	Category	Subject Name	Lectures	T/P/D	Credits
A53014	ES	Mechanics of Solids	3	1	3
A53015	PC	Thermodynamics	4	-	4
A53016	ES	Metallurgy and Material science	4	1	4
A53017	BS	Environmental studies	3	-	3
A53001	BS	Mathematics-III	3	1	3
A53018	ES	Electrical and Electronics Engineering	3	1	3
A53019	MC	Personality Development and Soft Skills	-	3	-
A53205	ES	Mechanics of solids Lab	-	3	2
A53206	ES	Metallurgy Lab	-	3	2
Total			**20**	**13**	**24**

II YEAR II SEMESTER **COURSE STRUCTURE**

Subject code	Category	Subject Name	Lectures	T/P/D	Credits
A54013	PC	Production Technology	3	-	3
A54014	PC	Kinematics of Machinery	3	1	3
A54015	PC	Thermal Engineering-I	3	1	3
A54016	PC	Mechanics of Fluids and Hydraulic Machines	3	1	3
A54017	PC	Machine Drawing	-	6	3
A54001	BS	Probability and Statistics	3	-	3
A54018	MC	Gender Sensitization	2	-	-
A54206	ES	Electrical and Electronics Engineering Lab	-	3	2
A54207	PC	Production Technology Lab	-	3	2
A54208	PC	Mechanics of Fluids and Hydraulic Machines Lab	-	3	2
Total			**17**	**18**	**24**

III YEAR I SEMESTER **COURSE STRUCTURE**

Subject code	Category	Subject Name	Lectures	T/P/D	Credits
A55023	PC	Dynamics of Machinery	3	1	3
A55024	PC	Design of Machine Members-I	3	1	3
A55025	PC	Metrology and surface Engineering	3	1	3
A55026 A55027 A55028	PE	**PROFESSIONAL ELECTIVE – I** Automobile Engineering Welding Technology Turbo Machinery	3	-	3
A55029	PC	Machine Tools	3	1	3
A55030	PC	Thermal Engineering-II	3	1	3
A55022	MC	English for Life Skills	2	-	-
A55205	HS	Personality Development and Career Building Lab	-	3	2
A55206	PC	Metrology and Machine Tools Lab	-	3	2
A55207	PC	Thermal Engineering lab	-	3	2
Total			**20**	**14**	**24**

III YEAR II SEMESTER **COURSE STRUCTURE**

Subject code	Category	Subject Name	Lectures	T/P/D	Credits
A56022	PC	Design of Machine Members-II	4	1	4
A56023	PC	Heat Transfer	3	1	3
A56024 A56025 A56026	PE	**PROFESSIONAL ELECTIVE – II** Renewable Energy Sources Computational Fluid Dynamics Tool Design	3	-	3
A56027 A56028 A56029	PE	**PROFESSIONAL ELECTIVE – III** Refrigeration and Air Conditioning Mechanical Vibrations Tribology	4	-	4
A56030 A56031 A56032	PE	**PROFESSIONAL ELECTIVE – IV** Finite Element Methods Production Planning and Control Flexible Manufacturing Systems	3	1	3
A56033	BS	Managerial Economics and Financial Analysis	3	1	3
A56011	MC	Logical Reasoning and Quantitative Aptitude	3	-	-
A56205	PC	Heat Transfer Lab	-	3	2
A56206	HS	Advanced English Communication Skills Lab	-	3	2
Total			**23**	**10**	**24**

IV YEAR I SEMESTER **COURSE STRUCTURE**

Subject code	Category	Subject Name	Lectures	T/P/D	Credits
A57025	PC	CAD/CAM	3	1	3
A57026	PC	Mechanical Measurements and instrumentation	3	1	3
A57027	PC	Operation Research	3	1	3
A57028 A57029 A57030	OE	**OPEN ELECTIVE – I** Energy Management and Conservation Disaster Recovery & Business Continuity Nano Technology	3	1	3
A57031 A57032 A57033	PE	**PROFESSIONAL ELECTIVE – V** Robotics Mechatronics Composite Materials	3	1	3
A57034 A57035 A57036	PE	**PROFESSIONAL ELECTIVE – VI** CNC Technologies Power Plant Engineering Unconventional Machining Processes	3	1	3
A57207	PC	Computer Aided Design and Manufacturing Lab	-	3	2
A57208	PC	Production Drawing practice and Instrumentation lab	-	3	2
A57209	PW	Industry Oriented Mini Project	-	-	2
Total			**18**	**12**	**24**

IV YEAR II SEMESTER **COURSE STRUCTURE**

Subject code	Category	Subject Name	Lectures	T/P/D	Credits
A58012 A58013 A58014	OE	**OPEN ELECTIVE – II** Business English Computer Graphics Maintenance and Safety Engineering	3	1	3
A58015 A58016 A58004	OE	**OPEN ELECTIVE – III** Industrial Management Total Quality Management Entrepreneurship Development	3	1	3
A58207	PW	Seminar	-	6	3
A58208	PW	Comprehensive Viva	-	-	3
A58209	PW	Project work	-	15	12
Total			**6**	**23**	**24**

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

T – Tutorial **P – Practical** **D – Drawing**

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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

SIMPLE STRESSES & STRAINS : Elasticity and plasticity – Types of stresses & strains-Hook's law – stress – strain diagram for mild steel – Working stress – Factory of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

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

FLEXURAL STRESSES: Theory of simple bending – Assumptions – Derivation of bending equation: M/I=f/y=E/R Neutral axis – Determination bending stresses – section

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

1. Strength of materials – R.S Kurmi and Gupta.
2. Solid Mechanics by Popov
3. Strength of materials – Ryder, G.H, Macmillan long man publications.
4. Strength of materials – W.A Nash , TMH

REFERENCES

1. Strength of materials – by Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of structures Vol-III, by S.B. Junnarkar.
4. Strength of materials by S. Timshenko

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II Year B.Tech. Mech-I Sem	**L**	**T/P/D**	**C**
	4	-	4

(A53015) THERMODYNAMICS

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

Introduction : Basic concepts: System, Control volume, Surrounding boundaries, Universe, Types of systems, Macroscopic and Microscopic view points, Concept of Continuum, Thermodynamics Equilibrium, state, Property, Process, Cycle – Reversibility – Quasi – static Process irreversible process, Causes of irreversibility – Energy in state and Transition, Types, Work and heat, Point and path function. Zeroth Law of Thermodynamics – Concept of quality of temperature – Principles of Thermometry – Reference points – Const. Volume gas thermometer – Scales of temperature, Ideal gas scale

UNIT – II

PMM I – Joule's experiments – First law of thermodynamics – Corollaries – First law applied to a process – applied to a flow system – Steady flow energy equation. Limitations of the first law – Thermal Reservoir, Heat pump, Parameters of performance, Second law of thermodynamics, Kelvin planck and Clausius Statements and their Equivalence/ Corollaries, PMM of second kind, Carnot's principle, Carnot cycle and its specialities, Thermodynamic scale of temperature, Clausius inequality, Entropy, Principle of Entropy increase – Energy equation, Availability and irreversibility – Thermodynamic Potentials, Gibbs and Helmhoultz functions, Maxwell Relations – Elementary Treatment of the third law of thermodynamics.

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

Perfect Gas Laws – Equation of State, specific and universal Gas constants – various Non-flow processes, properties, end states, Heat and work Transfer, changes in internal energy – Throttling and free Expansion Processes – Flow processes – Deviations from perfect Gas Model – Vander walls Equation of State – Compressibility charts – variable specific Heats – Gas tables.

Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. And Molecular internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases

UNIT – V

Power Cycles : Otto Diesel, Dual combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P-V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

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
4. Thermodynamics – Robert Balmer, Jaico pub.
5. Thermodynamics – J.P Holman, McGrawHill
6. Engineering Thermodynamics – K.Ramakrishna, Anuradha publishers.
7. Fundamentals of thermodynamics – Sonntag, Borgnakke and van wylen, John wiley & sons (ASIA) Pte Ltd

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II Year B.Tech. Mech-I Sem	**L**	**T/P/D**	**C**
	4	1	4

(A53016) METALLURGY AND MATERIAL SCIENCE

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, periiectoid 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

NON-FERROUS METALS AND ALLOYS: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT – V

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

COMPOSITE MATERIALS: Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites.

TEXT BOOKS:

1. Introduction to Physical Metallurgy / Sidney H. Avener
2. Essential of Materials science and engineering / Donald R. Askeland/ Thomson.

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
6. Material science & material / C.D Yesudian & harris Samuel.
7. Engineering materials and their applications – R.A Flinn and P.K Trojan/ Jaico books.
8. Engineering materials and metallurgy / R.K Rajput/ S.Chand.

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II Year B.Tech. Mech-I Sem	L	T/P/D	C
	3	-	3

(A53017) ENVIRONMENTAL STUDIES

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.

(b) Biodiversity and its conservation: Introduction - Definition: genetic, species and ecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. ICUN categories of biodiversity and RED DATA book - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

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.

Waste water and sewage treatment technology: primary, secondary and tertiary treatments. Bioremediation, Phyto-remediation, ZLD (zero liquid discharge), membrane technology. Application of GIS and GPS system in environmental science.

(b) Environmental policy, Rules and regulations. EIA (Environmental Impact Assessment) & EMP (ENVIRONMENTAL Management Plan) – Environment Protection Act. - Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act –Forest Conservation Act.-Public awareness. Global environmental problems and global efforts.

