**Bachelor of Technology (Mechanical Engineering)Kurukshetra University, Kurukshetra**

*SCHEME OF STUDIES/EXAMINATIONS(**w.e.f. 2015-16 onwards**)*

**Semester – IV**

| S. No. | Course No. | Course Title | Teaching Schedule | | | | Allotment of Marks | | | | Duration of Exam (Hrs.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | Hours/ Week | 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 Solid-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 Machine | 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 Machine 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 | |
| | | **Total** | **20** | **5** | **9** | **34** | **450** | **310** | **240** | **1000** | |
| 11 | MPC-202N | Energy Studies* | 3 | 0 | 0 | 3 | 75 | 25 | 0 | 100 | 3 |

**MPC-202N is a mandatory course and student has to get passing marks in order to qualify for the award of degree but its marks will not be added in the grand total.*

***Note:**All the students have to undergo six weeks industrial training after IV$^{th}$ semester and it will be evaluated in V$^{th}$ semester.*

| B. Tech. 4th Semester Mechanical Engineering | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course No.** | **Course Title** | **Teaching Schedule** | | | **Allotment of Marks** | | | **Duration of Exam (Hrs.)** |
| | | **L** | **T** | **P** | **Theory** | **Sessional** | **Total** | |
| **ME-202N** | **Production Technology-I** | 4 | 0 | 0 | 75 | 25 | 100 | 3 |
| ***Purpose*** | To make student aware about various metal cutting tools, mechanism involved and machines used for metal cutting. | | | | | | | |
| **Course Outcomes (CO)** | | | | | | | | |
| **CO-1** | Learn about tool geometry and nomenclature, chip classification, metal cutting theories, tool life, geometry, surface finish etc. | | | | | | | |
| **CO-2** | Learn about cutting fluids and tool life, economics of metal machining. | | | | | | | |
| **CO-3** | Learn about milling and drilling machines. | | | | | | | |
| **CO-4** | Learn about specifications of various machine tools, metrology, surface finish and its measurements. | | | | | | | |

## 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.*

| B. Tech. 4th Semester Mechanical Engineering | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course No.** | **Course Title** | **Teaching Schedule** | | | **Allotment of Marks** | | | **Duration of Exam (Hrs.)** |
| | | **L** | **T** | **P** | **Theory** | **Sessional** | **Total** | |
| **ME-204N** | **STEAMGENERATION & POWER** | 3 | 1 | 0 | 75 | 25 | 100 | 3 |
| ***Purpose*** | To make student learn about basics of Thermal engineering, steam generation and applications. | | | | | | | |
| **Course Outcomes (CO)** | | | | | | | | |
| **CO-1** | Learn about boilers, types of boilers and accessories and mounting used on boilers. | | | | | | | |
| **CO-2** | Learn about simple and modified Rankine cycle and working of steam engine. | | | | | | | |
| **CO-3** | Learn about design and analysis of steam flow through steam nozzles. To learn about the working of different types of condensers. | | | | | | | |
| **CO-4** | Learn about working of Steam turbines and about design and analysis of the steam turbine. | | | | | | | |

## 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.*

| B. Tech. 4th Semester Mechanical Engineering | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course No.** | **Course Title** | **Teaching Schedule** | | | **Allotment of Marks** | | | **Duration of Exam (Hrs.)** |
| | | **L** | **T** | **P** | **Theory** | **Sessional** | **Total** | |
| **ME-206N** | **MECHANICS OFSOLIDS-II** | 3 | 1 | 0 | 75 | 25 | 100 | 3 |

| | |
|---|---|
| ***Purpose*** | The objective of this course is to show the development of strain energy and stresses in springs, pressure vessel, rings, links, curved bars under different loads. The course will help the students to build the fundamental concepts in order to solve engineering problems |
| **Course Outcomes (CO)** | |
| **CO-1** | Identify the basics concepts of strain energy and various theories of failures and solve the problems |
| **CO-2** | Differentiate different types of stresses induced in thin pressure vessel and solve the problems. Use of Lame's equation to calculate the stresses induced in thick pressure vessel. |
| **CO-3** | Able to compute stresses in ring, disk and cylinder due to rotation. Classify the different types of spring and analyze the stresses produced due to loading |
| **CO-4** | Determine the stresses in crane hook, rings, chain link for different cross section and also the deflection of curved bars and rings. Analyze the stresses due to unsymmetrical bending and determine the position of shear centre of different section. |

## UNIT-I

**Strain Energy & Impact Loading**: Definitions, expressions for strain energy stored in a bodywhen load is applied (i) gradually, (ii) suddenly and (iii) with impact, strain energy of beamsin 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 graphicalrepresentations, 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 would cylinders, Numericals.

