

Bachelor of Technology (Mechanical Engineering)

KURUKSHETRA UNIVERSITY KURUKSHETRA

Scheme of Studies/Examination

Semester IV

S. No.	Course No.	Subject	L:T:P	Hours/Week	Examination Schedule (Marks)				Duration of Exam (Hrs)
					Theory	Sessional	Practical	Total	
1	AS-201N/ HS-201N	Mathematics-III/Fundamentals of Management	3:1:0	4	75	25	0	100	3
2	ME-202N	Production Technology-I	4:0:0	4	75	25	0	100	3
3	ME-204N	Steam Generation & Power	3:1:0	4	75	25	0	100	3
4	ME-206N	Mechanics of Solids-II	3:1:0	4	75	25	0	100	3
5	ME-208N	Fluid Mechanics	4:1:0	5	75	25	0	100	3
6	ME-210N	Dynamics of Machines	3:1:0	4	75	25	0	100	3
7	ME-214N	Fluid Mechanics Lab	0:0:2	2	0	40	60	100	3
8	ME-216N	Dynamics of Machines lab	0:0:2	2	0	40	60	100	3
9	ME-218N	Steam Generation & Power Lab	0:0:2	2	0	40	60	100	3
10	ME-220N	Production Technology Lab	0:0:3	3	0	40	60	100	3
		Total		34	450	310	240	1000	
11	MPC-202N	Energy Studies*	3:0:0	3	75	25		100	3

*Paper MPC-202 is a mandatory course which will be non-credit subject and student has to get pass marks in order to qualify the semester.

NOTE- 6 weeks hands on training to be done after IVth Semester Exams. Marks will be allotted after training report evaluation in 5th Semester.

Course No.	Course Title	Teaching Schedule			Allotment of Marks			Duration of Exam (Hrs.)
		L	T	P	Theory	Sessional	Total	
AS-201N	<u>MATHEMATICS-III</u>	3	1	0	75	25	100	3
Purpose	To acquaint the students with the basic use of PDE, Linear Programming problems, Fourier series and transforms, Complex variables and Probability							
Course Outcomes (CO)								
CO-1	This section is concerned mainly with Fourier series. However, the underlying ideas can also be extended to non-periodic phenomena. This leads to Fourier integrals and transforms which are very much useful in solving the initial and boundary value problems.							
CO-2	Students will learn about the formation and solution the partial differential equations. First order PDE of any degree by using Charpit's method will be discussed in details. In addition, how to solve homogeneous linear PDE with constant coefficients and variable separable method and LPP will be covered under this section.							
CO-3	Complex analysis is concerned with generalization of the familiar real functions of calculus and their detailed knowledge is an absolute necessity in practical work to solve engineering problems.							
CO-4	Probability theory provides models of probability distributions(theoretical models of the observable reality involving chance effects) to be tested by statistical methods which has various engineering applications, for instance, in testing materials, control of production processes, robotics, and automatization in general, production planning and so on.							

UNIT-I

Fourier Analysis

Fourier series: Euler's formulae, Orthogonality conditions for the Sine and Cosine function, Dirichlet's conditions, Fourier expansion of functions having points of discontinuity, Change of interval, Odd and even functions, Half-range series.

Fourier Transforms: Fourier integrals, Fourier transforms, Fourier Cosine and Sine transforms, Properties of Fourier transforms, Convolution theorem, Parseval's identity, Fourier transforms of the derivative of a function, Application of transforms to boundary value problems (Heat conduction and vibrating string).

UNIT-II

Partial Differential Equations and LPP

Formation and Solutions of PDE, Lagrange's Linear PDE, First order non-linear PDE, Charpit's method, Homogeneous linear equations with constant coefficients, Method of separation of variables.

Solution of linear programming problems: using Graphical and Simplex methods.

UNIT-III

Theory of Complex Variables

A review of concept of functions of a complex variable, Limit, continuity, differentiability and analyticity of a function. Basic elementary complex functions (exponential functions, trigonometric & Hyperbolic functions, logarithmic functions) Cauchy-Riemann Equations.