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:

1. Environmental Science: towards a sustainable future by Richard T.Wright.2008 PHL Learning Private Ltd New Delhi

2. Environmental Engineering and science by Gilbert M.Masters and Wendell P.Ela.2008 PHI Learning Pvt. Ltd.

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II Year B.Tech. Mech-I Sem	**L**	**T/P/D**	**C**
	3	1	3

(A53001) MATHEMATICS – III

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 place 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:

Solution of Algebraic and Transcendental Equations – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method. Solving system of non-homogeneous equations by L-U Decomposition method (Crout's Method)Jacobi's and Gauss-Seidel Iteration method,

UNIT-II:

INTERPOLATION: Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols- Difference Equations - Differences of a polynomial-Newton's formulae for interpolation – Central difference interpolation Formulae – Gauss Central Difference Formulae –Interpolation with unevenly spaced points-Lagrange's Interpolation formula.

UNIT-III:

NUMERICAL DIFFERENTIATION, NUMERICAL INTEGRATION & CURVE FITTING: Numerical Differentiation, Generalized Quadrature (Newton's Cote's formula), Trapezoidal, Simson's and Weddle's rules and problems. Curve fitting: Fitting a straight line – Second degree curve – exponentional curve-power curve by method of least squares.

UNIT – IV:

NUMERICAL SOLUTION OF IVP'S IN ODE: Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods –Predictor-Corrector Methods- Adams-Bashforth Method-Milne Thamson Method.

UNIT-V:

PARTIAL DIFFERENTIAL EQUATIONS: Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (Standard type) equations, Charpits Method, Method of separation of Variables for second order equations. Classification of general second order partial differential equations. Applications of Partial Differential Equations-One dimensional wave equation, Heat equation.

TEXT BOOKS:

1. Grewal B.S (2007), Higher Engineering Mathematics, 40th Edition, New Delhi, Khanna Publishers.
2. Iyengar T.K.V., Krishna Gandhi B. & Others (2011), Mathematical Methods, 10th Revised Edition, New Delhi, S. Chand & Company Limited.
3. Advanced Engineering Mathematics: Erwin Kreyszig, Wiley.

REFERENCES:

1. Shahanaz Bathul (2007), Mathematical Methods, 3rd Edition, Hyderabad, Right Publishers.
2. Jain R. K., and Iyengar S. R. K (2008), Advanced Engineering Mathematics, 3rd Edition, New Delhi, Narosa Publication House.
3. Introductory Methods of Numerical Analysis. S.S. Sastry, Prentice Hall.
4. Numerical Analysis (Paper IV), First Edition 2010, Telugu Akademi, Hyderabad.
5. Schaum's outline series on Matrices.
6. Mathematical Methods of Science and Engineering (Aided with Matlab) Kanti B.Datta (2012), Seventh Edition, CENGAGE Learning.

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II Year B.Tech- Mech-I Sem	**L**	**T/P/D**	**C**
	3	1	3

(A53018) ELECTRICAL AND ELECTRONICS ENGINEERING

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' 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:

AC MACHINES: Transformers: Principle of operation of 1-phase transformers, construction, oc & sc tests, losses, efficiency & regulation, applications.

Induction machines: Principle of operation of 3-phase induction machines, torque-slip characteristics. Losses and efficiency and applications.

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:

CATHODE RAY OSCILLOSCOPE: Principles of CRT (Cathode Ray Tube), Deflection, sensitivity, Electroscopic and Magnetic deflection, Application of CRO-voltage, Current and frequency measurements.

TEXT BOOKS:

1. Principles of Electrical and Electronics Engineering -*V.K.Mehta*, 2nd edition, S.Chand & Co, 2008.
2. Introduction to Electrical Engineering - *Kothari and Nagarath*, 2nd edition, TMH Publications.
3. Fundamentals of Electrical Engineering and Electronics - *J.B. Gupta*, S.K. Kataria & sons Publications, 2002.

REFERENCES:

1. Basic Electrical Engineering - *Kothari and Nagarath*, TMH Publications, 2nd edition
2. Electrical and Electronics Technology - *Hughes* – Pearson education

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II Year B.Tech. Mech-I Sem	**L**	**T/P/D**	**C**
	-	3	-

(A53019) PERSONALITY DEVELOPMENT AND SOFT SKILLS

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

Interpersonal Relations & Communication, Body Language, Teamwork & Leadership Quality.

UNIT-IV

Etiquette & Manners, Time Management, Matrix

UNIT-V

Problem Solving and Decision Making, Conflict & Conflict Management, Stress Management

TEXT BOOKS:

1. Managing Soft Skills for Personality Development, Edited by B.N. Ghosh, published by Mc Graw Hill Education (India) Private Limited

REFERENCES:

1. Carver,C.S and Scheier, M.F. (2000), on Perspectives Personality, 4th ed., Boston: Allyn and Bacon
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
4. Carneige, Dale. How to win friends & Influence People. Maanu Graphics Publishers

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II Year B.Tech. Mech-I Sem	**L**	**T/P/D**	**C**
	-	3	2

(A53205) MECHANICS OF SOLIDS LAB

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

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(A53206) METALLURGY LAB

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.
9. Study of the Micro Structure of Heat treated steels.
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.

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(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.

C) Inert Gas welding, TIG & MIG welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering & Brazing, Heat affected zones in welding, welding defects – causes and remedies – Destructive, Non destructive testing of welds.

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.

Stamping, forming and other cold working processes, Blanking and piercing – Bending and Forming – Drawing and its types, Deep Drawing – wire drawing and Tube drawing – coining – Hot and cold spinning – Types of presses and press tools, Forces and power requirement in the above operations.

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.

FORGING PROCESSES: Principles of forging – Tools and dies – Types Forging – Smith forging, Drop Forging – Roil forging – Forging hammers: Rotary forging – Forging defects.

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

TEXT BOOKS:

1. Manufacturing Processes for Engineering Materials – Serope Kalpakjian and Steven R Schmid, Pearson Publication.
2. Manufacturing Technology – P.N Rao, TMH
3. Production Technology – Sarma P.C, S.Chand publication.

REFERENCES:

1. Production Technology / R.K Jain
2. Process and materials of manufacturing – Lindberg/PE
3. Principles of metal Castings – Roenthal.
4. Welding Process – Paramar
5. Production Engineering – Suresh Dalela & Ravi Shanker / Galgotia Publications Pvt. Ltd.
6. Manufacturing Engineering and Technology / Kalpakjin. S / Pearson Edu.

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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.

MACHINES: Mechanism and machines – classification of machines – Kinematic chain – inversion of mechanism – inversions of quadric cycle, chain – single and double slider crank chains.

STRAIGHT LINE MOTION MECHANISMS: Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russul – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, pantograph.

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.

STEERING Mechanisms: Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio.

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.

HOOKE'S JOINT: Single and double Hooke's joint – Universal coupling – application – problems.

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 interfererence, 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

GEAR TRAINS: Introduction – Train value – Types – Simple and reverted wheel train – Epicyclic gear train, Methods of finding train value or velocity ratio – Epicyclic gear trains, Selection of gear box – Differential gear for an automobile.

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
3. Theory of Machines R.S Khurmi & J.K Gupta

REFERENCES:

1. Theory of Machines – Rattan .S.S, TMH, 2009 Edition
2. Theory of Machines – PL. Ballaney / kharina publishers,
3. Theory of Machines Sadhu Singh Pearsons Edn
4. Mechanism and Machine Theory / JS Rao and RV Dukkipati / NewAge
5. Theory of Machines / Shigley / Oxford.

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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

I.C ENGINES: Classification – Working principles, Valve and Port Timing Diagrams, Air – Standard, Air-fuel and actual cycles – Engine systems – Fuel, Carburetor, Fuel injection system & its Types, Ignition, Comparison of Air Standard and Actual Cycles, Actual and Fuel-Air Cycles of CI Engines.

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.

Combustion of C.I Engines: Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock – Need for air movement suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT – III

Performance and Testing: Parameters of performance – measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

UNIT – IV

RECIPROCATING & 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:

1. IC Engines – Mathur & Sharma – Dhanpath Rai & Sons.
2. Engineering fundamentals of IC Engines – Pulkrabek / Pearson / PHI
3. Thermal Engineering / Rudramoorhty – TMH
4. Thermodynamics & Heat Engines / B.Yadav / Central Book Depot, Allahabad.
5. I.C Engines / Heywood / McGrawHill.
6. Thermal Engineering – R.S Khurmi & J.K Gupta – S.Chand
7. Thermal Engineering data book – B. Srinivasulu Reddy / JK international.

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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

FLUID STATICS: Dimensions and units: physical properties of fluids - specific gravity, viscosity, surface tension – vapor pressure and their influence on fluid motion – atmospheric, gauge and vacuum pressures – measurement of pressure – Piezometer, U-tube and differential manometers.

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

CLOSED CONDUIT FLOW: Reynold's experiment-Darcy Weisbach equation-Minor losses in pipes – pipes in series and pipes in parallel – total energy line – hydraulic gradient line. Measurement of flow: pitot tube, venture meter and orifice meter.

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

RECIPROCATING 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.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

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(A54017) MACHINE DRAWING

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:

1. Machine Drawing – Ajeet Singh, TMH Publications
2. Machine Drawing – K.L Narayana, P.Kannaiah & K.Venkata Reddy/ New Age/publishers.
3. Machine Drawing – N.D Bhatt.

REFERENCES:

1. Machine Drawing – P.S. Gill.
2. Machine Drawing – Luzzader
3. Machine Drawing – Rajput

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)

UNIT-V: Stochastic Process: Introduction to stochastic Process, Classification of Random Processes, Stationary and non-stationary random process, Stochastic Matrix.
Markov Chain: Classification of States, Classification of chains, Random Walk and Gambler Ruin.

