SYLLABUS PRESCRIBED FOR BACHELOR OFMECHANICAL ENGINEERING SEMESTER PATTERN (CHOICE BASED CREDIT SYSTEM)

SEMESTER: SIXTH

6ME01 DESIGN OF MACHINE ELEMENTS

COURSE LEARNING OBJECTIVES (CLOs):

1. To study the concept of stresses and understand the design procedure of riveted andwelded joints.
2. To study design procedure of knuckle joint, springs and power screw.
3. To analyze &select types of shafts, keys, couplings for various machines &industrial applications.

COURSE OUTCOMES (COs):

1. Understand the concept of various stresses and apply the design procedure to riveted joints and welded joints.
2. Understand design procedure of knuckle joint, springs and power screw.
3. Analyze & select types of shafts, keys, couplings for various machines and industrial applications.
4. Analyze the various types of bearings and understand the design procedure of IC Engine parts.

Unit I:

(A) Meaning of design, Phases of design, Simple stresses, Thermal stresses, Impact Stress, Torsional stress, bending stresses in straight & curved beams, itsapplications, Hooks, C-clamps.
(B) Riveted Joints- Design, failures, strength & efficiency of riveted joint.
(C) Welded Joint- Strength, of transverse & parallel fillet welded section. **(11 hrs)**

Unit II:

(A) Design of knuckle joint.
(B) Design of spiral & leaf spring.
(C) Design of power screw- Torque required raising loads, efficiency & helix angle, overhauling & self-locking of screw, ACME threads, stresses in power screws. **(11 hrs)**

Unit III:

(A) Design of Shaft – Subjected to twisting, bending & combined twisting & bending loads, based on rigidity.
(B) Design of coupling, rigid coupling, sleeve, muff coupling, flange coupling& flexible coupling. **(11 hrs)**

Unit IV:

(A) Antifriction bearing: Types of bearing, construction, life of bearings, and selection of bearings.
(B) Journal bearing: Lubrication, selection of lubrication, design procedure &numerical.
(C) Design of IC Engine parts: Connecting rod, design of flywheel based onTM diagram. **(11 hrs)**

Books Recommended: -Text Books:-

1. Machine Design by Dr. P.C. Sharma & dr. D. K. Agrawal, Katsons Publications Ltd.
2. Machine Design by R.K.Jain ,Khanna Publisher's
3. Machine Design, R.S. Khurmi, J.K. gupta, Eurasia Publications, New Delhi.
4. Machine Design Data book by PSG, Coimbtore
5. Machine Design data book by Mahadevan

Reference Books:-

1. Design of Machine Element by V.B. Bhandari, Tata McGraw Hill Publuication.
2. Machine Design – Jindal, Pearson Publication.
3. Design of Machine Element – C. S. Sharma & Kamlesh Purohit, PHI Publication.

6ME02 DYNAMICS OF MACHINES

Course Learning Objectives:

1. To study Static force analysis and Dynamic force analysis of plane mechanisms.
2. To demonstrate the use of gyroscopic effect on ship, aero plane, four wheeler and twowheeler
3. To determine natural frequency vibrations.
4. To seek the knowledge of static and dynamic balancing.

Course Outcomes:

1. Apply basic concept of static force analysis and lubrication mechanism.
2. Understand the knowledge of dynamic force analysis analytically and graphically.
3. Apply the knowledge of space mechanism and vehicle dynamics.
4. Understand concept of free vibration and force vibration, concept of Torsionalvibration.
5. Analyze the concept of balancing of machinery.

Unit I:

1. Static equilibrium, superstition principle, Static force analysis applied to plane motion mechanisms, virtual work method, static force analysis without and with friction.

2. Theory of hydrodynamic lubrication, boundary lubrication, film lubrication, rolling friction, performance of bearing. **(8 Hrs.)**

Unit II:

1. D'Alemberts Principle. Engine force analysis-piston effort, thrust along connecting rod, side of cylinder, on the bearings, crank effort and turning moment on the crank shaft.