Line integral in complex plane, definition of the complex line integral, basic properties, Cauchy's integral theorem, and Cauchy's integral formula, brief of Taylor's, Laurent's and Residue theorems (without proofs).

UNIT-IV

Probability theory:

A review of concepts of probability and random variables: definitions of probability, addition rule, conditional probability, multiplication rule, Conditional Probability, Mean, median, mode and standard deviation, Bayes' Theorem, Discrete and continuous random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function.

Standard Distributions: Binomial, Poisson and Normal distribution.

References Books:

1. E. Kreyszig : Advanced Engineering Mathematics, Wiley India.
2. B. V. Ramana: Engineering Mathematics, Tata McGraw Hill.
3. R.K. Jain, S.R.K. Iyengar: Advanced Engineering Mathematics, Taylor & Francis.
4. [Murray R Spiegel](#): Schaum's Outline of Complex Variables, McGraw Hill Professional.
5. Michael D. Greenberg: Advanced Engineering Mathematics, Pearson Education, Prentice Hall.

Note: Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.

Course No.	Course Title	Teaching Schedule			Allotment of Marks			Duration of Exam (Hrs.)
		L	T	P	Theory	Sessional	Total	
HS-201N	<u>FUNDAMENTALS OF MANAGEMENT</u>	3	0	0	75	25	100	3
Purpose	To understand the concept and techniques of controlling and new trends in management							
Course Outcomes (CO)								
CO-1	An overview about management as a discipline and its evolution							
CO-2	Understand the concept and importance of planning and organizing in an organization							
CO-3	Enabling the students to know about the importance of hiring and guiding the workforce by understanding the concept of leadership and communication in detail							
CO-4	To understand the concept and techniques of controlling and new trends in management							

UNIT-1

1. Introduction to Management: Meaning, Definition, nature, importance & Functions, Management as Art, Science & Profession- Management as social System, Concepts of management-Administration

2. Evolution of Management Thought: Development of Management Thought- Scientific management, Administrative Theory of Management, Bureaucratic Organization, Behavioral approach (Neo Classical Theory): Human Relations Movement; Behavioral Science approach; Modern approach to management – Systems approach and contingency approach.

UNIT-II

3. Planning: nature, purpose and functions, types of plans, planning process, Strategies and Policies: Concept of Corporate Strategy, formulation of strategy, Types of strategies, Management by objectives (MBO), SWOT analysis, Types of policies, principles of formulation of policies

4. Organizing: nature, importance, process, organization structure: Line and Staff organization, Delegation of Authority and responsibility, Centralization and Decentralization, Decision Making Process , Decision Making Models, Departmentalization: Concept and Types (Project and Matrix), formal & informal organizations

UNIT-III

5. Staffing: concept, process, features; manpower planning; Job Analysis: concept and process; Recruitment and selection: concept, process, sources of recruitment; performance appraisal, training and development

6. Directing: Communication- nature, process, formal and informal, barriers to Effective Communication, Theories of motivation-Maslow, Herzberg, McGregor ; Leadership – concept and theories, Managerial Grid, Situational Leadership. Transactional and Transformational Leadership.

UNIT-IV

7. Controlling: concept, process, types, barriers to controlling, controlling Techniques: budgetary control, Return on investment, Management information system-MIS , TQM- Total Quality Management, Network Analysis- PERT and CPM.

8. Recent Trends in Management: -

Social Responsibility of Management–Management of Crisis, Total Quality Management, Stress Management, Concept of Corporate Social Responsibility (CSR) and business ethics.

2

Functional aspects of business: Conceptual framework of functional areas of management- Finance; Marketing and Human Resources

Text books

1. Management Concepts - Robbins, S.P; Pearson Education India
2. Principles of Management - Koontz & O'Donnel; (McGraw Hill)

Recommended books

1. *Business Organization and Management* – Basu; Tata McGraw Hill
2. Management and OB-- Mullins; Pearson Education
3. Essentials of Management – Koontz, Tata McGraw-Hill
4. Management Theory and Practice – Gupta, C.B; Sultan Chand and Sons, new Delhi
5. Prasad, Lallan and S.S. Gulshan. *Management Principles and Practices*. S. Chand & Co. Ltd., New Delhi.
6. Chhabra, T.N. *Principles and Practice of Management*. Dhanpat Rai & Co., Delhi.
7. Organizational behaviour – Robbins Stephen P; PHI.

