Corrected on 29.10.2012

BIRLA INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
MESRA, RANCHI.
COURSE STRUCTURE (I TO VIII SEMESTERS)
(EFFECTIVE FROM MO-2011)

Course No.	Subjects	L	T	P	CP
	I-SEMESTER				
HU1101	Technical English	3	0	0	3
PH1201	Physics	3	1	0	4
MA1301	Engg. Mathematics	3	1	0	4
EE2201	Principles of Electrical Engg.	3	1	0	4
CH1401	Engg. Chemistry	3	0	0	3
ME1202	Engg. Graphics	1	0	3	3
CS1302	Fundamental of Unix & C Programming	1	0	3	3
PE1202	Workshop Practice	0	0	3	2
PH1202	Physics Lab.	0	0	3	2
GA1002/GA1004 GA1006/GA1008	NCC/NSSS/PT & Games/ C.Arts	0	0	2	1
					Total 29
	II-SEMESTER				
EC2001	Principle of Electronics Engg.	3	0	0	3
MA2301	Advance Engg. Mathematics	3	1	0	4
CH2203	Environmental Science	3	0	0	3
CS2301	Fundamentals of Data Structure	3	1	0	4
ME2001	Principles of Mechanical Engg.	3	0	0	3
AM1201	Engineering Mechanics	3	1	0	4
CH1402	Chemistry Lab.	0	0	3	2
EE3202	Basic Electrical Engg. Lab.	0	0	3	2
EC2002	Basic Electronics Engg. Lab.	0	0	3	2
CS2302	Data Structure Lab.	0	0	3	2
GA2002/GA2004 GA2006/GA2008	NCC/NSS/PT & Games/C.Arts	0	0	2	1
					Total 30

III- SEMESTER					
ME 3001	Thermodynamics	3	0	0	3
ME3003	Fluid Mechanics & Hydraulics	3	0	0	3
ME3005	Mechanics of Solids	3	1	0	4
PE3001	Metallurgy	3	0	0	3
	Biological Science/Foreign Language	3	0	0	3
	Engg. Mechanics Lab./Basic Electrical Engg.	0	0	3	2
ME3002	Fluid Mechanics Lab.	0	0	3	2
ME3004	Mechanics of Solids Lab.	0	0	3	2
ME3006	Engg. Measurement Lab.	0	0	3	2
GA3002/3/4/8	NCC/NSS/PT & Games Creative Arts.	0	0	3	1
					Total 25
IV-SEMESTER					
ME 4001	Heat Power Conversion	3	0	0	3
ME4003	Mechanics of Materials	3	1	0	4
PE4001	Manufacturing Process-I	3	0	0	3
ME4005	**Non-Conventional Energy**	**3**	**0**	**0**	**3**
	Foreign Language/Biological Science	3	0	0	3
ME4004	Mechanical Engg. Lab.	0	0	3	2
ME4006	Non-Conventional Energy Lab.	0	0	3	2
PE4002	Manufacturing Process-I Lab.	0	0	3	2
GA4002/3/4/8	NCC/NSS/PT & Games Creative Arts	0	0	3	1
					Total 23
V-SEMESTER					
ME5001	IC Engine & Gas Turbine	3	1	0	4
ME5003	Kinematics & Kinetics of Machines	3	1	0	4
PE5001	Manufacturing Process – II	3	0	0	3
ME5005	**Design of Machine Elements**	**3**	**0**	**0**	**3**
	Breadth Subject	3	0	0	3
ME5002	I.C. Engines Lab.	0	0	3	2
ME5004	Energy Engg. Lab.	0	0	3	2
ME5006	CADD Lab.	0	0	3	2
					Total 23

VI-Semester					
ME6001	Automobile Engg.	3	0	0	3
ME6003	Heat & Mass Transfer	3	0	0	3
ME6005	Dynamics of Machines	3	1	0	4
	Breadth Subject	3	0	0	3
ME6007	**Design of Mechanical Systems**	**3**	**0**	**0**	**3**
ME6002	Automobile Engg. Lab.	0	0	3	2
ME6004	Heat Transfer Lab.	0	0	3	2
ME6006	Dynamics of Machines Lab.	0	0	3	2
					Total 22
VII-SEMESTER					
	Breadth Subject	3	0	0	3
	Elective I (Other Dept.)	3	0	0	3
	Elective II (Other Dept.)	3	0	0	3
	Elective III (Departmental)	3	0	0	3
	Elective IV (Departmental)	3	0	0	3
ME7002	Project	0	0	6	4
					Total 19
VIII-SEMESTER					
ME8002	Industrial Project & Comprehensive Viva	0	0	12	8
					Total 08
					Grand Total 179

DEPARTMENT OF MECHANICAL ENGINEERING
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ME 1202 ENGINEERING GRAPHICS

Sheet No. 1A:

Lines and Lettering

Sheet No. 1B:

Projection of points (**6 Hours)**

Sheet No. 2:

Projections of Straight Lines. **(6 Hours)**

Sheet No. 3:

Projections of Planes **(5 Hours)**

Sheet No. 4:

Projections of Solids. **(7 Hours)**

Sheet No. 5:

Section of solids **(6 Hours)**

Sheet No. 6

Isometric Projections (**6 Hours)**

Sheet No. 7:

Development of Surfaces **(6 Hours)**

Sheet No. 8:

Intersection of surfaces **(6 Hours)**

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48 Hours.

Books:

1. Engineering Drawing – Dhananjoy A. Jolhe.
2. Engineering Graphics – N.D. Bhat

DEPARTMENT OF MECHANICAL ENGINEERING
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ME 2001: Principles of Mechanical Engineering

Module – 1: Non-Conventional Energy and their resources: Energy sources; Renewable and Non-renewable Energy Resources; Advantages and Disadvantages of Renewable Resources; Renewable Energy Forms and Conversion; Solar Energy; Wind Energy; Tidal Energy; Ocean Thermal Energy; Geothermal Energy; Nuclear Energy; Hydro Energy. **(5 Lectures)**

Module – 2: Properties of pure substance, Boiler Mountings and Accessories: Definition; Function; Classification; Fire Tube and Water Tube Boilers; Cochran Boiler; Lancashire Boiler; Locomotive Boiler; Backcock and Wilcox Boiler; Packaged Boilers; High Pressure Boilers. Boiler Mountings & accessories. **(5 Lectures)**

Module – 3 Internal Combustion Engines: Classification of I.C. Engines, Petrol engine; Diesel engine; Gas Engine, Two- stroke & Four- stroke engine, C.I. Engines and S.I. Engines. **(5 Lectures)**