TEXT BOOKS:

1. Probability and Statistics for Engineers and Scientists by Sheldon M. Ross, Academic Press.
2. Probability and Statistics for Engineers by Richard A Johnson, Pearson Education.
3. Introduction to Probability by Charles M Grinstead, J Laurie Snell, American Mathematical Society.

REFERENCES:

1. A.V. Skorokhod, Basic Principles and Applications of Probability Theory, Springer.
2. Arnold O. Allen, Probability & Statistics, Academic Press.
3. Hwei P. Hsu, Theory and Problems of Probability, Random Variables, and RandomProcesses, Schaum's Outline Series, McGraw- Hill.
4. Mendan Hall, Probability & Statistics, Beaver Thomson Publishers.
5. Miller and John E. Freund, Probability & Statistics for Engineers, Prentice Hall of India.
6. Montgomery: Design and Analysis of Experiments, Wiley.
7. T.T. Soong, Fundamentals of Probability and Statistics for Engineers, JohnWiley & Sons, Ltd.
8. Zivorad R. Lazic, Design of Experiments in Chemical Engineering, Wiley-VCH.

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(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)

Introduction, Preparing for womanhood. Growing up male. First lesson in caste. Different Masculinities.

Just Relationships: Being Together as Equals (Towards a world of equals: Unit-12)

Mary Kom and Onler. Love and acid just do not mix. Love Letters. Mothers and Fathers. 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)

Fact and Fiction. Unrecognized and unaccounted work. Further Reading: Wages and Conditions of Work.

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)

Is Home a Safe Place? – When Women Unite [Film]. Rebuilding Lives. Further Reading: New Forums for Justice.

Thinking about sexual Violence (Towards a world of equals: Unit-11)

Blaming the Victim- "I Fought for my life….." – Further reading: The Caste Face of Violence.

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 exertise in this field.

Reference Books:

1. Sen, Amartya, "More than One Million Women are Missing." New York Review of Books 37.20 (20 December 1990). Print. 'We Were Making Hisoty…' Life Stories of Women in the Telangana People's Struggle. New Delhi: Kali for Women, 1989.

2. Tripti Lahiri. “By the Numbers: Where Indian Women Work.” Women’s Studies Journal (14 November 2012) Available online at:http://blogs.wsj.com/ India real time/2012/11/14/by-the-numbers-where-Indian-women-work/>
3. K.Satyanarayana and Susie Tharu (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2, Telugu and Kannada http://harpercollings.co.in/BookDetail.asp?Book Code=3732
4. Vimala. “Vantilliu (The Kitchen)”. Women Writing in India: 600 Bc To the Present, Volume It: The 20th Century, Ed. Susie Tharu and K.Lalitha. Delhi: Oxford University Press, 1995. 599-601.
5. Shatrunghna, Veena et al. Women’s Work and its impact on Child Health and Nutrition, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research, 1993.
6. Stree Shakti Sanghatana. “We Were Making History…’ Life Stories of Women in the Telangana People’s Struggle, New Delhi: Kali for Women, 1989.
7. Menon, Nivedita, Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
8. Jayaprabha, A. “Chupulu (Stares)”. Women Writing in India: 600BC to the Present. Volume II: The 20th Century Ed. Susie Tharu and K.Lalita, Delhi: Oxfor Univerity Press. 1995, 596-597.
9. Javeed. Shayan and Anupam Manuhaar. “Women and Wage Discrimination in India: A Critical Analysis.” International Journal of Humanities and Social Science Invention 2,.4 (2013).
10. Gautam, Liela and Gita Ramaswamy. “A ‘conversation’ between a Daughter and a Mother.” Broadsheet on Contemporary Politics. Special Issue on Sexuality and Harassment: Gender Politics on Campus Today. Ed. Madhumeeta Sinha and Asma Rasheed. Hyderabad: Anveshi Research Center for Women’s Studies, 2014.
11. Abdulali Sohaila. “I Fought For My Life… and Won.” Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
12. Jeganathan pradeep, Partha Chatterjee (Ed). “Community, Gender and Violence Subaltern Studies XI”. Permanent Black Ravi Dayal Publishers, New Delhi, 2000.
13. K.Kapadia. The Violence of Development: The Politics of Identity, Gener and Social Inequalities in India. London: Zed Books, 2002.
14. S.Benhabib. Situating the Self: Gender, Community, and Postmodernism in Contemporary Ethics, London: Routledge, 1992.
15. Virginia Woolf. A Room of One’s Own, Oxford: Black Swan, 1992.
16. T.Banuri and M. Mahmood, Just Development Beyond Adjustment with a Human Face, Karachi: Oxford University Press, 1997.

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(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.
3. Brake test on 3-phase induction motor.
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.
6. Microprocessor.

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(A54207) PRODUCTION TECHNOLOGY LAB

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

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press: Deep drawing and extrusion operation.
3. Bending operations.

IV. PROCESSING OF PLASTICS

1. Injection Moulding
2. Blow Moulding

REFERANCES:

1. Dictionary of Mechanical Engineering – G.H.F Nayer, Jaico publishing.

NOTE: Any 10 experiments from the above are to be conducted taking atleast 4 from each section.

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II Year B.Tech. Mech-II Sem	**L**	**T/P/D**	**C**
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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.
8. Calibration of Venturimeter.
9. Calibration of Orifice mater.
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.

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(A55023) DYNAMICS OF MACHINERY

PREREQUISITE: Engineering Mechanics- I & II, Mechanics of Solids, Kinematics of Machinery

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: Introduction – Free Body Diagrams – Conditions for equilibrium – Two, three and four force Members – Inertia forces and D' Alembert's Principle – planar rotation about a fixed center.

UNIT – II

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

BRAKES AND DYNAMOMETERS: Simple block brakes, internal expanding brake, band brake of vehicle, Dynamometers – absorption and transmission types. General description and methods of operations.

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

BALANCING : Balancing of rotating masses Single and multiple – single and different planes. Balancing of Reciprocating Masses, Primary and secondary balancing of reciprocating masses. Analytical and graphical methods – Unbalanced forces and couples – Balancing of "V" Engine, Multi cylinder in line and radial engines, balancing of locomotive.

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:

1. Theory of machines and Mechanisms by P.L. Ballaney, Khanna publishers.
2. Kinematics and Dynamics of Machinery by R.L.Norton, Mc Graw Hill.
3. Mechanism and Machine Theory / JS Rao and RV Dukkipati / Newage
4. Theory of Machines and Mechanisms by Uicker, Pennock and Shigley Oxford.

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(A55024) DESIGN OF MACHINE MEMBERS-I

PREREQUISITE: Engineering Mechanics- I & II, Engineering Drawing – I & II, Mechanics of Solids.

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.

STRESSES IN MACHINE MEMBERS: Simple stresses – Complex stresses – impact stresses – stress strain relations – static theories of failure – factor of safety – Design for strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations.

STRESSES DUE TO FATIGUE LOADING: Stress concentration – Theoretical stress – Concentration factor – Fatigue stress concentration factor notch sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Fatigue theories of failure – Goodman and Soderberg.

UNIT – II

RIVETED AND WELDED JOINTS: Riveted joints: Modes of failure of riveted joints – Strength equations – efficiency of riveted joints – Design of boiler joints – eccentrically loaded riveted joints.

Welded joints: Design of Fillet welds – axial loads – Circular fillet welds – bending and torsion – eccentrically loaded joints.

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

MECHANICAL SPRINGS: Stresses and deflections of helical springs – Extension – compression springs – Springs for static and fatigue loading – natural frequency of helical springs – Energy storage capacity – helical torsion springs – Co-axial springs, Design of leaf springs.

TEXT BOOKS:

1. Mechanical Engineering Design by Bahi and Goel, Standard Publications.
2. Machine Design by R.L.Norton, Mc Graw Hill/

REFERENCES:

1. Machine Design by Timothy H. Wenzell PE, Cengage.
2. Machine Design by V.Bandari, Tmh Publishers
3. Machine Design by / Schaum Series
4. Machine Design by Pandya & shah.
5. Machine Design by S. MD Jalaluddin, Anuradha Publishers.

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

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(A55025) METROLOGY AND SURFACE ENGINEERING

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.

LIMIT GAUGES: Taylors principle – Design of go and No go gauges, plug ring, snap, gap. Taper. Profile and position gauges.

UNIT – III

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

FLAT SURFACE MEASUREMENT: Measurement of flat surfaces – instruments used – straight edges – surface plates – optical flat and auto collimator.

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.

SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surface waviness – Numerical assessment of surface finish – CLAIR, R.M.S Valves – Rz value, Methods of measurement of surface finish – profilograph, Talysurf. ISI, symbols for indication of surface finish.

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:

1. Manufacturing Engineering and Technology, Serope Kalpakjian and steven R. Schmid, Ed,4, Pearson Publications, 2001
2. Metrology and Measurement, Anand Bewoor, Vinay A. Kulkarni, TMH,2009
3. Engineering Metrology, R. K. Jain, Khanna Publishers
4. Principles of Engineering Metrology, R.Ranendra, JAICO Publications,2008

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.
4. Surface Engineering for corrosion and wear resistance / JR Davis / Woodhead Publishers.
5. Precision Engineering and Manufacturing / R.L Murty / Newage Publications,2009

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(A55026) AUTOMOBILE ENGINEERING

(PROFESSIONAL ELECTIVE-I)

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

S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump – filters – carburetor – types – air filters – petrol injection. M.P.F.I system

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.

Emission from Automobiles – Pollution standards National and international – Pollution control – Techniques – Multipoint fuel injection for S.I. Engines. Common rail diesel injection Energy alternatives – Solar, photo – voltaic, hydrogen, Biomass, alcohols, LPG, CNG, liquid Fuels and gaseous fuels, electrical – their merits and demerits.