Note: Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.

Production Technology-I

UNIT-I

Geometry of Cutting Tools:

Introduction, Geometry of single point turning tools: Cutting edges, Rake and Clearance angles, Systems of description of tool geometry, Designation of tool geometry in Machine reference system, ORS system and NRS system

Geometry of Multi point cutting tools: Geometry of Milling cutters, Geometry of Drills

Mechanics of Metal cutting:

Cutting Tool Materials, Chip formation, Types of Chips, Chip control and chip breakers, orthogonal and oblique metal cutting, Chip thickness ratio, Velocity relationship in orthogonal cutting, Merchant's Analysis, Stress and Strain on the chip, Forces on single point cutting tool, Torque, heat produced, power and MRR equations, Use of Merchant's circle diagram in force analysis in orthogonal cutting for single point cutting tool.

Popular theories on mechanics of metal cutting: Earnst Merchant Theory, Merchant theory, Stabler Theory, Lee and Shaffer's Theory. Factors affecting temperature in metal cutting,

UNIT-II

Cutting Fluids and Tool life:

Cutting fluids, Purpose, Properties, Types of lubricants, Types of cutting fluids, Tool Failure, Mechanisms of Tool wear, Tool Life, Factors affecting tool life. Taylor's Tool life equation

Economics of metal machining:

Cost Considerations in Manufacturing, Elements of Machining cost, Minimum cost per piece, Maximum Production rate, Optimum cutting speed and optimum tool life for minimum cost of production and maximum production rate, Machinability, Machinability Index, Improving Machinability, Measurement of cutting forces, Tool force Dynamometers, Numerical on Mechanics of Metal cutting and economics.

UNIT-III

Milling Process:

Milling Machine Operations performed on Milling machine, Parts of Milling Machine, Types of Milling machines, fundamentals of Milling process, Milling Cutters, Elements of Plain Milling cutter, Cutter Holing devices, Cutting speed, Feed and depth of cut, Force system in Milling, Dividing head or Indexing Head, Methods of Indexing

Drilling Machine:

Types of Drills, Drilling machine Types, Drilling machine operations,, Size of Drilling machine, Main parts of drilling machine, Force system in Drilling, Cutting speed, Feed and Depth of cut in drilling, MRR in drilling, Numerical Problems on Drilling.

UNIT-IV

Specification of Machine Tools:

Introduction, purpose of machine tool specifications, Methods of specification of conventional machine tools: specification of lathes, specification of drilling and boring machines, specification of shaper, planer and slotter machines, specification of milling machine, specification of gear teeth generating machines, specification of grinding machines.

Metrology

Measurements, Linear Measurement, Callipers, Vernier Calliper, Micrometer, Angular Measurement, Comparators-mechanical, electrical and optical,sine bar, auto-collimator,

Surface finish and its measurement, Surface Roughness Measurement methods, Factors affecting surface finish in machining, micro and macro deviation, specifying surface finish.

Suggested reading:

1. Machining and Machine Tools by A.B. Chattopadhyay, Wiley India.
2. Manufacturing Processes by J.P. Kaushish, PHI
3. Metrology & Measurement By Bewoor, McGraw Hill.
4. A Textbook of Production Technology by P.C.Sharma, S.Chand pub.
5. Workshop Technology: B.S.Raghuwanshi, DhanpatRai Publications.
6. Production Technology: R.K.Jain, Khanna Publishers.
7. Machine Tools: R.Kesavan & B.Vijaya Ramnath, Laxmi Publications.
8. Machining and Machine Tools: A.B.Chattopadhyay, WILEY INDIA.