Module 4: Heat transfer; various modes of heat transfer, one dimensional steady state conduction. Application to composite walls and cylinders **(5 Lectures)**

Module 5: Simple stresses and strains, Hooke's Law elasticity, Relation between elastic constants, Thermal Stresses. **(5 Lectures)**

Module – 6 Transmission of Power: Transmission systems; Belt Drives; Flat belt; V-Belt; Limiting Tensions ratio, Chain drives; Gear Drives; Rope Drives; Types of gears; Gear Trains: Simple, compound and epicyclic gear trains. **(5 Lectures)**

Module 7: Vibrations, Types of Vibrations, Free undamped longitudinal vibrations, Free damped longitudinal vibrations. **(5 Lectures)**

Books:

1. Fundamentals of Classical Thermodynamics – G.J. Van Wylen and R.E. Sorntag, Second Edition, Wiley Eastern (1984).
2. An Introduction to Thermodynamics – P.K. Nag
3. Thermal Engineering – R.K. Rajput
4. Strength of Materials – F.L. Singer
5. Theory of Machines – Thomas Beven

ME 3001 THERMODYNAMICS

Module- 1 Basic concepts and Definition.

A thermodynamic system and the control volume, properties and state of a substance, processes and cycles, Macroscopic versus microscopic point of view, Equality of temperature, The Zeroth law of thermodynamics. (5 Lectures)

Module- 2 Work and Heat.

Definition of work, Units of work, work done at the moving boundary of a system, other systems that involve work, concluding remarks regarding works, Definition of heat, comparison of Heat and Work.. (7 Lectures)

Module- 3 First Law of thermodynamics.

The first law of thermodynamics for a closed system, executing a cycle, The first law for a change of state.The first law of thermodynamic for an open system, Steady state steady flow process. Throttling . 8 Lectures)

Module- 4 Second law of thermodynamics.

Limitation of the first law of thermodynamic, heat engine and refrigerators, The second law of thermodynamics, Equivalence of the two statements of the second law, Carnot cycle, two propositions regarding efficiency of a cornot cycle, The thermodynamic temperature scale.
(8 Lectures)

Module-5 Entropy

Entropy a thermodynamic property, The Inequality of Clausius, Entropy change in reversible and irreversible processes, Two important relations involving entropy, The principle of increase of entropy of the universe, Available and unavailable energy. (6 Lectures)

Module-6 Ideal Gases.

Definitions, the specific heats and their relation , the Joules Law of enternal energy, Entropy change for flow and non flow processes. (4 Lectures)

Module-7 Thermodynamic cycles.

Air standard cycles: Otto cycle, Diesel cycle and Brayton cycle. Simple vapour cycles: Carnot cycle, Rankine cycle, vapour compression refrigeration cycle. (7 Lectures)

Text book. : Fundamentals of classical thermodynamics by G.J. Van Wylen & R.E. Sonntag.

Reference Books:

1. An Introduction to Thermodynamics – P.K. Nag
2. Engineering Thermodynamics – R.K.Rajput

ME 3003 FLUID MECHANICS AND HYDRAULICS

MODULE: I
Fluid statics : Concept of continuum and physical properties of fluids, specific gravity, viscosity surface Tension, vapor pressure. Measurement of pressure- Piezometer, U-tube and differential tube manometers. (5 Lectures)

MODULE: II
Fluid kinematics : Eulerigian and lagrangina description of fluid flow, Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform, non uniform, laminar, turbulent, rotational, and irrotational flows,equation of continuity for one dimensional flow.
Fluid dynamics : Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend. (5 Lectures)

MODULE: 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: pilot tube, venturimeter, and orifice meter, Flow nozzle, Turbine flow meter. Boundary layer theory, separation of boundary layer and its control. (5 Lectures)

MODULE: 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 don and efficiency, flow over radial vanes. (5 Lectures)

MODULE: V
Hydraulic Turbines : Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic design –draft tube theory and functions and efficiency. (5 Lectures)

MODULE: VI
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. (5 Lectures)

MODULE: VII
Centrifugal pumps : Classification, working, work done, manomertic head, losses and efficiencies, specific speed, pumps in series and parallel,performance characteristic curves, NPSH.
Reciprocating pumps : Working, Discharge, slip, indicator diagrams. (5 Lectures)

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

REFERENCE BOOKS :
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. Fluid Mechanics with Engineering Application by J.B. Franzini and Finnemore, Mc Graw Hill.
4. Fluid Mechanics by V. L. Streeter.
5. Fluid Mechanics, Fundamentals and Applications (in SI Unit) by Yunus A. Cangel and John M. Cimbala, Mc Graw Hill.

ME 3005 MECHANICS OF SOLIDS

MODULE-1

Two dimensional state of stress at a point. Complementary shears, Principal stresses Graphical representation of state of stress. (6 Lectures)

MODULE –2

Two dimensional state of strain at a point, Principal strains, Graphical representation of state of strain, Strain rosettes. (6 Lectures)

MODULE – 3

Distribution of bending stress and shear stress in the cross-section of beams.
(6 Lectures)

MODULE-4

Differential equation of the elastic curve-Deflection of beams by double integration method – Area moment theorems – Application to simply supported, Cantilever and overhanging beams.
(8 Lectures)

MODULE -5

Statically indeterminate beams: propped cantilevers, built in beam, fixed beams and continuous beams. (7 Lectures)

MODULE - 6

Strain energy for axial load, bending and torsion. Castigliano's theorem – Application. Deflection due to shear. (6 Lectures)

MODULE -7

Torsion of circular shaft and power transmitted by the shaft. Combined bending and twisting of circular shaft – Equivalent B.M. and Equivalent Twisting moment.
(6 Lectures)

Recommended Books:

1. Strength of Materials –F.L. Singer.
2. Strength of Materials by Ryder .
3. Strength of Materials by S.S.Rattan.

PE 3001 METALLURGY

Review of Engineering and industrial materials – their classification and application, recent development in metallic materials

A brief description of iron and steel making – Raw materials Principles and processes

Isomorphous, eutectic and peritectic systems, Iron – Carbon equilibrium diagram, classification of steels, effect of alloying elements on steels. Tool steels

Isothermal decomposition of austenite (TTT Curve), transformation of austenite upon continuous cooling, annealing, normalising, hardening, tempering, hardenability of steel, Jominey hardening test, end quench test, surface hardening, case hardening, recovery, recrystallisation and grain growth