2. Dynamic equivalent system of connecting rod.

3. Turning moment diagrams for two stroke, four stroke and multi cylinder engines, fluctuations of speed & energy, Flywheel requirements. **(7 Hrs.)**

Unit III:

1. Space mechanism: - Gyroscope, gyroscopic effect as applied to ship, aero plane, four wheeler, two wheeler, universal joint.

2. Vehicle dynamics: - Coefficient of adhesion, resistance to vehicle motion, relative drive effectiveness, braking of vehicles. **(7 Hrs.)**

Unit IV: Types of vibrations, elements of mechanical vibrating systems, degree of freedom in mechanical vibratory system.

1. **Longitudinal vibrations**- Natural frequency of free longitudinal vibrations by equilibrium, energy and Rayleigh method. Effect of inertia constraint in longitudinal vibrations. Damped vibrations with mass, spring and dash pot. Definitions of logarithmic decrement, magnification factor, transmissibility, vibration isolation.
2. **Torsional vibration**- single rotor systems, Two Rotor system, three rotor system, geared systems. **(8 Hrs.)**

Unit V:

1.**Transverse vibrations**- Natural frequency of free transverse vibrations. Effect of inertia constraints in transverse vibrations. Natural frequency of free transverse vibrations due to point load and uniform distributed load acting over a simply supported shaft. Frequency of free transverse vibrations of a shaft subject to a number of point loads by energy and Dunkerley's method.

2. Whirling or critical speed shaft**.** **(6 Hrs)**

Unit VI:

Balancing: - Balancing of rotating masses in same and different transverse planes, Partial

balancing of reciprocating masses & Study of its effect. **(8 Hrs)**

Books Recommended:

Text Books:

1) Theory of Machines, P.L.Ballaney, Published by Dhanpat Rai andsons-N Delhi.
2) Theory of Machines, S.S.Ratan, Published by Tata Mc Graw Hill.
3) Theory of Machines, V.P.Singh, Published by Dhanpat Rai-N Delhi.
4) Theory of Machine, R.S.Khurmi and Gupta J.K., Published by Eurasia Publishinghouse-N.

Reference Books:

1) Theory of Machines and Mechanisms, J.E.Shigley, Uicker and Gordon, Published by Oxford University press-New York.
2) Theory of Machines and Mechanisms, Ghosh and Amitabh, Published AffiliatedEast West Press

6ME03 CONTROL SYSTEM ENGINEERING

Course Learning Objectives:

1. To study the basics of control systems and their mathematical modeling along with reduction methods.
2. Study the basic control actions and Industrial controllers.
3. To study the analysis of control systems with respect to transient time response andtheir errors.
4. To study the different pneumatic controllers and prime movers and their actions.
5. To understand stability analysis, frequency analysis by using bode plot for analyticalproblems.
6. Study of important automatic speed control systems.

COURSE OUTCOMES:

1. Understand the basic system concept and study different types of systems.
2. Understand the concept Transient- Response analysis and will apply in numericalmethods, the knowledge of basic control action and industrial controllers.
3. Understand the concept of Stability and exhibit the knowledge of root locus concept.
4. Understand the concept of Frequency Response method and use bode diagram in solving analytical problems.

Unit I: Introduction system concept, open & closed loop systems, Mathematical models of physical systems, transfer functions. Block diagrams reduction and signal flow graphs. **(9 Hrs)**

Unit II: Basic control actions and Industrial controllers :-Classification of industrial automatic controllers, control actions, proportional controllers, obtaining derivative and integral control action, effects of integral and derivative control action on systems performance. **(7 Hrs)**

Unit III: Transient Response Analysis :- Introduction Std. Test signals, steady state response of first and second order systems for stop, ramp and impulse input, transient response specifications,steady state error & error constants. **(8 Hrs)**

Unit IV: Concept stability, necessary condition for stability, Rauths stability criterion, Root locus concept, construction of Root loci, systems with transportation lag. **(9 Hrs)**