Note: *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit*

STEAM GENERATION & POWER

UNIT I

Introduction; classification of boilers; comparison of fire tube and water tube boiler; their advantages; description of boiler; Lancashire; locomotive; Babcock; Wilcox etc.; boiler mountings; stop valve; safety valve; blow off valve; feed check etc.; water level indicator; fusible plug; pressure gauge; boiler accessories; feed pump; feed water heater; preheater; superheater; economizer; natural draught chimney design; artificial draught; stream jet draught; mechanical draught; calculation of boiler efficiency and equivalent evaporation(no numerical problem)

UNIT II

Carnot cycle; simple and modified Rankine cycle; effect of operating parameters on rankine cycle performance; effect of superheating; effect of maximum pressure; effect of exhaust pressure; reheating and regenerative Rankine cycle; types of feed water heater; reheat factor; binary vapour cycle. Simple steam engine, compound engine; function of various components.

UNIT III

Function of steam nozzle; shape of nozzle for subsonics and supersonics flow of stream; variation of velocity; area of specific volume; steady state energy equation; continuity equation; nozzle efficiency; critical pressure ratio for maximum discharge; physical explanation of critical pressure; super saturated flow of steam; design of steam nozzle. Advantage of steam condensation; component of steam condensing plant; types of condensers; air leakage in condensers; Dalton's law of partial pressure; vacuum efficiency; calculation of cooling water requirement; air expansion pump.

UNIT IV

Introduction; classification of steam turbine; impulse turbine; working principal; compounding of impulse turbine; velocity diagram; calculation of power output and efficiency; maximum efficiency of a single stage impulse turbine; design of impulse turbine blade section; impulse reaction turbine; working principle; degree of reaction; parsons turbine; velocity diagram; calculation of power output; efficiency of blade height; condition of maximum efficiency; internal losses in steam turbine; governing of steam turbine.

Text Books :

1. Thermal Engineering – P L Ballaney, Khanna Publishers
2. Thermodynamics and Heat Engines vol II – R Yadav, Central Publishing House

Reference Books :

1. Applied Thermodynamics for Engineering Technologists – T D Eastop and A. McConkey, Pearson Education
2. Heat Engineering – V P Vasandani and D S Kumar, Metropolitan Book Co Pvt Ltd.

Note: Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.

MECHANICS OF SOLIDS-II

Unit-I

Strain Energy & Impact Loading: Definitions, expressions for strain energy stored in a body when load is applied (i) gradually, (ii) suddenly and (iii) with impact, strain energy of beams in bending, beam deflections, strain energy of shafts in twisting, energy methods in determining spring deflection, Castigliano's theorem, Numerical.

Theories of Elastic Failure: Various theories of elastic failures with derivations and graphical representations, applications to problems of 2- dimensional stress system with (i) Combined direct loading and bending, and (ii) combined torsional and direct loading, Numericals.

Unit-II

Thin Walled Vessels: Hoop & Longitudinal stresses & strains in cylindrical & spherical vessels & their derivations under internal pressure, wire wound cylinders, Numericals.

Thick Cylinders & Spheres: Derivation of Lamé's equations, radial & hoop stresses and strains in thick, and compound cylinders and spherical shells subjected to internal fluid pressure only, hub shrunk on solid shaft, Numericals.

Unit-III

Rotating Rims & Discs: Stresses in uniform rotating rings & discs, rotating discs of uniform strength, stresses in (I) rotating rims, neglecting the effect of spokes, (ii) rotating cylinders, hollow cylinders & solid cylinders. Numericals.

Springs: Stresses in closed coiled helical springs, Stresses in open coiled helical spring subjected to axial loads and twisting couples, leaf springs, flat spiral springs, concentric springs, Numericals.

Unit-IV

Bending of Curved Bars : Stresses in bars of initial large radius of curvature, bars of initial small radius of curvature, stresses in crane hooks, rings of circular & trapezoidal sections, deflection of curved bars & rings, deflection of rings by Castigliano's theorem, stresses in simple chain link, deflection of simple chain links, Problems.

Unsymmetrical Bending: Introduction to unsymmetrical bending, stresses due to unsymmetrical bending, deflection of beam due to unsymmetrical bending, shear center for angle, channel, and I-sections, Numericals.