Grey iron, S.G. Iron, white iron, malleable iron. Principles of corrosion, forms of corrosion, factors affecting the rate of corrosion, corrosive agents, protection against corrosion; weld metal zone, HAZ, parent metal zone, Joint efficiency, weldability, concepts of ductile and brittle fractures

Properties and applications of Non ferrous Metals and Alloys-Al & Cu

Text Books:

1. Elements of Metallurgy — D. Swaroop
2. Material Science and Engineering — V. Raghvan
3. Metallurgy for Engineers — L.C.Rollagon

ME 4001 HEAT POWER CONVERSION

Module 1: *Thermodynamic vapour cycles:* Components of steam power system; Carnot cycle and Rankine cycle; their comparison; p-v, T-s & h-s diagrams; Reheat cycle; Regenerative cycle; use of steam table and chart. [5 Lectures]

Module 2: *Fuels and Combustions:* Classification of fuels; basic chemistry and combustion equations; theoretical and excess air; stoichiometric air-fuel ratio; conversion of volumetric to weight analysis and vise-versa [5Lectures]

Module 3: *Boiler performance:* Equivalent evaporation; Boiler efficiency; Heat balance; Boiler Draught; its classification; Chimney height; maximum discharge through chimney; Chimney efficiency. [5 Lectures]

Module 4: *Steam Nozzles:* Introduction; types of steam nozzles; nozzle efficiency; velocity of steam flow through the nozzle; discharge and condition of maximum discharge through a nozzle; physical significance of critical pressure ratio; Supersaturated flow through nozzle; General relationship between area, velocity and pressure in nozzle flow. [5 Lectures]

Module 5:*Steam Turbines:* Impulse and Reaction turbine; principle of working; velocity diagrams; compounding; Degree of reaction; efficiencies; condition of maximum efficiency [5 Lectures]

Module 6: Losses in steam turbines, state- point locus and reheat factor; governing of steam turbine; Back-pressure and pass-out Turbine [5 Lectures]

Module 7: *Steam condensers:* Classification of condensers; sources of air in condenser; effects of air leakage in condenser; vacuum efficiency; condenser efficiency; cooling water calculations; Air pumps. [5 Lectures]

Recommended Books:

1. Theory and Practice of Heat Engine – D.A. Rangham; Camb. Univ. Press.
2. Elements of Heat Engine – Pandey & Saha
3. Steam and Gas Turbine – R. Yadav
4. Thermal Engineering – R. K. Rajput.
5. Engineering Thermodynamics- P.K.Nag.

ME 4003 MECHANICS OF MATERIALS

Module-1 Theories of elastic failure: Introduction, significance and comparison of various theories. Equivalent bending moment and equivalent torque. (6 Lectures)

Module-2 Unsymmetrical bending: Limitations of flexural formula. Bending stresses in beams with loads not acting in the plane of symmetry of the cross-section. Flexural formulas for stresses with reference to principal axes of inertia of the cross-section. (6 Lectures)

Module-3 Shear Centre: Theory of shear flow, shear flow diagrams and shear centre for thin-walled symmetrical sections. (6 Lectures)

Module-4 Bending of curved beams: Beams of small and large initial curvature, evaluation of circumferential stresses. Stresses and deformation of closed rings. (7 Lectures)

Module-5 Thin and thick cylinders: Radial and circumferential stresses, stresses produced due to shrink fit. (6 Lectures)

Module-6 Rotating Disc: Stresses in disc of uniform thickness and uniform strength. (6 Lectures)

Module-7 Springs: Open coiled helical spring, leaf spring and spiral spring. (8 Lectures)

Recommended Books:

1. Advanced Mechanics of Material by Seely & Smith
2. Strength of Materials by Ryder.
3. Strength of Materials by S.S. Rattan.

PE 4001 MANUFECTURING PROCESS –I

Theory of Metal Cutting
Geometry of single point cutting tool, Orthogonal and oblique cutting, Tool forces in orthogonal cutting, types of chips, Machinability, tool failure, tool life, cutting fluids and cutting tool materials
Machine Tools
Constructional features, specification, operations and drives of lathe, working principles of capstan and Turret lathes, Shaper, Planer, & Slotter.

Constructional features, specification, operations and drives of milling & drilling machine, indexing in milling operations

Grinding and finishing operations
Cylindrical, surface and centreless grinding; Broaching, lapping, honing and buffing

Gear cutting by forming and generating methods.

Introduction to Modern Manufacturing Processes
Fundamental principles, application possibilities, process parameters, and operational characteristics of Abrasive Jet Machining (AJM), Water Jet Machining (WJM), Ultrasonic Machining (USM), Chemical Machining (CHM).

Text Books

1.	Workshop Technology –Vol. II	B S Raghuwanshi
2.	Production Technology -Vol. II	OP Khanna & M Lal
3.	Elements of workshop technology- Vol. II	Hajra Choudhry
4.	Modern Machining Processes	P. C. Pandey, H. S. Shan, TMH
5.	Non-conventional Machining	P. K. Mishra ,Narosa Publishing House
6.	New Technology	A. Bhattacharyya, IE(I)

Reference Books

1.	Production Technology hand book	HMT
2.	Principles of manufacturing materials and processes	J S Campbell
3.	Principles of Manufacturing technology	P N Rao (Part I)

ME 4005 NON CONVENTIONAL ENERGY

Module 1:
Introduction: Energy needs and energy supply, conventional & non-conventional energy sources. Principle of operation and need of the non conventional energy sources. Present energy scenario.

Wind Energy: Availability, site selection, different types of wind turbines, design criteria and material selection economics. (5 Lectures)

Module 2:
Solar energy: Solar geometry, Characteristics & estimation of solar radiation. Collector – flat plate & concentrating types. Heat loss calculation for flat plate type collector, Collector efficiency calculation, Selective paints & surfaces for them. (6 Lectures)

Module 3:
Thermal Storages and Solar ponds – principle & its uses.

Solar Application: Heating of air & water for building and other uses. Active & passive systems, solar pumps, solar power plant, solar cookers, solar refrigeration & air conditioning solar cookers, solar furnaces etc. (5 Lectures)

Module 4:
Bio-conversion: Photosynthesis & generation of bio-gas, digester and their design, selection of material, feed of digester, pyrolytic gasification, algae production & their uses.
(5 Lectures)

Module 5:
Geo-thermal Energy: Sites, potentiality and limitation, study of different conversion system and other uses of geo-thermal sources. (5 Lectures)

Module 6:
Tidal Energy: Sites, potentiality and possibility of harnessing from site, limitation. Different method of using tidal power. (4 Lectures)

Module 7:
Ocean Thermal Energy: Principle of utilization and its limitation description of few system.