TEXT BOOKS:

1. Automobile Engineering / William Crouse, TMHILL Publishers.
2. A systems Approach to Automobile Technology, Jack Erjavec, YESSDEE Publishers Pvt. Ltd. New Delhi.

REFERENCES:

1. Automotive Mechanics / G.B.S.Narang
2. Automotive Mechanics / Heitner
3. Automotive Engines / Srinivasan
4. Automobile Engineering – K.K Ramalingam / Scitech Publications
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

Introducing- Welding as a Production Process – its advantages and limitations. Gas Welding Process, Types of fuels, Actylene, Indane, Butane, etc. Gas welding equipment, Gas welding technique. Electric arc welding – Manual metal arc welding – Power supplies, cables and other accessories for arc welding, Welding technique – atomic, hydrogen welding, Thermit welding, soldering, Brazing and braze welding.

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

Modern welding Processes – Electron beam welding, plasma arc welding, Friction welding, Explosive welding, Ultrasonic welding, Stud welding, Under water welding, Diffusion bonding, Cold welding, Welding of dissimilar metals.

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

Weldability, Automation and Design in Welding-Weldability – definition. Temperature Distribution in welding – heat affected zone weldability of steel, cast iron. Aluminum, Pre heating and post heating of weldments. Estimation of transition temperature. Automation in welding – Seam tracking vision and arc sensing welding robots. Design of weldments-Welding symbols positions of welding joint and groove design. Weld stress – Calculations – Design of weld size.

TEXT BOOKS:

1. Abbott,J & smith, K.M. Welding technology; Texas State Technical College Publishing.
2. Radhakrishnan. V.M. welding Technology and Design, New age International Pub. Ltd.,

REFERENCES:

1. Little R.L. , Welding Technology Tata Mcgraw – hill
2. Partmer R.S. Welding Process and Technology, Khanna Publishers.
3. Lancaster J.F., Metallurgy of Welding, Georgy Allen Unwin.
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:

STEAM NOZZLES: Convergent and Convergent-Divergent nozzles, Energy Balance, Effect of backpressure of analysis. Designs of nozzles.

STEAM TURBINES: Impulse turbines, Compounding, Work done and Velocity triangle, Efficiencies, Constant reactions, Blading, Design of blade passages, Angle and height, Secondary flow. Leakage losses, Thermodynamic analysis of steam turbines.

UNIT-III:

GAS DYNAMICS: Fundamental thermodynamic concepts, isentropic conditions, Mach numbers and area, Velocity relations, Dynamic Pressure, Normal shock relation for perfect gas. Supersonic flow, oblique shock waves. Normal shock recoveries, detached shocks, Aerofoil theory.

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:

AXIAL FLOW COMPRESSORS: Flow Analysis, Work and velocity triangles, Efficiencies, Thermodynamic analysis. Stage pressure rise, Degree of reaction, Stage Loading, General design, Effect of velocity, Incidence, Performance.

CASCADE ANALYSIS: Geometrical and terminology. Blade force, Efficiencies, Losses, Free end force, Vortex Blades.

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:

1. Principles of Jet Propulsion and Gas Turbine/NJ Zucrow/John Wiley & Sons/Newyork
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
6. Gas Turbines Theory and Practice/Zucrow/John Wiley & Sons/Newyork
7. Element of Gas Dynamics/Liepeman and Roshkow/ Dover Publications

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(A55029) MACHINE TOOLS

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

ELEMENTARY TREATMENT OF METAL CUTTING THEORY – Element of cutting process – Geometry of single point tool and angles chip formation and types of chips – built up edge and its effects chip breakers, Mechanics of orthogonal cutting – Merchant's Force diagram, cutting forces – cutting speeds, feed, depth of cut, tool life, coolants, machinability – Tool materials.

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.

TURRET AND CAPSTAN LATHES – collet chucks – other work holders – tool holding devices – box and tool layout.

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.

DRILLING AND BORING MACHINES – Principles of working, specifications, types, operations performed – tool holding devices – Twist drill – Boring machines – Fine boring machines – Jig Boring machine, Deep hole drilling machine.

UNIT – IV

MILLING MACHINES – Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – machining operations, Types geometry of milling cutters – milling cutters – method of indexing – Accessories to milling machines.

UNIT – V

GRINDING MACHINES – Fundamentals – Theory of grinding – classification of grinding machine – cylindrical and surface grinding machines – Tool and cutter grinding machine – special types of grinding machines – Different types of abrasives – bonds, specification and selection of a grinding wheel.

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

1. Production Technology by R.K. Jain and S.C.Gupta.
2. Production Technology by H.M.T.
3. Manufacturing Technology by P.N. Rao

REFERENCES:

1. Machine Tools – C.ELANCHEZHIAN and M.Vijayan / Anuradha Agencies Publishers.
2. Workshop Technology – B.S Raghu Vamshi – Vol-ii.

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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

BASIC CONCEPTS of RANKINE CYCLE: Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating, Combustion, fuels and combustion, concepts of heat of reaction, adiabatic flame temperature, stoichiometry, fuel gas analysis.

UNIT – II

BOILERS: Classification – Working principles – with sketches including H.P Boilers – Mountings and Accessories – Working principles, Boiler horse power, equivalent evaporation, efficiency and heat balance – Draught, classification – Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced.

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.

GAS TURBINES: Simple gas turbine plant – ideal cycle, essential components – parameters of performance – actual cycle – regeneration inter cooling and reheating – Closed and semi-closed cycles – merits and demerits, Brief concepts about compressors, combustion chambers and turbines of gas turbine plant.

UNIT – V

JET PROPULSION: Principle of operation – classification of jet propulsive engines – Working principles with schematic diagrams and representation on T-S diagram – Thrust, Thrust Power and Propulsion Efficiency – Turbo jet engines – Needs and demands met by Turbo jet – Schematic Diagram, Thermodynamic cycle, Performance Evaluation Thrust Augmentation – Methods.

ROCKETS: Application – Working Principle – Classification – Propellant Type – Thrust, Propulsive Efficiency – Specific impulse – solid and liquid propellant Rocket Engines.

TEXT BOOKS:

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

REFERENCES:

1. Thermodynamics and Heat Engines / R.Yadav / Central Book Depot.
2. Gas Turbines and Propulsive Systems – P. Khajuria & S.P.Dubey Dhanpatrai.
3. Gas Turbines / Cohen, Rogers and Saravana Muttoo / Addison Wesley – Longman.
4. Thermal Engineering – R.S.Khurmi / JS Gupta / S.Chand.
5. Thermal Engineering – P.L Bellaney / Khanna publishers.
6. Thermal Engineering M.L. Mathur & Mehta / Jain Bros.

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(A55022) ENGLISH FOR LIFE SKILLS

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

"**Education: Indian and American" by *Anurag Mathur*** from **English for Life Skills,** published by Orient Black Swan Private Limited, Hyderabad, India.

"Teamwork Skills" by *SP Dhanavel* from **English and Soft Skills,** published by Orient Black Swan Private Limited, Hyderabad, India.

UNIT-II

"Work" by *D.H.Lawrence* from **English for Life Skills,** published by Orient Black Swan Private Limited, Hyderabad, India.

"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

"How Wealth Accumulates and Men Decay" by *G.B.Shaw* from **English for Life Skills,** published by Orient Black Swan Private Limited, Hyderabad, India.

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

TEXTBOOKS:

1. "English for Life Skills" published by Orient Black Swan Private Limited, Hyd, India.
2. "English and Soft Skills" by SP Dhanavel published by Orient Black Swan Private Limited, Hyd, India.

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.

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III Year B.Tech. MECH - I Sem	L	T / P / D	C
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(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:

What Makes a Leader, Empowering and Influencing Others, Leading Change and Innovation.

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:

1. Covey, Stephen. Seven Habits of Highly Effective People. New York: Simon and Schuster, Inc., 1989
2. Ruble, Peter . "Is Perception Reality?" www.ezinearticles.com.
3. Peale, Norman V. The Power of Positive Thinking. New York: Simon and Schuster, 2002.
4. Carneige, Dale. How to win friends & Influence People. Maanu Graphics Publishers
5. Sharma, Robin. The Monk Who Sold His Ferrari. Jaico.

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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
12. Grinding of tool angles.

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.
6. Heat balance on IC Engines.
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.
10. Dis-assembly / assembly of engines.
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
5. Study & Design Worm gears – Properties of worm gears – Selection of materials – Strength and wear rating of worm gears.

UNIT – I

SLIDING CONTACT BEARINGS: Types of Journal bearings – basic modes of Lubrication – Bearing construction – bearing design – bearing materials – Selection of lubricants.

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

DESIGN OF SPUR AND HELICAL GEAR DRIVES: Spur and Helical gears – Load concentration factor – Dynamic load factor, Surface compressive strength – Bending strength – Design analysis of Spur and Helical gears – Estimation of centre distance, module and face width, check for plastic deformation, Check for dynamic and wear considerations.

DESIGN OF BEVEL GEAR DRIVES: Bevel gears – Load concentration factor – Dynamic load factor, Surface compressive strength – Bending strength – Design analysis of Bevel gears – Estimation of centre distance, module and face width, check for plastic deformation, Check for dynamic and wear considerations.

UNIT – V

DESIGN OF WORM GEARS: Worm gears – Properties of worm gears – Selection of materials – Strength and wear rating of worm gears – force analysis – Friction in worm gears – thermal considerations.

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

TEXT BOOKS:

1. Design of Machine Elements by Kulkarni, Mc Graw Hill.
2. Machine Design, by T.V.Sundarajan Murthy and N,Shanmugam – Anuradha Publications.
3. Design Data Books – P.S.G College of Technology – Mahadevan.