Text Books:

1. Strength of Materials – R.K. Rajput, Dhanpat Rai & Sons.
2. Strength of Materials – Sadhu Singh, Khanna Publications.
3. Strength of Materials – R.K. Bansal, Laxmi Publications.

Reference Books:

1. Strength of Materials – Popov, PHI, New Delhi.
2. Strength of Materials – Robert I. Mott, Pearson, New Delhi
3. Strength of Material – Shaums Outline Series – McGraw Hill
4. Strength of Material – Rider – ELBS

Note: Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.

FLUID MECHANICS

Unit I

Fluid Properties: Concept of fluid and flow, ideal and real fluids, continuum concept, Properties of fluid: mass density, weight density, specific volume, specific gravity, viscosity, causes of viscosity, surface tension, capillarity, vapour pressure, compressibility and bulk modulus, Newtonian and non-Newtonian fluids.

Fluid Statics: Pressure, Pascal's law, hydrostatic law, pressure measurement, manometers, hydrostatic forces on submerged plane and curved surfaces, buoyancy, stability of floating and submerged bodies, liquids in relative equilibrium. Problems.

Unit II

Fluid Kinematics: Eulerian and Lagrangian description of fluid flow; types of fluid flows, stream, streak and path lines; acceleration of a fluid particle, flow rate and continuity equation, differential equation of continuity in cartesian and polar coordinates, rotation and vorticity, circulation, stream and potential functions, flow net. Problems.

Fluid Dynamics: Concept of system and control volume, Euler's equation, Bernoulli's equation and its practical applications, venturimeter, orificemeter, orifices, mouthpieces, Impulse momentum equation, kinetic energy and momentum correction factors. Problems.

Unit III

Viscous Flow: Flow regimes and Reynold's number, Navier-Stokes equation, relationship between shear stress and pressure gradient, flow of viscous fluids in circular pipe and between stationary and moving parallel plates, hydrodynamic lubrication, movement of piston in a dashpot, power absorbed in bearings. Problems.

Turbulent Flow Through Pipes: Transition from laminar to turbulent flow, Reynold's equation of turbulence, Shear stress in turbulent flow, Prandtl mixing length hypothesis, Major and minor losses in pipes, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes, hydraulically smooth and rough pipes, velocity distribution in pipes, friction coefficients for smooth and rough pipes. Problems.

Unit IV

Boundary Layer Flow: Boundary layer concept, displacement, momentum and energy thickness, Blasius solution, von-Karman momentum integral equation, laminar and turbulent boundary layer flows, separation of boundary layer and its control.

Flow over Bodies: Drag and lift, friction and pressure drag, lift and drag coefficients, stream lined and bluff bodies, drag on a flat plate, drag on a cylinder and an airfoil, circulation and lift on a circular cylinder and an airfoil. Problems.

Reference and Text Books:

1. Introduction to Fluid Mechanics – R.W. Fox, Alan T. McDonald, P.J. Pritchard, Wiley Publications.
2. Fluid Mechanics – Frank M. White, McGraw Hill
3. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons
4. Fluid Mechanics – Streeter V L and Wylie E B, Mc Graw Hill
5. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, Tata McGraw Hill.
6. Mechanics of Fluids – I H Shames, Mc Graw Hill
7. Fluid Mechanics: Fundamentals and Applications -YunusCengel and John Cimbala, McGraw Hill.
8. Fluid Mechanics: Pijush K. Kundu, Ira M. Cohen and David R. Rowling, Academic Press.

Note: Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.

DYNAMICS OF MACHINES

UNIT I

Static force analysis: Static equilibrium, Equilibrium of two and three force members, Members with two forces and a torque, Equilibrium of four force members, free body diagram, Principle of Superposition, static forces Analysis of four bar mechanisms and slider crank mechanism,

Dynamic Force Analysis: D'Alembert's principle, Equivalent offset inertia force, Dynamic force analysis of four bar mechanism and slider crank mechanism Engine force analysis, Turning moment on crank shaft, Dynamic Equivalent systems, Inertia of connecting rods, Inertia force in reciprocating engines (Graphical and Analytical methods), Turning moment diagrams, fluctuation of energy, Flywheels, Flywheel dimensions, Punching Press.