Other Non-Conventional Sources: Hydrogen energy, its production and applications. Fluidized bed combustions, waste product energy. (5 Lectures)

Books:

1. Non-conventional Energy Sources – G.D. Rai
2. Solar Energy –Garg and Prakash
3. Solar Energy Utilization – G.D. Rai
4. Solar Thermal energy – Peter J. Lunde

ME 5001 I C ENGINES AND GAS TURBINES

Module-1
Introduction: Classification of I.C. Engine, fundamental difference between S.I. and C.I. engines, Comparison of two stroke and four stroke engine, Air Standard Cycles: Otto, Diesel, Dual, Joule and Brayton cycles, Fuel-air Cycles and their analysis. (5 Lectures)

Module-2
Combustion: Combustion in S.I. engines, stages, ignition lag, factors affecting ignition lag, flame propagation and its factors, knocking and its factors, control, measurement of knock. Combustion in C.I. engines, stages of combustion, delay period and affecting factors, detonation and affecting factors, control and comparison with knocking of S.I. engines, rating of C.I. engine fuels. (5 Lectures)

Module-3
Carburetion, Injection and supercharging: Introduction, derivation of choke jet ratio of a simple carburetor, MPFI system. Injection system of C.I. engines. Introduction to supercharging and its purpose. (5 Lectures)

Module-4
Engine Cooling and Lubrication: Introduction, air and water cooling, thermo-syphon, pump circulation.
Mechanism of lubrication, properties of lubricating oil, Role of Additives. (5 Lectures)

Module-5
Testing and Performance: Introduction, measurement of air, fuel consumption, indicated power, brake power, Morse test, Heat balance sheet, governing of I.C. engine.
Performance parameter of S.I. and C.I. engine, performance map. (5 Lectures)

Module-6 Gas turbine and Jet Propulsion: Theory of gas turbine, thermodynamic analysis of Brayton cycle, and with regeneration, reheat, inter-cooling. Compressor and turbines isentropic efficiency, Analysis of cycle considering losses.
Jet propulsion cycle, elementary idea of turbojet, Turbo-propulsion, ramjet and pulses jet, Classification of Rocket propulsion. (5 Lectures)

Module-7 Engine Emission and Green house effect: Introduction, engine emissions and their effects, gasoline and diesel emission, methods of measuring pollutants, controlling of engine emission, Factors affecting green house effects. (5 Lectures)

Text Book:
1. Internal combustion engines by E.F.Obert.
2. Gas turbine Theory by Cohen Roger.

Reference Books:
1. A course in Internal Combustion Engines by M.L. Mathur and R.P. Sharma.
2. Gas Turbine Jet and Rocket Propulsion by M.L.Mathur and R.P.Sharma.

ME 5003 KINEMATICS AND KINETICS OF MACHINES

Module-1: MECHANISMS: Kinematic concept of Link, Kinematic chain, Mechanism, degree of freedom, Inversions of four bar mechanism, single slider crank mechanism and double slider crank mechanisms, Straight line motion mechanism and Copying mechanism.

(5 Lectures)

Module-2: MOTION ANALYSIS: Types of motion: Kinematic and Dynamic quantities, Vector diagrams, Instantaneous centers velocity and acceleration diagram of plane mechanism including Corioli's components. Instantaneous center method, Klein's construction, Analytical treatment

(10 Lectures)

Module-3: FORCE ANALYSIS: Static force analysis, dynamic force analysis, equivalent system

(6 Lectures)

Module-4: FLYWHEEL: Turning Moment on crankshafts, Turning Moment diagram, Fluctuation of energy and speed and determination of M.I. of fly wheel.

(5 Lectures)

Module-5: GEARS, Fundamental laws of gearing: classification and basic terminology, involute tooth profile and its kinematic consideration, spur gears, other types of gears, standards in tooth forms. (8 Lectures)

Module-6: Gear trains: Simple, compound and epi-cyclic gear trains (5 Lectures)

Module-7: CAMS: Various types of cams, Displacement, velocity and acceleration of followers, Graphical determination of CAM profiles with different types of followers, specified Cam Profile.

(6 Lectures)

Recommended Books:

1. Theory of Machine by Thomas Beven
2. Theory of Machine by S.S. Rattan, Tata McGrow Hill.
3. Theory of machines by V. P. Singh

PE 5001 MANUFECTURING PRACTICE –II

Introduction to foundry process and its importance, Patterns, pattern materials, types of patterns, pattern allowances, mould and core making, properties of molding and core sands. Sand testing, machine molding, gating, risers and solidification of casting, design of gating systems.

Centrifugal casting, investment casting, die casting and shell molding

Working principle and operation of cupola, cleaning of casting, inspection of casting, casting defects

Principle, working and application of oxy- acetylene gas welding and gas cutting, electric arc welding, MMAW

SAW, MIG, electroslag, TIG and plasma arc welding, thermit welding, and solid state welding.

Resistance welding, spot, seam, projection and butt welding, soldering and brazing

Fundamental principles, application possibilities, process parameters, and operational characteristics of Electrochemical machining (ECM), Electrochemical Grinding (ECG), Laser Beam and Electron Beam machining and welding, Electro Discharge Machining (EDM).

Text Books:

1. Foundry, Forming and Welding — P.N. Rao, Tata Mc Graw- Hill
2. Text book of welding technology — O.P. Khanna
3. A course in workshop Technology — Vol. I B.S. Raghuvansi, Dhanpat Rai & Co.
4. Modern Machining Processes — P. C. Pandey, H. S. Shan, Tata McGraw-Hill
5. Non-conventional Machining — P. K. Mishra ,Narosa Publishing House
6. New Technology — A. Bhattacharyya, IE(I)

References

1. Foundry technology — K.P. Sinha and D.B. Goel Standard publishers, Delhi
2. Welding and welding Technology — Richard L. Little (TMH Edition)
3. Metal casting — Rossenthal, Tata Mc Graw- Hill

ME 5005 DESIGN OF MACHINE ELEMENTS

Module -1. Principles of Machine Design, standardization, designation and selection of materials, aesthetic and ergonomic considerations in design, Preferred numbers, Tolerances. (5 Lectures)

Module -2. Design against static and fluctuating loads. (5 Lectures)

Module -3. Threaded Joints, Cotter and Knuckle joints. (5 Lectures)

Module –4 Riveted and Welded Joints. (5 Lectures)

Module –5 Shafts, keys, couplings, Belt, Rope and chain drives (5 Lectures)

Module – 6 Power screws, Screw Jack, Helical and leaf springs. (5 Lectures)

Module – 7 Clutches and Brakes (5 Lectures)

Text Books:

1. Machine Design by Maleev and Hatman, CBS Publisher & Distributor, New Delhi, 1983.
2. Mechanical Engineering Design by J.F. Shegley, McGraw Hill Book and Company, U.S.A., 1986.