REFERENCES:

1. Machine Design by V.Bandari, TMH Publishers
2. Machine Design / R.N.Norton
3. Mech. Engg. Design / JE Shigley
4. Design of machine elements by Pandya and Shah.

<u>NOTE</u>: 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.
5. Understand concepts of Radiation Heat Transfer, emissivity & Laws of Black body radiation.

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

ONE DIMENSIONAL STEADY STATE CONDUCTION HEAT TRANSFER: Homogeneous slabs, hollow cylinders and spheres – overall heat transfer coefficient – electrical analogy – Critical radius of insulation.

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

BOILING AND CONDENSATION: Boiling - Pool boiling – Regimes Calculations on Nucleate boiling, Critical Heat flux and Film boiling.

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

HEAT EXCHANGERS: Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods – Problems using LMTD and NTU methods.

UNIT – V

RADIATION HEAT TRANSFER: Emission characteristics and laws of black-body radiation – irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefen and Boltzmann – heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

TEXT BOOKS:

1. Fundamentals of Engg. Heat and Mass Transfer / R.C. SACHDEVA / New Age International.
2. Heat Transfer – P.K.Nag / TMH

REFERENCES:

1. Heat Transfer / HOLMAN / TMH
2. Heat Transfer – Ghoshdastidar – Oxford University Press – II Edition

3. Heat and Mass Transfer – Cengel – McGraw Hill.
4. Heat and Mass Transfer – R.K.Rajput – S.Chand & Company Ltd.
5. Heat and Mass Transfer – Christopher A Long / Pearson Education.
6. Heat and Mass Transfer – D. S Kumar / S.K.Kataria & Sons
7. Heat and Mass Transfer – Kondandaraman
8. Fundamentals of Heat Transfer & Mass Transfer – incropera & Dewitt / John Wiley Pub.

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:

1. Utilize the Solar energy and their impact on Environment.
2. Understand the Types of Solar Energy Collectors, Energy Storage devices and Applications.
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.

BIO-MASS : Principles of Bio-Conversion, Anaerobic . aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking I.C.Engine operation and economic aspects.

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.
2. Non – Conventional Energy Sources / G.D.Rai.

REFERENCES:

1. Renewable Energy Sources / Twidell & Weir
2. Solar Energy / Sukhatme
3. Solar Power Engineering / B.S Magal Frank Kreith & J.F Kreith.
4. Principles of solar Energy / Frank Krieth & John F. K reider.
5. Non-Conventional Energy / Ashok V.Desai / Wiley Eastern
6. Non-Conventional Energy Systems/ K.Mittal / Wheeler
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.
3. Understand fundamentals of fluid flow modeling, Explicit & Implicit methods.
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.

APPLIED NUMERICAL METHODS: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix inversion, Direct methods for Matrix inversion, Direct methods for banded matrices.

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.

Review of Equations Governing fluid flow and heat transfer, introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier – stokes equations, conservation of energy principle, special forms of the Navier stokes equations.

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:

1. Numerical heat transfer and fluid flow / Suhas V. Patankar Hema shava Publishers coporation & Mc Graw Hill.
2. Computational fluid flow and heat transfer / Muralidharan – Narosa Publications

REFERENCES:

1. Computational Fluid Dynamics; Basics with applications – John D. Anderson / Mc Graw Hill.
2. Fundamentals of Computational Fluid Dynamics – Tapan K. Sengupta / Universities Press.

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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

LOCATING AND CLAMPING METHODS: Basic Principles of Location - Locating methods and devices - Principles of clamping - Mechanical, Pneumatic and Hydraulic actuation - Clamping force analysis – Simple Design problems.

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:

1. Donaldson C., Lecain G.H. and Goold V.C. (2007), Tool Design, 3rd edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

REFERENCES:

1. Joshi P. H., (2004) Jigs and Fixtures, 2nd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
2. Edward G. Hoffman (2004) Jigs and Fixtures Design, Thomson - Delmar Learning Series, Singapore.
3. Jeff Lantrip, David A. Smith and John G. Nee, (2003) Fundamentals of Tool Design, 5th Edition, Society of Manufacturing Engineers.

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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

INTRODUCTION OF REFRIGERATION: Necessity and applications – Unit of refrigeration and C.O.P – Mechanical Refrigeration – Types of ideal cycles of refrigeration.

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

VAPOR COMPRESSION REFRIGERATION: Working principle and essential components of the plant – simple vapor compression refrigeration cycle – COP – Representation of cycle on T-S and p-h charts – effect of sub cooling and super heating – cycle analysis – Actual cycle influence of various parameters on system performance – use of p-h charts – numerical problems.

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

REFRIGERANTS: Desirable properties – classification refrigerants used – Nomenclature - Ozone Depletion – Global warming.

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

REQUIREMENTS OF HUMAN COMFORT AND CONCEPT OF EFFECTIVE TEMPERATURE – Comfort chart – Comfort Air conditioning – Requirements of industrial air conditioning, Air conditioning Load Calculations.

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.
2. Principles of Refrigeration – Dossat / Pearson Education.
3. Refrigeration and Air Conditioning - P.L. Bellaney
4. Basic Refrigeration and Air Conditioning – Ananthanarayanan / TMH.
5. Refrigeration and Air Conditioning – R.S. Khurmi & J.K Gupta – S.Chand – Eurasia Publishing House (P) Ltd.

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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 arbitry 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
2. Mechanical Vibrations by G.K.Groover.

REFERENCES:

1. Mechanical Vibrations by SS Rao, Pearson, 2009 Ed 4.
2. Mechanical Vibrations by Rao V.Dukkipati and J.Srinivas, PHI,2010
3. Mechanical Vibrations-V.Ram Murthy
4. Vibration problems in Engineering by S.P.Timoshenko.
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

Laws of friction - Friction theories - Surface contaminants - Frictional heating - Effect of sliding speed on friction - Classification of wear - Mechanisms of wear - Quantitative laws of wear – Wear resistance materials.

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:

1. Friction. Wear, Lubrication : A Text book in Tribology / Kenneth C Ludema / CRC Press / 1st Edition
2. Engineering Tribology / John Williams / Cambridge University Press / 2005
3. Engineering Tribology / Stachowiak & Batchelor / Butterworth – Heinimann / 2005

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(A56030) FINITE ELEMENT METHODS

(PROFESSIONAL ELECTIVE-IV)

PREREQUISITE: Engineering Mechanics-I&II, Mechanics of solids

COURSE OUTCOMES:

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

1. Understand the general description of an element using Rayleigh-Ritz Method, Potential Energy Method, and Weighted Residual Method.
2. Calculate stiffness matrix for different types of elements.
3. Finding stress-strain-displacement relations of various 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 back ground, 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

ONE DIMENSIONAL PROBLEMS: Stiffness equations for a axial bar element in local co-ordinates using Potential Energy approach and Virtual energy principle – Finite element analysis of uniform, stepped and tapered bars subjected to mechanical and thermal loads – Assembly of Global stiffness matrix and load vector – Quadratic shape functions – properties of stiffness matrix.

UNIT – III

ANALYSIS OF TRUSSES: Stiffness equations for a truss bar element oriented in 2D plane – Finite Element Analysis of Trusses – Plane Truss and space Truss elements – methods of assembly.

ANALYSIS OF BEAMS: Hermite shape functions – Element stiffness matrix – Load vector – Problems.

UNIT – IV

2-D STRUCTURAL PROBLEMS: CST – Stiffness matrix and load vector – Isoparametric element representation – Shape functions – convergence requirements – problems.

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

ANALYSIS OF HEAT TRANSFER PROBLEMS: 1D Heat conduction – 1D fin elements – 2D heat conduction – analysis of thin plates – Composite slabs – problems.

DYNAMIC ANALYSIS: Dynamic equations – Lumped and consistent mass matrices – Eigen Values and Eigen Vectors – mode shapes – modal analysis for bars and beams.

TEXT BOOKS:

1. The finite element methods in Engineering – S.S.Rao – Elsevier 4th edition.
2. Introduction to finite elements in engineering – Tirupathi K. Chandrupatla and Ashok D. Belagundu.

REFERENCES:

1. Finite Element Methods / Alavala / TMH
2. An introduction to Finite Element Methods – J.N. Reddy – Mc Grawhill.
3. The Finite element method in engineering science – O.C. Zienkoitz, McGrawhill.
4. Concepts and applications of finite element analysis – Robert Cook – Wiley.
5. Introduction of Finite Element Analysis – S. Md. Jalaludeen – Anuradh publications.

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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
5. Understand the concept of Dispatching – Activities of dispatcher – Dispatching procedure – follow up – definition – reasons for existence of functions.

UNIT – I

Introduction : Definitions – objectives of production planning and control – functions of production planning and control – elements of production control – types of production – organization of production planning and control – internal organizations department.

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

UNIT – II

Inventory management – Functions inventory – Relevant inventory cost – ABC analysis – VED Analysis – EOQ model – inventory control systems – P – Systems and Q – Systems

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

UNIT – III

Routing – Definition – routing procedure – Route sheets – Bill of material – factors affecting routing procedure, Schedule – definition – difference with loading.

UNIT – IV

Scheduling policies – techniques, standard scheduling methods – job shop, flow shop. Line balancing, aggregate planning – methods for aggregate planning – Chase planning, expediting, control aspects.