Unit V: Frequency Response methods:-Introduction, concept of Bode diagrams. **(8 Hrs)**

Unit VI: Study of important automatic speed control systems in machine tools, Prime movers, system generators, etc. Analysis of performance characteristics**.** **(7 Hrs)**

BOOKS RECOMMENDED:-

TEXT BOOKS:

1. Automatic Control Enginering by F. H. Ravan Mc-Graw-Hill.
2. Modern Control Engg. - by Katsuhiko Ogata, PHI, .
3. Control System Engg. - by Nagrath & Gopal,

REFERENCE BOOKS:

1) Automatic Control Engg. - by Kuo B.C. & F. Golnaraghi,
2) Modern Control System by Richard C. Dorf, Robert H. Bishop,

6ME04 PROF. ELECTIVE I
TOOL ENGINEERING

Course Learning Objectives (CLOs):

1. To study the basic geometries of different cutting tools, chip formation mechanism, toolforce analysis etc. in metal cutting.
2. To understand the steps in designing and drawing of single and multipoint cutting toolsand form tools.
3. To study the basic principles of work piece positioning and clamping. To get acquaintedwith designs of locators, clamps, drill bushes and methods of location.
4. To understand the design and operation of various types of Jigs and Fixtures.
5. To develop a graphical design of a jig or fixture suitable to the requirements of awork piece.
6. To understand the theory of metal cutting and how to estimate the required force and clearance amount in sheet metal cutting and forming operations.
7. To study construction and working of various types of dies used for different pressworking operations.
8. To study the steps in designing and drawing of different cutting, drawing and forming diesin press working.

Course Outcomes:

1. Create the design of single and multi-point cutting tools.
2. Apply the knowledge related to machining in order to estimate tool life and selectionof cutting fluids.
3. Create the design of multipoint tools like twist drills, reamers, broach and millingcutters & press working dies like punching, blanking and drawing.
4. Analyze the real time problems of work holding by designing jigs and fixtures.

Unit 1:

Single Point cutting Tool:
Shear angle, shear strain, velocity relations, un-deformed chip thickness, Merchant's circle, energy relations, nomenclature, single point cutting tool design, recommended speed, feed and depth of cut Form tools. Graphical approach of circular form tool design. **(08 Hours)**

Unit II:

Jig & Fixture Design: Economics, principles of locations, types of locations, prevention of

jamming, problems of chip & dust in location, use of dowels. Redundant location, Principles of clamping, types of clamps, power clamping, Tool guiding & tool setting,types of drill Jigs & fixtures, **(07 Hours)**

Unit III:

Jig & Fixture Design:
Design of Plate, Channel, Box, Turnover and Post type Drill Jigs.
Design of Turning, Milling, Fixture, Broaching, Assembly & Welding Fixtures. **(07 Hours)**

Unit IV:

Multi-point Cutting Tools:
Types, Geometric elements and forces in various tools like Twist drills & Reamers, Circular Broaches, Milling Cutters, Taps and Dies, Gear shaper cutter & Gear Hobs. **(07 Hours)**

Unit V:

Press tools: Classification of presses, Theory of sheet metal cutting, clearance, cutting force calculations, Methods of reducing cutting forces, Centre of pressure & its significance, Classification of press working operations, Theory of bending, spring back action in metals, drawing fundamentals, calculation of drawing & bending forces, planning for cupping operation, Stock layout. **(07 Hours)**

Unit VI:

Design of Press working Tools:
Types of die construction, function & nomenclature of die components, Cutting Dies- Blanking & Punching,
Forming Dies-Forming, Drawing and Bending etc. Design of Compound, Combination and progressive dies miscellaneous dies- Horn die, Cam-action die, Rubber & Building die, Suppress die **(08 Hours)**

Text Books:

1. Tool Design - Cyril Donaldson (Tata Mc-graw Hill)
2. Jigs & Fixtures - P.H.Joshi (Tata Mc-graw Hill)
3. Fundamentals of Metal Cutting & M/c Tools - Juneja (New Age International).
4. Fundamentals of Tool Design - A.Kumar (Dhanpatrai & Sons).
5. A Text book of Production Engineering- P.C.sharma (S.Chand Publication).