Reference Books:

1. Machine Design, Sharma and Agarwal, S.K. Kataria and Sons, New Delhi, 2001.
2. Design of Machine Elements, VB Bhandari, Tata McGraw Hill, New Delhi 1999.
3. Hand book of Properties of Engineering Materials and Design Data far Machine Elements, Abdulla Shariff, Dhanpat Rai & Sons, New Delhi – 2001.

ME 4007 THEORY OF MACHINES (PRODUCTION ENGG.) IV SEM.

Module-1: Definitions; Link or element of a machine, Kinematic pair, Kinematic chain, Mechanism, Inversion, Machine. Degree of freedom, Inversions of four bar chain, single slider crank chain and Double slider crank chain. Straight line motion mechanism and copying mechanism. (5)

Module 2: Velocity and acceleration diagram of planar mechanism including corriolis component. Relative velocity method, Instantaneous centre method. Klein's construction and Analytical treatment of single slider crank mechanism. (10)

Module 3: Static force analysis, Dynamic force analysis, Equivalent two-mass system. (5)

Module 4: Flywheel: Turning moment on crankshaft, Turning moment diagram, Fluctuation of speed and energy and determination of moment of inertia of flywheel. (5)

Module 5: Fundamental law of gearing, classification and basic terminology, Involute tooth profiles, spur gears. Gear trains; simple, compound and epicyclic geat trains. (8)

Module 6: Cams: various types of cams, various types of followers, Displacement –time, velocity-time and acceleration-time diagrams. Graphical determination of cam profiles, specified cam profiles. (6)

Module7: Vibrations: Linear single degree of fresdom systems, Free undamped and free damped longitudinal vibration, Transverse vibrations in shaft, torsional vibration, Turo-rotor system and three-rotor system. (6)

Text Book:

1. Theory of Machine by Thomas Beven

Reference Books:

1. Theory of Machines and Mechanism by Ghosh and Malik
2. Mechanism and Machine Theory by J.S. Rao and R.V. Dukkibati
3. Theory of Machine by S.S. Rattan, Tata McGrow Hill.

ME 6001 AUTOMOBILE ENGINEERING

Module 1:
Carburetion, Injection systems and Electrical systems; Simple carburetor, modification of simple carburetor for conditions of Economy Power Accelerations. Idling and starting M.P.F.I. and F.I. system. Injection system of C.I. Engines, Bosch pump injection.

Battery and cranking motor, the charging circuit, the ignition system and other electrical devices. (5 Lectures)

Module 2: Mechanics of Motor Vehicle: Power for propulsion, rolling, air and grade resistance, Traction and tractive effort, road performance curves, Acceleration, gradeability and Draw par pull calculation of maximum acceleration, maximum acceleration, maximum tractive effort and reactions for different drivers. (5 Lectures)

Module 3: Power Transmission Systems: General arrangement of clutch, friction clutch, gear box, torque transmission, fluid flywheel, sliding, constant and synchromesh type gear box, epi-cyclic gear box, live axle transmission, Rear engine vehicles. Type of axles, Axle less transmissions, Four wheel drive. (5 Lectures)

Module 4: Torque converters and Automatic transmission: Torque convertor, Turbo transmitter convertor, Automatic transmission, Borg-Warner transmission, Automatic control and central mechanism. (5 Lectures)

Module 5: Drive Lines and Rear Axles: Universal joints, propeller shaft, Live rear axle, find drive, torque reaction, thrust systems, differentials, wheel bearing.

(5 Lectures)

Module 6: Front Axle, Steering Mechanism and Carriage Unit: Primary construction, ackarman linkage, center point steering, Axle construction, steering mechanisms, wheel alignments, independent and dead axle suspension.
Frame design, types and actions of springs and dampers, chasis lubrication.

(5 Lectures)

Module 7: Brakes and Tyres: Functions and method of operation, types, linkages, hydraulic mechanism servo and power brakes, Types of tyre and tubes. (5Lectures)

Books:

1. The Motor Vehicles by Newton and Steeds
2. Automotive Mechanic: by W.H. Crouse
3. Automotive Mechanics by Heitner

ME 6003 HEAT AND MASS TRANSFER

Module-1 Introductory concepts, modes of heat transfer – conduction, convection and radiation, basic equations and applications, generalized conduction differential equation, simple steady and unsteady state solution, one dimensional heat conduction without heat generation and with heat generation composite walls, cylinders and spheres, electrical analogs of thermal systems.
(6 Lectures)

Module-2 Extended surfaces (Fins) : General equation, temperture distribution, heat flow, fin efficiency, effectiveness, variable area, circumferential fin, pin fin of variable section.
(4 Lectures)

Module-3 Radiation: Definition and laws of thermal radiation, black body, real surfaces, gray surfaces, radiation properties, shape factor, radiosity, irradiation, electrical analogy, three-surface system, radiation shield. (5 Lectures)

Module-4 Convection: Concept of viscous and thermal boundary layers, laminar and turbulent flow, continuity equation, momentum equation, energy equation, solution for laminar flow, integral equation, Nusselt number correlations-constant heat flux, turbulent flow, flow across cylinders, force convection for internal flow-laminar & turbulent. (7 Lectures)

Module-5 Natural convection: Grashoff number, analytical method, integral method, practical correlation, constant heat flux, horizontal and inclined flat surfaces, cylindrical surfaces, combined free and forced convection. (4 Lectures)

Module 6: Heat Exchanger: Types of heat exchanger, LMTD method of analysis, correction factor concepts, NTU – effectiveness method of analysis, storage type exchangers, basic ideas of boiling process and mechanism. (5 Lectures)

Module-7 Mass Transfer: Molecular diffusion, equimolal counter diffusion, diffusion into a stationary medium, convective mass transfer, Numberical problems. (4 Lectures)

Books:

1. Heat and Mass Transfer by J.P. Holman
2. Heat Transfer by S. P. Sukhatme
3. Heat and Mass Transfer by P. K. Nag
4. Heat and Mass Transfer by D.S.Kumar
5. A course in Heat Transfer by Arora and Domkundwar

ME 6005 DYNAMICS OF MACHINES

Module 1: Balancing of revolving masses and locomotives: Balancing of several masses revolving in the same plane and different planes. Primary and secondary unbalance in reciprocating engine mechanism, partial balancing of a reciprocating mass by a revolving mass; partial balancing of two cylinders un coupled locomotive engine, Hammer blow; variation of tractive effort, swaying. Couples, coupled wheels of a locomotive. (7 Lectures)

Module 2: Balancing of Engines: Balancing of in line, radial and V-type multicylinder engines, Direct and Reverse cranks. Engine firing timings, principles of balancing machines (6 Lectures).