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:

1. Production Planning and Control – M.Mahajan – Dhanpati rai & Co.
2. Production Planning and Control Jain & Jain – Khanna publications

REFERENCES:

1. Production Planning and Control – Text & cases / SK Mukhopadhyaya.
2. Production and operations Management – R.Paneer Selvam – PHI
3. Operations Management by Chase / phi
4. Management Science - A.R.Aryasri – 4e – TMH
5. Operations Management – Heizer – Pearson

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(A56032) FLEXIBLE MANUFACTURING SYSTEMS

(PROFESSIONAL ELECTIVE-IV)

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

FLEXIBLE MANUFACTURING SYSTEMS: FMS - Introduction - Evolution - Definition - Need - Economic Justification, Application - Machine tool Selection and Layout - Computer control system - Data files - Reports - Planning the FMS - Analysis Methods for FMS - Benefits and limitations.

UNIT - IV

FLEXIBLE MANUFACTURING CELLS: Introduction - Cell description and classifications - Unattended machining - Component handling and storage system - Cellular versus FMS - System - Simulation, Hardware configuration - Controllers - Communication networks – Lean production and agile manufacturing.

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:

1. William W. Luggen, "*Flexible Manufacturing Cells and Systems"*, Prentice Hall, New Jersey, 1991.
2. Mikell P. Groover, "*Automation Production Systems &Computer Integrated manufacturing"*, Prentice Hall of India, New Delhi, 2007.
3. Jha.N.K, "*Handbook of Flexible Manufacturing Systems*", Academic Press Inc., 1991.

REFERENCES:

1. David J. Parrish, "*Flexible Manufacturing"*, Butterworth-Heinemann, Newton, MA, USA, 1990.
2. Radhakrishnan.P and Subramanyan.S, "*CAD/CAM/CIM"*, Wiley Eastern Ltd., New Age International Ltd., 1994.
3. Raouf.A and Ben-Daya.M, Editors, "*Flexible manufacturing systems: recent development"*, Elsevier Science, 1995.
4. Kalpakjian, "*Manufacturing engineering and technology"*, Addison-Wesley Publishing Co., 1995.
5. Taiichi Ohno, "*Toyota production system: beyond large-scale production"*, Productivity Press (India) Pvt. Ltd. 1992.

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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
5. Understand Double – Entry Book Keeping, Journal, Ledger, and Trial Balance

UNIT – I

INTRODUCTION TO MANAGERIAL ECONOMICS: Definition, Nature and scope of Managerial Economics – Demand Analysis: Demand Determinants, Law of Demand and its exceptions.

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:

1. Aryasri, Managerial Economics and Financial Analysis, TMH, 2009.
2. Varshney & Maheshwari; Managerial Economics, Sultan Chand, 2009.

REFERENCES:

1. Raghunatha Reddy & Narasimhachary; Managerial Economics & Financial Analysis, Scitech, 2009.
2. V. Rajasekarn & R.Lalitha, Financial Accounting, Pearson Education, New Delhi, 2010.
3. Suma Damodaran, Managerial Economics, Oxford University Press, 2009.
4. Domnick Salvatore; Managerial Economics in a Global Economy, 4th Edition, Cengage, 2009.
5. Subhash Sharma & M.P.Vittal, Financial Accounting for Management, Text & Cases, Machmillan, 2008.
6. S.N. Maheshwari & S.K .Maheshwari, Financial Accounting, Vikas 2008.
7. Truet and Truet; Managerial Economics; Analysis, Problems and Cases, Wiley, 2009.
8. Dwivedi; Managerial Economics, Vikas 2009.
9. M. Kasi Reddy, S.Saraswathi; Managerial Economics and Financial Accounting, PHI, 2007.
10. Erich A. Helfert; Techniques of Financial Analysis, Jalco, 2007.

Codes / Tables: Present Value Tables need to be permitted into the examinations Hall.

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(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.
10. Emissive apparatus.
11. Stefan Boltzman Apparatus
12. Critical Heat flux apparatus.
13. Study of heat pipe and its demonstration.
14. Study of two – Phase flow.

Note: Any 12 Experiments are to be conducted from the above.

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(A56206) ADVANCED ENGLISH COMMUNICATION SKILLS LAB

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:

1. **Vocabulary Building** – synonyms and antonyms, Word Roots, One-Word Substitutes, Prefixes and Suffixes, Study of Word Origin, Analogy, Idioms and Phrases.
2. **Reading Comprehension –** Reading for Facts, Guessing meanings from context, Scanning, Skimming, Inferring Meaning, and Critical Reading.
3. **Writing Skills** –Structure and presentation of different types of writing - Resume Writing /E-Correspondence/Statement of Purpose.
4. **Technical Writing**- Technical Report Writing, Research Abilities/Data Collection/Organizing Data/Tools/Analysis.
5. **Group Discussion** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Coherence.
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:**

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.
3. English Language Communication : A Reader cum Lab Manual Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
4. English Vocabulary in Use series, Cambridge University Press 2008.
5. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
7. Handbook for Technical Writing by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
10. English for Technical Communication for Engineering Students, Aysha Vish hwamohan, Tata Mc Graw-Hil 2009.
11. Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron‘s/DELTA/Cambridge University Press.
12. International English for Call Centres by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

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(A57025) CAD/CAM

PREREQUISITE: Engineering Drawing – I & II, Machine drawing and Machine Tools.

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

NUMERICAL CONTROL: NC, NC modes, NC elements, NC machine tools structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming.

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
2. Computer Aided Design and Manufacturing – Lalit Narayan , etal – PHI
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
6. Computer Numerical Control Concepts and programming / Warren S. S eames / Thomson.

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(A57026) MECHANICAL MEASUREMENTS AND INSTRUMENTATION

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

DEFINITION – Basic principles of measurement – Measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. Dynamic performance characteristics – sources of error, Classification and elimination of error.

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

MEASUREMENT OF TEMPERATURE: Classification – Ranges – Various Principles of measurement – Expansion, Electrical Resistance Thermistor – Thermocouple – Pyrometers – Temperature indicators.

MEASUREMENT OF PRESSURE: Units – classification – different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges – ionization pressure gauges, Mcleod pressure gauge.

UNIT – III

MEASUREMENT OF LEVEL: Direct method – indirect methods – capacitative, 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:

1. Measurement Systems : Applications & Design by D.S Kumar, Anuradha Agencies.
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
3. Mechanical and industrial Measurements / R.K Jain / Khanna Publishers.
4. Mechanical Measurements / Sirohi and Radhakrishna / New Age
5. Instrumentation & mech. Measurements by A.K.Tayal, Galotia Publications.

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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
3. Various inventory models, solving waiting line problems, deciding best strategies by theory of games.
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:

LINEAR PROGRAMMING METHOD: Problem formulation – Graphical solution – Simplex method – Artificial variables Techniques – Two – phase method, Big-M method – Duality principle.

UNIT – II

TRANSPORTATION PROBLEM: Formulation – Optimal solution – unbalanced transportation problem – Degeneracy, Assignment problem – Formulation – Optimal solution – Variants of Assignment Problem – Travelling salesman problem.

UNIT – III

THEORY OF GAMES: Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – dominance principle – m X 2 & 2 X n games – graphical method.

WAITING LINES: Introduction – Single Channel – Poisson arrivals exponential service times – with infinite population and finite population models – Multichannel – Poisson arrivals – exponential service times with infinite population single channel Poisson arrivals.

UNIT – IV

SEQUENCING: Introduction – Flow – Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines.

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

DYNAMIC PROGRAMMING: Introduction – Terminology – Bellman's Principle of optimality – Applications of dynamic programming – shortest path problem – linear programming problem.

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:

1. Operations Research / S.D.Sharma – Kedarnath
2. Operations Research / J.K . Sharma 4e / MacMilan
3. Operations Research / R.Pannerselvam 2e, PHI Publications

REFERENCES:

1. Operations Research / A.M. Natarajan, P.Balasubramani, A.Tamilarasi / Pearson Education.
2. Operations Research: Methods & Problems / Maurice Saseini, Arhur Yaspan & Lawrence Friedman.
3. Introduction to O.R / Taha 8e / PHI
4. Operations Research / Wagner / PHI Publications.
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

ENERGY MANAGEMENT : Definition, Scope of energy management, General Principles, Objectives and necessary steps energy management, Energy Manager- Qualifications, Functions, Duties and guidelines, Language. Energy Action Planning, Energy Monitoring and Targeting, Bench Marking,

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

ENERGY CONSERVATION: Introduction, Indian Energy Conservation Act, List of Energy Intensive Industries, Rules for Efficient Energy Conservation, Identification of Energy Conservation opportunities, Technologies for Energy Conservation, Energy Conservation Schemes and Measures,

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:

1. Energy Conservation/ Paul O' Callaghan/ 1981.
2. Energy Management and Conservation /K V Sharma and P Venkataseshaiah.

REFERNCES:

1. Energy Management/ Paul O' Callaghan/ Mc Graw Hill/ 1992
2. Heat Recovery Systems / D.A.Reay / E and F.N.Spon / 1979
3. Energy Management, / Murphy W.R. and Mckay G/ Butterworth London, 1982.
4. Plant Engineers and Managers guide to Energy Conservation /Albert Thumann / Nost and Reinhold Co., New York.
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:

1. Ghosh G.K., 2006, Disaster Management ,APH Publishing Corporation.

REFERENCES:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.

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(A57030) NANO TECHNOLOGY
(OPEN ELECTIVE-I)

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 confinements (Quantum Wells), three dimensional confinements (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

NANO AND MOLECULAR ELECTRONICS: Resonant – tunneling structures, single electron tunneling, Single Electron transistors, coulomb blockade, giant magneto resistance, tunneling magneto resistance.

UNIT – V

NANOLITHOGRAPHY AND NANOMANIPULATION: e – beam lithography and SEM based nanolithography and nanomanipulation, ion beam lithography, oxidation and metallization. Mask and its application. Deep UV lithography, X-ray based lithography.