REFERENCE BOOKS :

1. Metal Cutting Theory & Cutting Tool Design- Arshinov (Mir Publications)
2. Tool Design - ASTME (ASTME)
3. Jigs and Fixture- Grantt.

PROFESSIONAL ELECTIVE – I

6ME04 (2) NON-CONVENTIONAL ENERGY SYSTEMS

Course Learning Objectives (CLOs):

1. To study the introduction to renewable and non-renewable resources of energy.
2. To study the radiation transmission through covers & Solar Energy collections.
3. To study the solar energy utilization and solar energy storage.
4. To study energy from ocean and energy from wind.
5. To study biomass energy resources like biomass and biodiesel.
6. To study photo voltaic cell, fuel cell and geothermal energy.

Course Outcomes (COs):

1. Able to study the concept of renewable and non-renewable sources.
2. Apply the basic concept of solar energy utilization and storage.
3. Apply the concept of energy from ocean and wind.
4. Study the concept of bio-mass energy resources.

UNIT I:

1. **Introduction:** - Renewable &Non-renewable energy sources. Overview and development of World Energy Scenario.
2. **Solar Radiation:** Solar constant, Definitions of basicearth-sunangles. Types of Solar radiation, Measurement of solar radiation using Pyrheliometer, Pyranometer and Sunshine Recorder, estimation of solar radiation intensity. **(7 hrs)**

UNIT II:

1. **Solar Collectors:**-classifications of collectors- concentrating, non-concentrating collectors and Evacuated tube solar collectors, its construction, and working.

2. **Solar Energy Storage & Utilization:**-Methods of storage such as Mechanical, Thermal, Electrical, Thermochemical and Electromagnetic storage. Applications of solar energy in heating,cooling, pumping, powerproduction, distillation,drying,etc. **(7 Hrs)**

UNIT III:

Direct Energy Conversion:-

1. **Solar Photovoltaic cells :** Principle, Construction and Working, Conversionefficiency.
2. **Fuel Cells:** working principle, types offuelcells, applications.
3. **Geothermal Energy Resources:** Hot Dry Rock system, Vapour dominated, liquid dominated, flash steam, binary fluid and total flow concept of power generation. **(8Hrs)**

UNIT IV: Energy from Ocean:

1. **Tidal Power:**-Types of tidal plants such as single and two basin plants, power developed &operation of tidal power plant.
2. **Ocean thermal energy conversion system:** - Construction and working of open cycle and closed cycle OTEC systems. **(7Hrs)**

UNITV: Wind Power: - Introduction, Principles of wind energy conversion, Operation, maintenance and economics. Wind patterns and Wind speed data, Types of wind mills, application for pumping and power generation. Conversion efficiency, Site selection. **(8Hrs)**

UNITVI: BiomassEnergyResources: Mechanism of green plant photo synthesis.efficiencyy of conversion, solar energy plantation, Biogas-Types of bio gas plants, factors affecting production rates. Types of gasifiers, Introduction to bio- diesel and ethanol as alternative fuels, properties of biofuel. **(7Hrs)**

Books Recommended:

TEXT BOOKS:-

1. Solar Energy, S.P.Sukhatme,TMH
2. Non-Conventional Energy Sources, G.D.Rai, Khanna Publications
3. Non-Conventional Energy Sources, B. H. Khan

REFERENCE BOOKS:-

1. Treatise on Solar Energy : H.P. Garg; John Wiley & Sons
   Renewable Energy Conversion, Transmission and Storage, Bent Sorenson; Elsevier Publication
2. Renewalle Energy; GodfreyBoyle, Oxford University Press, Mumbai.