Module 3: Governors: Centrifugal governors – Porter, Proel, Hartnell; Sensitiveness hunting, Isochronism stability Effort and Power, Effect of friction on sensitiveness. (6 Lectures)

Module 4: Gyroscope: Gyroscopic couple, Gyroscopic effect on naval ship, stability of two wheeled and Four wheeled vehicles. (6 Lectures)

Module 5: Frictional Devices: Power Screws, pivot and collar bearings, plate and cone clutches, Band and Block Brakes, shoe brakes, friction axis (7 Lectures)

Module 6: Vibration, types of vibrations and its effect on the elastic constraints, undamped free longitudinal, transverse and torsional vibrations, torsional vibration of a geared system. (7 Lectures)

Module 7: Damped free vibration, logarithmic decrement, forced vibrations, vibration isolation, transmissibility (6 Lectures)

Books:

1. Theory of Machine by P.L. Balaney, Khanna
2. Theory of Machines by Thomas Beven.
3. Theory of Machines by S.S. Rattan.

ME 6007 DESIGN OF MECHANICAL SYSTEM

Module 1: Design of Spur and Helical gears, Reduction gear boxes. (5 Lectures)

Module 2: Design of Bevel and Worm gears, Differential gear boxes. (5 Lectures)

Module 3: Rolling contact and sliding contact bearings. (5 Lectures)

Module 4: Design of I.C. Engine parts: cylinder, Piston, connecting rod, crank shaft and valve. (5 Lectures)

Module 5: Design of centrifugal pump. (5 Lectures)

Module 6: Pressure vessels, supports, openings (5 Lectures)

Module 7: Optimization and Probabilistic approach in Machine Design. (5 Lectures)

Reference Books:

1. Machine Design, Maleev and Hartman, CBS Publisher & Distributor, New Delhi, 1983.
2. Mechanical Engineering Design, J.F. Shighly, McGraw Hill Book Company, U.S.A. 1986.
3. Machine Design, Sharma and Agarwal, S.K. Kataria and Sons, New Delhi, 2001.
4. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill, New Delhi, 1999.
5. Mechanical Reliability, L.S. Shrinath, Affiliated East West Press, New Delhi, 2002.
6. Hand Book of Properties of Engineering materials and Design Data for Machine Elements, Abdulla Shariff, Dhanptat Rai & Co., New Delhi 2001.
7. Machine Design by U. C. Jindal, Pearson Education, N. Delhi,2010

Electives (Departmental & Free Electives)

LIST OF ELECTIVES III & IV

ELECTIVE- III

1. ME 7317 Design of Mechanical Handling Equipment.
2. ME 7327 Mechanical Vibration
3. ME 7323 Finite Element Analysis
4. ME 7015 CFD
5. ME 7313 Composite Materials
6. ME 7311 Fluidics

ELECTIVE –IV

1. ME 7029 Design of Thermal Systems
2. ME 7331 Refrigeration & Air-conditioning
3. ME 7033 Power Plant Engineering
4. ME 7035 Design, Modelling & Application of Solar Energy
5. ME 7037 Industrial Management
6. ME 7039 Mechatronics

Elective III

ME 7317 Design of Mechanical Handling equipment

Module-1.

Design of Load Lifting Attachments:- Load chains and types of ropes used in Materials handling system, Forged Standard and Ramshorn Hooks, Crane Grabs and Clamps, Grab Buckets, Electromagnets. (5L)

Module-2.

Design of Hoists:- Drives for hosting, components and hosting mechanism, rail travelling component and mechanisms, hoisting gear operation during transient motion, selecting the motor rating and determining breaking torque for hoisting mechanism.
(5L)

Module- 3.

Design of Cranes:- Hand-propelled and electrically driven E.O.T. overhead travelling cranes, Travelling mechanism of cantilever and monorails cranes, design considerations for structure of rotary cranes with fixed radius, fixed post and overhead travelling cranes, Stability of stationary jib and travelling jib cranes. (5L)

Module-4.

Design consideration for conveyor belts, Bucket-elevators, Screw conveyors, Vibratory Conveyors, Cabin Conveyors, Mobile racks.
(5L)

Module-5.

Design and application in shop floor Material Handling Equipment's, Fork Lift truck etc.
(5L)

Module-6.

Two-phase flow system-Coal dust, grains and food grains etc.
(5L)

Module-7.

Application of Materials Handling Equipment's in Automobile industries, applicable to Power Plants and applicable to Foundries. (5L)

Reference Books:

1. N. Rudenko, Materials Handling Equipment, Peace Publishers, Moscow
2. James M. Apple, Materials Handling System Design, John-Willey and Sons Publication, New York.

ME 7327 Mechanical Vibration

Module 1: Introduction to mechanical vibration, important definitions in vibration analysis, main causes of vibration, the basic components of mechanical vibrating system, types of vibration, degrees of freedom, Harmonic motion and its properties, harmonic analysis-Fourier's series, representation of harmonic motion in complex form.
(5L)

Module 2: Undamped free vibration of single dof system, Free Body diagrams, Absolute and relative motion, derivation of differential equation of motion using D'Alembert's principle and energy method , solution of differential equation of a classical spring-mass system and its natural frequency, Rayleigh's method. (5L)

Module 3: Damped Free vibration analysis of a single dof system, different types of damping used in practice (viscous damping, eddy current damping, structural damping, dry friction damping, non contact damping), Solution of free vibration with damping (viscous damping) in a single dof system, Special cases of damping (under damping, critical damping, over damping), damping ratio, logarithmic decrement. (5L)

Module 4: Forced vibration analysis of single dof system due to harmonic excitation, Magnification factor, transient and steady state response, transmissibility and vibration isolation, rotor unbalance, whirling of rotating shaft, base excitation.
(5L)

Module 5: Free vibration of two degree of freedom systems, derivation of equations of motion, coordinate coupling, principal coordinates, orthogonality of modes, Lagrange's equation, Forced vibration of two dof system with harmonic excitation, torsional vibration with two rotor masses. (5L)