UNIT II

Gears: Classification of gears, Gear terminology, Fundamental law of gearing, Forms of Teeth, Cycloidal and involute profiles of gear teeth, Interchangeable Gears, path of contact, arc of contact, number of pairs of teeth in contact (Contact Ratio), Interference in involute gears, minimum number of teeth, undercutting,

Helical, Spiral, Bevel and worm & worm gears, Terminology, Efficiency

Gear trains: Simple, compound, reverted, Planetary or epicyclic gear trains, Analysis of Epicyclic Gear trains, Torques in epicyclic gear trains, Sun and Planet gear, Automotive transmissions gear train. Differential.

UNIT III

Brakes: Types of brakes, Block and shoe brake, band brake, band and block brakes, internal expanding shoe brake, Effect of Braking.

Dynamometers: Types of Dynamometers, Pony and Rope Brake Dynamometer, Hydraulic Dynamometer, Belt Transmission Dynamometer, Epicyclic train Dynamometer, Bevis Gibson torsion dynamometer.

Governors: Types of Governors, Watt, Porter, Proell, Hartnell, Hartung, Wilson-Hartnell, Inertia Governors, Sensitiveness, Hunting, Isochronism, Stability of Governors, Effort and Power of a Governor, Controlling Force.

UNIT IV

Balancing of rotating masses: Static and Dynamic Balancing, Single Rotating mass, Many Masses rotating in same plane and in different planes. Analytical method for balancing of rotating masses.

Balancing of reciprocating masses: Reciprocating Engine, Partial Primary balance, Balancing of Multi-cylinder in line engines, Balancing of Radial Engines, Balancing of V-Engines, Balancing of Rotors

Gyroscope: Angular Velocity, Angular Acceleration, pitching and rolling, Gyroscopic couple and its effect on Aeroplanes, Naval ships, Stability of an automobile (2 & 4-wheers), taking a turn, Gyroscopic effect in stone crusher.

Suggested reading:

1. Theory of machines: S. S. Rattan, Tata McGraw Hill Publications.
2. Theory of Machines: V. P. Singh, Dhanpat Rai & Co. Pvt. Ltd.
3. Theory of machines: Kinematics and Dynamics by Sadhu Singh, Pearson Publications
4. Theory of Machines and Mechanisms.: Uicker, J.J., Pennock G.R and Shigley, J.E., 3rd Edition, Oxford University Press, 2009.
5. Mechanism synthesis and analysis: A.H. Soni, McGraw Hill Publications.
6. Mechanism: J.S. Beggs.
7. Mechanics of Machines: P.Black, Pergamon Press.

MPC-202 N		ENERGY STUDIES				
Lecture	Tutorial	Practical	Major Test	Minor Test	Total	Time
3	-	-	75	25	100	3
Purpose	To make the students conversant with the basics concepts and conversion of various form of Energy					
Course Outcomes						
CO1	An overview about Energy , Energy Management, Audit and tariffs					
CO2	Understand the Layout and working of Conventional Power Plants					
CO3	Understand the Layout and working of Non-Conventional Power Plants					
CO4	To understand the role of Energy in Economic development and Energy Scenario in India					

UNIT-I

Introduction: Types of energy, Conversion of various forms of energy, Conventional and Non-conventional sources, Need for Non-Conventional Energy based power generation.

Energy Management: General Principles of Energy Management, Energy Management Strategy.

Energy Audit: Need, Types, Methodology and Approach.

UNIT-II

Conventional Energy sources: Selection of site, working of Thermal, Hydro, Nuclear and Diesel power plants and their schematic diagrams & their comparative advantages- disadvantages.