TEXT BOOKS:

1. Charles.p.pode, introduction to nanotechnology, springer publications.
2. Springer Handbook of Nanotechnology – Bharat Bhusan
3. Phani Kumar, Principles of nanotechnology, scitech publications.

REFERENCES:

1. David Ferry " Transport in Nano structures" Cambridge University press 2000
2. Nanobiotechnology; ed. C.M.Niemeyer, C.A. Mirkin.
3. Nanofabrication towards biomedical application, Techniques, tools, Application and impact – Ed. Challa S.S.R.Kumar, J.H.Carola.
4. Encyclopedia of Nanotechnology – Hari Singh Nalwa
5. Carbon Nanotubes; Properties and Applications – Micheal J.O' Connell
6. S.Dutta " Electon Transport in Mesoscopic systems" Cambridge University press.
7. H.Grabert and M. Devoret " Single charge Tunneling" Plenum press 1992.

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(A57031) ROBOTICS
(PROFESSIONAL ELECTIVE-V)

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
3. Solve differential kinematics problems using Jacobians.
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

INRODUCTION: 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 – Vaccuum cup and other types of grippers – General consideration on gripper selection and design.

UNIT – II

MOTION ANALYSIS: Basic rotation matrices – Composite rotation matrices – Euler Angles – Equivalent Angle and Axis – Homogeneous transformation – Problems.

MANIPULATOR KINEMATICS: D-H notations – joint coordinates and world coordinates – Forward and inverse kinematics – problems.

UNIT – III

DIFFERENTIAL KINEMATICS: Differential kinematics of planar and spherical manipulators – Jacobians – Problems.

UNIT – IV

ROBOT DYNAMICS: Lagrange – Euler formulations – Newton - Euler formulations – Problems on planar two link manipulators.

TRAJECTORY PLANNING: Joint space scheme – cubic polynomial fit – Avoidance of obstacles – Types of motion: Slew motion – joint interpolated motion – straight line motion – problems.

UNIT – V

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

Feed back components: position sensors – potentiometers, resolvers and encoders – velocity sensors – Tactile sensors- Robot Application in Manufacturing: Material handling – Assembly inspection.

TEXT BOOKS:

1. Industrial Robotics / Groover M.P / Pearson Edu.
2. Introduction to Robotic Mechanics and control by JJ Craig, Pearson, 3rd edition.

REFERENCES:

1. Robotics / Fu K.S / McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3. Robot Analysis and intelligence / Asada and Slotine / Wiley inter Science.
4. Robot Dynamics & Control – Mark W. Spong and M.Vidyasagar / John Wiley & sons (ASIA) Pte. Ltd..
5. Robotics and control / Mittal R.K & Nagrath I.J / TMH.

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(A57032) MECHATRONICS
(PROFESSIONAL ELECTIVE-V)

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 elecromechanical drives.
4. Describe the overview of micro controllers and programable 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.

SIGNAL CONDITIONING: Introduction – Hardware – Digital I/O, Analog input – ADC, resolution, speed channels filtering noise using passive components – Resistors, capacitors – Amplifying signals using OP amps – Software – Digital Signals Processing – Low pass, high pass, notch filtering.

UNIT – II

PRECISION MECHANICAL SYSTEMS: Pneumatic Actuation Systems – Electro – pneumatic Actuation Systems – Timing Belts – Ball Screw and Nut – Linear Motion Guides – Linear Bearing – Harmonic Transmission – Bearings – Motor / Drive selection.

UNIT – III

ELECTRONIC INTERFACE SUB SYSTEMS: TTL, CMOS interfacing – Sensor interfacing – Actuator Interfacing – solenoids, motors isolation schemes – opto coupling, buffer IC's- Protection schemes – circuit breakers, over current sencing, reset able fuses, thermal dissipation – Power Supply – Bipolar transistors / mosfets

ELECTROMECHANICAL DRIVES: Relays and Solenoids – Stepper Motors – DC brushed motors – DC brushless motors – DC servo motors – 4 quadrant servo drives, PWM's – Pulse width Modulation – Variable Frequency Drives, Vector Drives – Drive system load calculation.

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

PROGRAMMABLE MOTION CONTROLLERS: introduction – system transfer function – laplace transform and its application in analyzing differential equation of a control system – feedback devices; Position velocity sensors – optical incremental encoders – Proximity sensors; inductive, capacitive, infrared – continuous and discrete processes – control system performance & turning – digital controllers – P, PI, PID control – control modes – position, velocity and torque – velocity profiles – Trapezoidal – S.Curve – electronic gearing – controlled velocity profile – multi axis interpolation, PTP, Linear, Circular – Core functionalities – home, record position, Go to position – applications; SPM, Robotics.

TEXT BOOKS:

1. Mechatronics – N. Shanmugam / Anuradha Agencies Publishers.

REFERENCES:

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W Bolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics System Design / Devdas shetty/Richard/Thomson.

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(A57033) COMPOSITE MATERIALS

(PROFESSIONAL ELECTIVE-V)

PREREQUISITE: Metallurgy and Material Science, Mechanics of Solids.

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.
5. Understand Laminate Code, In-Plane and Flexural Modulus of a Laminate.

UNIT-I

INTRODUTCTION 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.

REINFORCEMENTS: Fibers Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide, fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetts , Metal matrix and ceramic composites.

UNIT – II

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

MACROMECHANICAL ANALYSIS OF A "LAMINA": introduction, Definitions: stress, strain, Elastic Moduli, strain Energy. Hooke's Law for different types of materials, Hooks Law for a two dimensional unidirectional lamina, plane stress assumption, reduction of Hooks Law in three dimensions to two dimensions, relationship of compliance and stiffness matrix to engineering elastic constants of a lamina.

UNIT – III

Hookes Law for a Two-Dimensional Angle Lamina, Engineering constants of an Angle Lamina. Invariant Form of Stiffness and compliance Matrices for an Angle Lamina Strength Failure. Envelops, Maximum Strain Failure Theory, Tsai-Hill Failure Theory, Tsai-Wu Failure Theory Comparison of Experimental Results with Failure Theories. Hygrothermal Stresses and Strains in a Lamina: Hygrothermal Stress-Strain Relationships for a Unidirectional Lamina, Hygrothermal Stress-Strain Relationships for a Angle Lamina.

UNIT – IV

MICROMECHANICAL ANALYSIS OF A LAMINA: Introduction, Volume and Mass Fractions, Density, and Void Content, Evaluation of the Four Elastic Moduli, Strength of Materials Approach, Semi Empirical Models Elasticity Approach, Elastic Moduli of Lamina with Transversely Isotropic Fibers, Ultimate Strengths of a Unidirectional Lamina, Coefficients of Thermal Expansion, Coefficients of Moisture Expansion .

UNIT- V

MACROMECHANICAL ANALYSIS OF LAMINATES: Introduction, Laminate Code, Stress- Strain Relations for a Laminate, In-Plane and Flexural Modulus of a Laminate, Hygrothermal Effects in a Laminate, Warpage of Laminates.

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:

1. Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press, 1994.
2. R. M. Jones Mechanics of Composite Materials, McGraw Hill Company, New York, 1975.

REFERENCES:

1. B. D. Agarwal and L.J. Broutman, Analysis and performance of fibre Composites, Wiley-Interscience, New York, 1980.
2. Mechanics of Composite Materials, Second Edition (Mechanical Engineering), By Autar K. Kaw, Publisher: CRC
3. Ever J. Barbero, Finite Element Analysis of Composite Materials CRC Press, 2007.
4. 3.L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold, New York, 1969.
5. Madhujit Mukhopadhyay, Mechanics of Composite Materials and Structures, University Press, 2009.
6. Krishan K. Chawla, Composite Materials Science and Engineering, Springer, 2009, Ed. 6. Robert M. Jones, Mechanics of Composite Materials, 1999, Ed. 2.

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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.

CNC MACHINES AND ELEMENTS: Machine structure – guide ways – feed drives – spindles – spindle bearings – measuring systems – tool monitoring systems.

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, embeded 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:

1. Computer control of manufacturing systems / Yoram koren / Mc Graw Hill intl. 1983.
2. CAD/CAM – Michel P. Groover, TMH

REFERENCES:

1. Machining tools hand book Vol-3, (Automation & control) Manfred Weck / John Wiley and sons, 1984.
2. Mechatronics - HMT,TMH.

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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: Combustion Process: Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cylone furnace, design and construction, Dust collectors, Electrostatic precipitators, cooling towers and heat rejection, corrosion and feed water treatment.

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

DIESEL POWER PLANT: Introduction – IC Engines, types, construction – Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.

GAS TURBINE PLANT: introduction – classification – construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines, Combined cycle Power plants –Different types—Gas & Steam and other combinations - Comparison.

UNIT - III

HYDRO ELECTRIC POWER PLANT: Water power – Hydrological cycle – Hydrographs – storage and Pondage – Numerical examples of construction of Hydrograph, Load duration curves -classification of dams and spill ways.

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

UNIT – IV

NUCLEAR POWER STATION: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation.

TYPES OF REACTORS: Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

POWER FROM NON-CONVENTIONAL SOURCES: Utilization of solar – Collectors – Principle of working, Wind energy – Types – HAWT, VAWT – Tidel energy.

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:

1. Power Plant Engineering – P.C.Sharma / S.K.Kataria Publications.
2. A Course in Power Plant Engineering: / Arora and S.Domkundwar.

REFERENCES:

1. A Text book of Power Plant Engineering / Rajput / Laxmi Publications
2. Power plant Engineering / Ramalingam / Scietech Publishers.
3. Power Plant Engineering: P.K.Nag / ii Edition / TMH.
4. An introduction to Power Plant Technology / G.D. Rai.
5. Power plant Engg – Elanchezhian – I.K international Publications.