Module 6: Derivation of equations of motion of multi dof system, matrix formulation, influence coefficients, types of couplings, natural frequencies and mode shapes (eigenvalues and eigenvectors), numerical techniques in determination of natural frequencies of multi dof systems- Rayleigh's method, Stodala's method, Matrix Iteration method, Holzer's method for multi rotor, and Dunkerley's method. (5L)

Module 7: Signature Analysis and Preventive maintenance- Vibration measuring instruments, Vibration testing equipments: signal generation, measuring and conditioning instruments, signal analysis instruments, vibration signatures and standards.
(5L)

Text Books/ Reference Books:

1. Theory of Vibration with Applications: W. T. Thomsom and Marie Dillon Dahleh, Pearson Education.

2. Mechanical Vibration Analysis: P Srinivasan, Tata McGraw-Hill.
3. Mechanical Vibration: T. Gowda, Jagadeesha T, D V Girish, McGrawhill Education (India) Private Limited.
4. Theory and Practice of Mechanical Vibrations: J.S. Rao and K. Gupta, New Age International Publishers.
5. Elements of Vibrations Analysis: Leonanrd Meirovitch,Tata McGraw Hill. :

ME 7323 Finite Element Analysis

Module- 1:

Introduction to central ideas underlying the Finite Element Method in Mechanical Engineering, Basic concepts-Variational method, Weighted residual methods, Potential energy method. (5L)

Module-2:

Interpolation function/Shape function- one dimensional linear element (bar element), Properties of interpolation function in one dimensional linear element.
Two dimensional linear element- Shape function for triangular and rectangular element, Properties of shape functions of triangular and rectangular elements. (5L)

Module-3:

Application of finite element in field problems- Steady state and time dependent field problems, specific application areas include heat transfer, irrotational fluid flow etc. (5L)

Module-4:

Torsion of noncircular sections- general theory, twisting of square bar, shear stress component, evaluation of the twisting torque. (5L)

Module-5:

Potential energy formulations, axial force element, system of axial force members, general formulation examples. (5L)

Module-6:

Truss element- finite element analysis of truss element, structural model, element matrices, analysis of pinned truss problems. (5L)

Module-7:

Beam element- structural model, strain energy equation, displacement equation, element stiffness matrix, analysis of a statically indeterminate problems. (5L)

Text book:

1. L. J. Segerlind, Applied Finite Element Analysis, Second edition, John Wiley & Sons, 1984.

Reference Books:

1. P. Seshu, Text Book of Finite Element Analysis, Prentice-Hall of India Pvt. Ltd., New Delhi, 2004.

ME 7015 COMPUTATIONAL FLUID DYNAMICS

MODULE-I

Introduction to Computational Fluid Dynamics, Models of the fluid flow, conservative and non-conservative forms of equations, substantial derivative, a brief overview of the governing equations for fluid flow and heat transfer. [5L]

MODULE-II

Classification of partial differential equations and pertinent physical behaviour, parabolic, elliptic and hyperbolic equations, linear and non-linear PDE, Initial and boundary condition, Implementations of boundary conditions. [5L] **MODULE-III**

An overview of finite difference method, Difference equations, forward and backward difference, two point central difference scheme, central second order difference, three point backward difference scheme, three point forward difference scheme, local discretisation error, round off error, explicit and implicit schemes. [5L]

MODULE-IV

Tri-diagonal matrix algorithm (TDMA), Exact solution of Convection diffusion Problem, approximate solution of convection diffusion problem using different scheme, limitations, advantage upwind scheme, Von Newmann stability analysis. [5L]

MODULE-V

CFD Techniques: Lax-Wandroff technique, MacCormack's Techniques, Jacobi and Gauss-Seidel techniques, relaxation technique, consistency, stability and convergence, artificial diffusion. [5L]

MODULE-VI

Grid Transformation: Introduction, General transformation of equations, metrics and Jacobians, concept stretched grids, adaptive grids and boundary fitted grids. [5L]

MODULE-VII

Finite Volume Methods: Discretisation for one dimension steady diffusion problems, specification of interface diffusivity, source term linearization, Discretisation of transient one-dimensional diffusion problems using FVM, Discretisation for multi-dimensional diffusion problems using FVM, Discretisation of one dimensional steady convection diffusion problem using FVM. [5L]

Books:

1. Computational Fluid Dynamics the Basic and applications - J. D. Anderson Jr.
2. Numerical Heat Transfer and Fluid Flow by Subhas V. Patankar, Hemisphere Publishing Corporation, Newyork
3. An introduction to computational fluid dynamics The finite volume method by H.K. Versteeg and W. Malalasekera, Pearson Education Limited.
4. Computational Fluid Dynamics by Principles and Applications – J. Blazek
5. Numerical Computation of Internal and External Flows (Vol. I & II) by C. Hirsch

ME 7313 COMPOSITE MATERIALS

Module-1. INTRODUCTION TO COMPOSITES

Fundamentals of composites - need for composites – Enhancement of properties - classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC) – Reinforcement – Particle reinforced composites, Fibre reinforced composites. Applications of various types of composites. (5L)

Module-2. POLYMER MATRIX COMPOSITES

Polymer matrix resins – Thermosetting resins, thermoplastic resins – Reinforcement fibres – Rovings – Woven fabrics – Non woven random mats – various types of fibres. PMC processes - Hand lay-up processes – Spray up processes – Compression moulding – Reinforced reaction injection moulding - Resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre reinforced plastics (FRP), Glass fibre reinforced plastics (GRP). (5L)

Module-3. METAL MATRIX COMPOSITES

Characteristics of MMC, Various types of Metal matrix composites Alloy vs. MMC, Advantages of MMC, Limitations of MMC, Metal Matrix, Reinforcements – particles – fibres. Effect of reinforcement, Volume fraction, Rule of mixtures. Processing of MMC, Powder metallurgy process, diffusion bonding, stir casting, squeeze casting. (5L)

Module-4. CERAMIC MATRIX COMPOSITES

Engineering ceramic materials – properties – advantages – limitations – Monolithic ceramics - Need for CMC – Ceramic matrix - Various types of Ceramic Matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibres- whiskers. Sintering - Hot pressing – Cold iso-static pressing (CIPing) – Hot iso-static pressing (HIPing). (5L)

Module-5. ADVANCES IN COMPOSITES

Carbon / carbon composites – Advantages of carbon matrix – limitations of carbon matrix Carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Sol gel technique. Composites for aerospace applications. (5L)

Module-6. SECONDARY PROCESSING AND JOINING OF COMPOSITE

Forging and extrusion of composites – critical issues, dynamic recovery and dynamic recrystallization, mechanical properties; Induction Heating, Fusion Bonding, Ultrasonic welding, Gas tungsten arc welding, Gas metal arc welding, Resistance spot & seam welding, Resistance brazing, Resistance spot joining, Resistant spot brazing, Resistance welding of thermoplastic-graphite composite, Weld bonding, Brazing of MMC. (5L)