**Thick Cylinders & Spheres**: Derivation of Lame's equations, radial & hoop stresses andstrains 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 & solids 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 initialsmall 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 l. 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.*

| B. Tech. 4th Semester Mechanical Engineering | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course No.** | **Course Title** | **Teaching Schedule** | | | **Allotment of Marks** | | | **Duration of Exam (Hrs.)** |
| | | **L** | **T** | **P** | **Theory** | **Sessional** | **Total** | |
| **ME-208N** | **FLUID MECHANICS** | 4 | 1 | 0 | 75 | 25 | 100 | 3 |
| ***Purpose*** | To familiarize the students with the basic concepts of Fluid Mechanics. | | | | | | | |
| **Course Outcomes (CO)** | | | | | | | | |
| **CO-1** | Understand the basic concepts of fluid and learn about fluid statics. | | | | | | | |
| **CO-2** | Understand the basic concepts of fluid kinematics and analyse the laws of fluid dynamics and its applications. | | | | | | | |
| **CO-3** | Determine the major and minor losses through pipes and learn to draw the hydraulic gradient and total energy lines. | | | | | | | |
| **CO-4** | Understand the concept of boundary layer and flow over bodies. | | | | | | | |

## 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: Fundamnetals 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.*

| B. Tech. 4th Semester Mechanical Engineering | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course No.** | **Course Title** | **Teaching Schedule** | | | **Allotment of Marks** | | | **Duration of Exam (Hrs.)** |
| | | **L** | **T** | **P** | **Theory** | **Sessional** | **Total** | |
| **ME-210N** | **DYNAMICS OFMACHINES** | 4 | 0 | 0 | 75 | 25 | 100 | 3 |
| ***Purpose*** | To familiarize the students with the effect of dynamic forces in various machines and vehicles. | | | | | | | |
| **Course Outcomes (CO)** | | | | | | | | |
| **CO-1** | To study the effect of static and dynamic forces on the components of mechanisms | | | | | | | |
| **CO-2** | To study the design and working of various gears and gear trains. | | | | | | | |
| **CO-3** | To study the various types of brakes and dynamometers. | | | | | | | |
| **CO-4** | To study the unbalanced forces and vibrations in various components of rotating and reciprocating machines. | | | | | | | |
| **CO-5** | To study the gyroscopic effect in aeroplanes, ships, two and four wheelers. | | | | | | | |

## 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 barmechanisms 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 mechanismEngine 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 involutes 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 VEngines, 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-wheeers), 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.
8. Theory of Machines: P.L.Ballaney, Khanna Publisher.

**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.*

| B. Tech. 4th Semester Mechanical Engineering | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course No.** | **Course Title** | **Teaching Schedule** | | | **Allotment of Marks** | | | **Duration of Exam (Hrs.)** |
| | | **L** | **T** | **P** | **Sessional** | **Practical** | **Total** | |
| **ME-214N** | **FLUIDMECHANICSLAB** | 0 | 0 | 2 | 40 | 60 | 100 | 3 |
| ***Purpose*** | To familiarize the students with the equipment and instrumentation of Fluid Mechanics. | | | | | | | |
| **Course Outcomes (CO)** | | | | | | | | |
| **CO-1** | Operate fluid flow equipment and instrumentation. | | | | | | | |
| **CO-2** | Collect and analyse data using fluid mechanics principles and experimentation methods. | | | | | | | |
| **CO-3** | Determine the coefficient of discharge for various flow measurement devices. | | | | | | | |
| **CO-4** | Calculate flow characteristics such as Reynolds number, friction factor from laboratory measurements. | | | | | | | |
| **CO-5** | Identify and discuss foundation-level fluid phenomena including laminar to turbulent transition, turbulence etc. | | | | | | | |
| **CO-6** | Measure pressure loss due to friction for pipe flow. | | | | | | | |