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(A57036) UNCONVENTIONAL MACHINING PROCESSES

(PROFESSIONAL ELECTIVE-VI)

PREREQUISITE: Machine Tools, Renewable Energy Sources.

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

ELECTRON BEAM MACHINING: Generation and control electron beam for machining theory of electron beam machining, comparison of thermal and non-thermal processes. General principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.

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.
2. Manufacturing engineering and Technology, serope kalpakjian and steven R. Schmid, Ed-4, pearson publications,2001.

REFERENCES:

1. Modern machining process / Pandey P.C and shah H.S / TMH
2. New Technology / Bhattacharya A / The institution of engineers, india,1984.
3. Unconventional Machining Processes / C. Elanchezhian, B.vijaya Ramnath and M. vijayan/ Anuradha publications / 2005.

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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.
2. **Part Modeling**: Generation of various 3D Models through protrution revolve, shell sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modeling surface and assembly modeling, study of various standard translators, Design simple components.
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.

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(A57208) PRODUCTION DRAWING PRACTICE AND INSTRUMENTATION LAB

PREREQUISITE: Engineering Drawing – I & II, Machine Drawing, Metrology.

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

Conventional representation of materials – conventional representation of parts – screw joints, springs, gears, electrical, hydraulic and pneumatic circuits – methods of indicating notes on drawings.

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
2. Machine Drawing with AutoCAD – Pohit and Ghosh,PE

REFERENCES:

1. Geometric dimensioning and tolerancing – James D.Meadows / B.S Publications.

(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.

6. Calibration of capacitive transducer for angular displacement.

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

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L	T/P/D	C
3	1	3

(A58012) BUSINESS ENGLISH
(OPEN ELECTIVE – II)

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,

Common Components of Business Letters, Strategies for Writing the Body of a Letter, Kinds of Business Letters, Writing Effective Memos, Case Study.

UNIT-III

Technology –enabled Business Communication

Introduction, Technology-based Communication Tools, Positive Impact of Technology – Enabled Communication, Negative Impact of Technology – Enabled Communication, Selection of Appropriate Technology, Effectiveness in Technology- Based Communication.

UNIT-IV

Business Reports and Proposals

Introduction, Feasibility of a Report- Characteristics and Elements of Business Report, Purpose of a Business report, Steps in writing a routine Business report, Business Proposals.

UNIT-V

Ethics in Business Communication

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

REFERENCES:

1. Business Communication Basic concepts and Skills – J P Parikh Anushu Surve, Swarnabharati, Asma Bahrainwala (2011), published by Orient Blackswan Printers Ptv. Ltd.
2. Fifty ways to improve your Business English, Ken Taylor (2006), published by Orient Blackswan Printers Ptv.Ltd.
3. Business Communication by Anjanee Sethi, Bhavana Adhikari published by Tata McGraw Hill Education
4. Business communication skills for Managers: An Advanced Approach (2013) by John M. Penrose, Robert W. Rasbery, Robert J, Myers, Published by Cengage Learning
5. A Course in Business Communication by Madhulika Jha, Shekhar, published by Orient Blackswan Printers Ptv.Ltd
6. Everyday Business English (2003) (English For Work) by Glenn Darragh
7. Business Communication- from Principles to Practice by Matthukutty M.Monipally, published by Tata McGraw Hill Education
8. Business English -Writing for the Global Workplace by Dona J.Young, published by Tata McGraw Hill Education

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(A58013) COMPUTER GRAPHICS
(OPEN ELECTIVE – II)

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. Indentify the various visible surface detection methods
5. Design the sequence of computer animation.

UNIT - 1:

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 coordinat4 reference frame, window to view-port co-ordinate transformations, viewing function, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland Hodgeman 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:

1. Computer Graphics C version Donald Hearn and M. Pauline Baker, Pearson/PHI
2. Computer Graphics Principles & practice, second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education

REFERENCES:

1. Computer Graphics Second edition, Zhigand xiang, Roy Plastock, Schaum's outlines, Tata McGraw hill edition.
2. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
3. Principles of Interactive Computer Graphics, Neuman and Sproul, TMH.
4. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.
5. Computer Graphics, Steven Harrington, TMH

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(A58014) MAINTENANCE AND SAFETY ENGINEERING

(OPEN ELECTIVE-II)

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

INTRODUCTION: Need for Maintenance, Facts and Figures, Modern Maintenance, Problem and Maintenance strategy for the 21st Century Engineering Maintenance Objectives and Maintenance in Equipment Life cycle, Terms and Definitions.

MAINTENANCE MANAGEMENT AND CONTROL: Maintenance Manual Maintenance, Facility Evaluation Functions of Effective Maintenance Management, Maintenance Project Control Methods, Maintenance Management Control indices.

UNIT – II

TYPES OF MAINTENANCE: Preventive Maintenance, Elements of Preventive, Maintenance Program, Establishing Preventive Maintenance Program PM Program Evaluation and improvement, PM Measures, PM Models, Corrective Maintenance, Corrective Maintenance Types, Corrective Maintenance Steps and Downtime Components, Corrective Maintenance Measures, Corrective Maintenance Models.

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

Sampling, Post Maintenance Testing, Reasons for Safety Problems in Maintenance, Guidelines to improve Safety in Maintenance Work, Safety Officer's Role in Maintenance Work, Protection of Maintenance Workers.

MAINTENANCE COSTING: Reasons for Maintenance Costing, Maintenance Budget Preparation Methods and steps, Maintenance Labor Cost Estimation, Material Cost Estimation, Equipment Life Cycle Maintenance Cost Estimation, Maintenance Cost Estimation Models.

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
3. Engineering Maintenance a modern approach, B.S.Dhallon, 2002. C.R.R Publishers.

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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

INTRODUCTION TO MANAGEMENT: Entrepreneurship and organization – Nature and importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management , Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

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

OPERATIONS MANAGEMENT: Principles and Types of Plant Layout – Methods of production (job, batch and Mass Production), Work Study – Basic procedure involved in Method Study and Work Measurement – Statistical Quality Control: X chart, c chart. P chart, (simple problems), Acceptance Sampling, Deming's contribution to quality.

HUMAN RESOURCES MANAGEMENT (HRM): Evolution of HRM, Concepts of HRM, Basic functions of HR Manager, Man power planning, Recruitment, Selection, Training and Development, Placement, Wage and salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

UNIT – III

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

MARKETING: Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle, Channels of Distribution.

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

CONTEMPORARY MANAGEMENT PRACTICES: Basic concepts of Just – In – Time (JIT) system, Total Quality Management (TQM), Six sigma and Capability Maturity Model (CMM) Levels, Value Chain Analysis, Enterprises Resource Planning (ERP), Performance Management, Business Process outsourcing (BPO), Business Process Re-engineering 5S Model, Deming's PDCA, Kaizen, Poka – Yoke, Munda, Benchmarking, Balanced Score Card.

TEXT BOOKS:

1. Aryasri; Management Science, TMH, New Delhi,2009.

REFERENCES:

1. Stoner, Management, Pearson, 2009
2. Kotler Philip & Keller Kevin Lane; Marketing Management PHI, 2009
3. Koontz, Weihrich, & Aryasri; Principles of Management, TMH, 2009
4. Thomas N. Duening & John M. Ivancevich Management, Principles and Guidelines, Cengage, 2009
5. Kanishka Bedi, Production and operations Management, Oxford University Press,2009.

6. Memoria & S.V.Ganker, Personal Management, Himalaya, 2009
7. Schermerhorn; Management, Wiley, 2009
8. Parnell; Strategic Management, Biztantra, 2009.
9. L.S. Srinath; PERT / CPM, Affiliated East-west Press, 2009.
10. William J. Stevenson & Ceyhun Ozgur, Introduction to Management Science, TMH, 2007.

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- Crating 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:

THE COST OF QUALITY: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost Information, Accounting Systems and Quality Management.

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.
2. Total Quality Management- A Practical Approach/H. Lal
3. Quality Management/Kanishka Bedi/Oxford University Press/2011
4. Total Engineering Quality Management/Sunil Sharma/Macmillan

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(A58004) ENTREPRENEURSHIP DEVELOPMENT
(OPEN ELECTIVE-III)

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:

Introduction to Entrepreneurship, Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur.

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

UNIT – II:

The Business Plan Nature and scope of Business plan , Writing Business Plan, Evaluating Business plans, Using and implementing business plans. Marketing plan, financial plan and the organizational plan, Launching formalities.

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:

New venture Expansion Strategies and Issues Features and evaluation of joint ventures, acquisitions, merges, franchising. Public issues, rights issues, bonus issues and stock splits.

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:

Labour legislation, Salient Provision under Indian Factories Act, Industrial Disputes Act, Employees State Insurance Act, Workmen's Compensation Act and payment of Bonus Act. This course replaces the course offered in earlier years as 'Entrepreneurship& Management'

TEXT BOOKS:

1. Robert Hisrich, & Michael Peters: Entrepreneurship, TMH, 5th Edition.
2. Dollinger: Entrepreneurship,4/e, Pearson, 2004.

REFERENCES:

1. Vasant Desal: Dynamics of Entrepreneurial Development and management, Himalaya Publishing
House, 2004.
2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999.
3. Robert J.Calvin: Entrepreneurial Management, TMH, 2004.
4. Gurmeet Naroola: The Entrepreneurial Connection, TMH, 2001.
5. Agarwal :Indian Economy , Wishwa Prakashan 2005.
6. Dutt & Sundaram : Indian Economy. S. Chand, 2005.
7. Srivastava: Industrial Relations & Labour Laws, Vikas, 2005.
8. Aruna Kaulgud: Entrepreneurship Management by. Vikas publishing house, 2003.