Module-7. INDUSTRIAL APPLICATION OF COMPOSITE MATERIALS

Civil constructions of structures/panels, Aerospace industries, Automobile and other surface transport industries, Packaging industries, House hold and sports components etc. (5L)

TEXT BOOKS

1. Mathews F.L. and Rawlings R.D., Composite materials: Engineering and Science, Chapman and Hall, London, England, 1st edition, 1994.
2. Chawla K.K., Composite materials, Springer – Verlag, 1987

REFERENCES

1. Clyne T.W. and Withers P.J., Introduction to Metal Matrix Composites, Cambridge University Press, 1993.
2. Strong A.B., Fundamentals of Composite Manufacturing, SME, 1989.
3. Sharma S.C., Composite materials, Narosa Publications, 2000.

ELECTIVE –IV

ME 7331 REFRIGERATION AND AIR CONDITIONING

Module- 1. Definition of Refrigeration and Air-conditioning, Introduction and Basic concepts. Air-cycle Refrigeration, its application in air-craft refrigeration Evaporative cooling system, Boot strap cooling system, Regenerative cooling system, Reduced Ambient system.
(5Lectures)

Module-2. Simple vapour compression Refrigeration systems, Compound vapour compression Refrigeration systems and its applications. (5 Lectures)

Module-3 Vapour Absorption Refrigeration system and its applicantions. Thermo-electric Refrigeration systems, Steam jet Refrigeration system.
(5 Lectures)

Module-4 Function and classification of compressors, construction and working of reciprocating compressors, Work done and volumetric efficiency.
Multi-stage compression and their advantages Centrifugal and Rotary Compressors.
(5Lectures)

Module-5 Properties of Refrigerants and eco-friendly refrigerants.
Low Temperature Refrigeration and its applications. (5 Lectures)

Module-6 Psychrometry, Cooling load calculation and Air-conditioning, systems and accessories. (5 Lectures)

Module-7 Cooling Towers & Cooling Ponds. (5 Lectures)

Text Books:

1. Refrigeration & Air-conditioning – Manohar Prasad
2. Refirgeration & Air-conditioning – Arora & Domukndwar
3. Refrigeration & Air-conditioning – C.P. Arora.

Reference books:

1. Refrigeration & Air-conditioning – R.C. Jordan & G.B. Priester.

ME 7033 POWER PLANT ENGINEERING

Module 1: Introduction: Review of electricity generation in Indian context and energy scenario in India, Principal types of power plants, special feature, application and future trend of developments.
(5 Lectures)

Module 2: Steam Power Plants: Major components of power plant, fuels and their properties, storage, preparation, handling and burning, Ash handling and dust collection, Feed water treatment plants, cooling towers, insulation, Heat balance of power plant.
(5 Lectures)

Module 3: Nuclear Power Plants: Principle of power generation by nuclear fission and fusion, fuels for nuclear power plants, preparation and care, fertile materials and breeding, Different types of reactor, Breeder reactors, Radioactive waste disposal systems.
(5 Lectures)

Module 4: Diesel and Gas Turbine Power Plants: Introduction, field of use, air supply, and cleaning system, fuel storage and supply systems, cooling systems, lubricating and starting systems, Components of gas turbine power plant, Different arrangements of components, Optimum design of Gas turbine unit for combined cycle plant, comparative study of diesel and gas turbine plants.
(5 Lectures)

Module 5: Hydraulic Power Plants: Different types of hydraulic power plants, rain fall and run-off measurements and plotting of various curves for estimating power available with or without storage, Pump storage plant. (5 Lectures)

Module 6: Combined operation of different power plants: Introduction, Advantages of combined working, load division between power stations, storage type hydro-electric power plant in combination with steam plant, Coordination of different types of power plants, Instrumentation and control methods used in different types of power plant.
(5 Lectures)

Module 7: Economic Analysis: Difference between Base load and peak load plants, Different terms and definitions, Means of meeting the total load demand, Performance and operating characteristics of power plants, Load division, Tarrif method for Electrical Energy.
(5 Lectures)

Books:

1. Power Plant Engineering: by F.T. Morse.
2. Power Plant Engineering: by Arora & Domkundwar, Dhanpatrai Publication
3. Power Plant Engineering: by N.K.Nag, T.M. H. Publication
4. Power Plant Technology: by M.M.E. Wakil, McGraw Hill Publication.
5. Power Plant Engineering: by K.K. Ramalingam, Scitech Publications.

ME 7039 MECHATRONICS

MODULE 1 : Introduction to Mechatronics, Design Process, Modeling Electromechanical systems, System Interfacing, Instrumentation and Control System Introduction to Micro and Nano technology (5L)

MODULE 2 : Mechatronics Sensors and Actuators, Fundamentals of Time and Frequency, Performance Technology, linear and Rotational Sensors, Acceleration sensors, Flow sensors, Temperature sensors, distance measuring and Proximity sensors, Light Detection, Image and Vision Systems (5L)

MODULE 3 : Digital Logic, signal Conditioning , Op amplifiers, Filtering, Active and Digital Filters, digital Outputs and power Drives, A to D converters, voltage Regulators, Power Supplies and Batteries, Timer (5L)

MODULE 4 : Actuators, Permanent Magnet Brushed DC Motor Characteristics, Characteristic Equations for Constant Voltage, Solenoids, Brushless DC motors, Stepper Motors, Pneumatic and Hydraulic Systems, Piezo Actuators (5L)

MODULE 5: MECHATRONICS projects and Systems Engineering, Rapid Prototyping and Mechanical Systems, RP techniques, SLA, SLA, FDM, Soft modeling Circuit Prototyping (5L)

MODULE 6 : Microprocessors General Aspects, Definition and brief description, Characteristic of microprocessor, Buses, Memory and Input/ Output, ALU, Timing and Control unit, Microcontrollers (5L)

MODULE 7 : Artificial Intelligence, fuzzy Logic, Microsensors, On line Quality Control, PLC, System Transfer Functions, Data Acqusition Systems (5L)

Books: (1). Mechatronics, Sensors and Actuators by Robert H. Bishop , CRC Press

(2). A Text book of Mechatronics by R.K.Rajput, S.Chand Publications

(3). Introduction to Mechatronic Design by Carryer,Ohline, Kenny

(4). An Intruction to Mechatronics, by Devdas Shetty