**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. o 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 vertex 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.**

| B. Tech. 4th Semester Mechanical Engineering | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course No.** | **Course Title** | **Teaching Schedule** | | | **Allotment of Marks** | | | **Duration of Exam (Hrs.)** |
| | | **L** | **T** | **P** | **Sessional** | **Practical** | **Total** | |
| **ME-216N** | **DYNAMICS OFMACHINESLAB** | 0 | 0 | 2 | 40 | 60 | 100 | 3 |
| ***Purpose*** | To familiarize the students with the equipment and instrumentation of Fluid Mechanics. | | | | | | | |
| **Course Outcomes (CO)** | | | | | | | | |
| **CO-1** | To learn about the working of Flywheel. | | | | | | | |
| **CO-2** | To experimentally calculate Gyroscopic couple of a motorised gyroscope | | | | | | | |
| **CO-3** | To learn about balancing of rotating mass. | | | | | | | |
| **CO-4** | To learn about the working of various types of governors. | | | | | | | |
| **CO-5** | To study various types of brakes used in automobiles. | | | | | | | |

**LIST OF EXPERIMENT**

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 ashaft with theoretical values.
3. To find experimentally the Gyroscopic couple on motorized gyroscope andcompare with applied couple.
4. To perform the experiment of balancing of rotating parts and finds the unbalancedcouple and forces.
5. To determine experimentally the unbalance forces and couples of reciprocatingparts.
6. To calculate the torque on a planet carrier and torque on internal gear usingepicyclic gear train and holding torque apparatus.
7. To study the different types of centrifugal and inertia governors and demonstrateany 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.**

| B. Tech. 4th Semester Mechanical Engineering | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course No.** | **Course Title** | **Teaching Schedule** | | | **Allotment of Marks** | | | **Duration of Exam (Hrs.)** |
| | | **L** | **T** | **P** | **Sessional** | **Practical** | **Total** | |
| **ME-218N** | **STEAMGENERATION AND POWERLAB** | 0 | 0 | 2 | 40 | 60 | 100 | 3 |
| ***Purpose*** | To make the students aware of different boilers and steam turbines using different experiments. | | | | | | | |
| **Course Outcomes (CO)** | | | | | | | | |
| **CO-1** | Students will be able to collect broad knowledge of about the different boilers. | | | | | | | |
| **CO-2** | Students will be able to understand the working of the steam engine. | | | | | | | |
| **CO-3** | Ability to determine the power and efficiency of the steam turbine and cooling tower | | | | | | | |
| **CO-4** | Able to describe quantitatively the heat balance sheet of the boiler. | | | | | | | |

**List of Experiments:**

1. To study the Babcock-Wilcox boiler (Model).
2. To study thelocomotive boiler (Model).
3. To study the Lancashire boiler (Model).
4. To study the Nestler'sboiler.(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.**

| B. Tech. 4th Semester Mechanical Engineering | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course No.** | **Course Title** | **Teaching Schedule** | | | **Allotment of Marks** | | | **Duration of Exam (Hrs.)** |
| | | **L** | **T** | **P** | **Sessional** | **Practical** | **Total** | |
| **ME-220N** | **PRODUCTION TECHNIOLOGYLAB** | 0 | 0 | 3 | 40 | 60 | 100 | 3 |
| ***Purpose*** | To make the students understand the different types of machines in production industries and welding machines. | | | | | | | |
| **Course Outcomes (CO)** | | | | | | | | |
| **CO-1** | To practice on Milling machine | | | | | | | |
| **CO-2** | To make gears and study grinders. | | | | | | | |
| **CO-3** | To study the working CNC machines. | | | | | | | |
| **CO-4** | To carry welding out using TIG/MIG Welding machine. | | | | | | | |

**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.**

| B. Tech. 4th Semester Mechanical Engineering | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Course No.** | **Course Title** | **Teaching Schedule** | | | **Allotment of Marks** | | | **Duration of Exam (Hrs.)** |
| | | **L** | **T** | **P** | **Theory** | **Sessional** | **Total** | |
| **MPC-202N** | **ENERGY STUDIES** | 3 | 0 | 0 | 75 | 25 | 100 | 3 |
| ***Purpose*** | To make the students conversant with the basics concepts and conversion of various form of Energy | | | | | | | |
| | **Course Outcomes (CO)** | | | | | | | |
| **CO-1** | An overview about Energy , Energy Management, Audit and tariffs | | | | | | | |
| **CO-2** | Understand the Layout and working of Conventional Power Plants | | | | | | | |
| **CO-3** | Understand the Layout and working of Non-Conventional Power Plants | | | | | | | |
| **CO-4** | 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:** Basicprinciple, site selection of Solar energy power plant, photovoltaic technologies, PV Systems and their components, Wind energy power plant, Bio energy plants,Geothermal energy plantsand 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 energyscenario, 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 – Dhanpat Rai& 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.
8. George Sutton: Direct Energy Conversion –McGraw

**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.*