UNIT-III

Non-Conventional Energy sources: Basic principle, site selection of Solar energy power plant, photovoltaic technologies, PV Systems and their components, Wind energy power plant , Bio energy plants ,Geothermal energy plants and tidal energy plants. MHD

UNIT-IV

Energy Scenario: Lay out of power system, Role of Energy in Economic development, energy demand, availability and consumption, Commercial and Non-commercial energy, Indian energy scenario, long term energy scenario, energy pricing, energy sector reforms in India, energy strategy for the future.

References:

1. Energy Studies-Wiley Dream tech India.
2. Non-conventional energy resources- Shobhnath Singh, Pearson.
3. Soni,Gupta,Bhatnagar: Electrical Power Systems – DhanpatRai& Sons
4. NEDCAP: Non Conventional Energy Guide Lines
5. G.D. Roy :Non conventional energy sources
6. B H Khan :Non Conventional energy resources - McGraw Hill
7. Meinel A B and Meinal M P,Addison:Applied Solar Energy- Wesley Publications
7. George Sutton: Direct Energy Conversion -McGraw

FLUID MECHANICS LAB

List of Experiments:

1. To determine the meta-centric height of a floating body.
2. To determine the hydrostatic force and center of pressure on both a submerged or partially submerged plane surface and compare with the theoretical result.
3. To demonstrate the working of different pressure measuring devices.
4. To measure the pressure and pressure difference by pressure gauge, single column manometer, U-Tube manometer & Inclined tube manometer.
5. To verify the Bernoulli's Theorem.
6. To determine coefficient of discharge of an orifice meter.
7. To determine the coefficient of discharge of venturimeter.
8. To determine the coefficient of discharge of Notch (V and Rectangular types).
9. To determine the coefficient of discharge, contraction & velocity of an orifice.
10. To find critical Reynolds number for a pipe flow.
11. To determine the friction factor for the pipes.
12. To determine the minor losses due to sudden enlargement, sudden contraction and bends.
13. To show the velocity and pressure variation with radius in a forced vortex flow.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

DYNAMICS OF MACHINES LAB

1. To determine experimentally, the moment of inertia of a flywheel and axle compare with theoretical values.
2. To find out critical speed experimentally and to compare the whirling speed of a shaft with theoretical values.
3. To find experimentally the Gyroscopic couple on motorized gyroscope and compare with applied couple.
4. To perform the experiment of balancing of rotating parts and find the unbalanced couple and forces.
5. To determine experimentally the unbalance forces and couples of reciprocating parts.
6. To calculate the torque on a planet carrier and torque on internal gear using epicyclic gear train and holding torque apparatus.
7. To study the different types of centrifugal and inertia governors and demonstrate any one.
8. To study the automatic transmission unit.
9. To study the differential types of brakes.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

STEAM GENERATION AND POWER

List of Experiments:

1. To study the Babcock-Wilcox boiler (Model).
2. To study the locomotive boiler (Model).
3. To study the Lancashire boiler (Model).
4. To study the Nestler's boiler (Model).
5. To study various parts of the vertical steam engine.
6. To prepare heat balance sheet for given boiler.
7. To find dryness fraction of steam by separating and throttling calorimeter.
8. To find power output & efficiency of a steam turbine.
9. To study cooling tower and find its efficiency.
10. To study the various mountings and accessories of a boiler.
11. To study and find volumetric efficiency of a reciprocating air compressor.
12. To find the efficiency of condenser.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

PRODUCTION TECHNOLOGY LAB

List of Experiments:

1. Practice of slab milling on milling machine.
2. Practice of slotting on milling machine.
3. To cut gear teeth on milling machine using dividing head.
4. Introduction to gear hobber, demonstration of gear hobbing and practice.
5. Introduction to various grinding wheels and demonstration on the surface grinder.
6. Introduction to tool and cutter grinder and dynamometer.
7. Study the constructional detail and working of CNC lathes Trainer.
8. To carry out welding using TIG/MIG welding set.
9. Introduction, demonstration & practice on profile projector & gauges.
10. To make a component on lathe machine using copy turning attachment.
11. To cut external threads on a lathe.
12. To cut multi slots on a shaper machine.
13. To perform drilling and boring operation on a Component.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.