6ME04 PROF. ELECTIVE I

COMPUTER AIDED DESIGN & SIMULATION

Course Learning Objectives (CLOs):

1. To study product cycle & fundamentals of CAD/CAM.
2. To understand the concept of representations of curves and surfaces.
3. To study the solid modeling techniques.
4. To study the geometric transformation techniques.
5. To study basic probability & statistics and physical modeling.
6. To study Simulation of Mechanical Systems & Simulation of manufacturingsystems.

Course Outcomes (COs):

1. Understand the concept of CAD/ CAM and CIM.
2. Apply knowledge using CAD modeling for component design
3. Apply the knowledge of geometric transformation.
4. Understand the Mechanical & Manufacturing simulation systems.

Unit I: Fundamentals of CAD/CAM

Product cycle and scope of CAD/CAM/CIM in product cycle, CAD/CAM, Hardware and software, selection of software, CAD workstation configurations. **(6 Hrs)**

Unit II: Representations of curves and surfaces

Introduction to analytical curves, synthetic curves: Hermit cubic Spline, Bezier Curve, B- Spline curve. Surface Representation : Synthetic Surfaces, Applications of surface modeling. **(6 Hrs)**

Unit III: Solid Modeling

2D Vs 3D modeling, Comparison of Wireframe, surface and solid modeling techniques, Geometry Vs Topology, Requirements of Solid Modeling Methods: Constructive Solid Geometry (CSG), Boundary Representation (B-rep), etc. **(6 Hrs)**

Unit IV: Geometric transformation

2D geometric transformations, Homogeneous co- ordinate representation, Composite Transformations, 3D transformations, Inverse transformations, geometric mapping. **(8 Hrs)**

Unit V: Introduction to statistics and physical modeling

A review of basic probability and statistics, random variables and their properties ,Estimation of means variances and correlation.

Physical Modeling- Concept of System and environment, Principles of modeling, types of models. **(8Hrs)**

Unit VI: Simulation of Mechanical Systems

Basic Simulation modeling, Role of simulation in model evaluation and studies, advantages of simulation

Simulation of manufacturing Systems: Introduction to Flexible manufacturing systems, Simulation software for manufacturing, **(8 Hrs)**

Book's Recommended-Text Books:

1) P. N. Rao; CAD/CAM Principles and Applications; McGraw Hills Publications.
2) Mikel P. Groover and Emory W. Zimmers: Computer Aided Design andManufacturing, Prentice hall.
3) Ibrahim Zeid: Mastering in CAD- CAM, Tata McGraw Hill Publication.
4) Geoffrey Gordon, System Simulation; Prentice Hall

Reference Book:

1) Mikell P. Groover: Automation, Production systems & Computer Integrated manufacturing, Prentice Hall.
2) Robert E. Shannon; System Simulation: The Art and Science ; Prentice Hall
3) J. Schwarzenbach and K.F. Gill Edward Arnold; System Modelling and Control
4) P. Radhakrishnan and Subramaniam: CAD/CAM/CIM, wiley Eastern Ltd.

6ME05 OPEN ELECTIVE-II
NON-CONVENTIONAL ENERGY SYSTEMS

Course Learning Objectives (CLOs):

1. To study the introduction to renewable and non-renewable resources of energy.
2. To study the radiation transmission through covers & Solar Energy collections.
3. To study the solar energy utilization and solar energy storage.
4. To study energy from ocean and energy from wind.
5. To study biomass energy resources like biomass and biodiesel.
6. To study photo voltaic cell, fuel cell and geothermal energy.

Course Outcomes (COs):

1. Understand concept of renewable and non-renewable sources.
2. Understand the basic concept of radiation transmission through covers and solar energy collections, the basic concept of Solar energy utilization and storage.
3. Demonstrate, concept of energy from ocean and wind.
4. Understand the concept of bio-mass energy resources, concept of direct energy conversion and fuel cell.

UNIT I

Introduction: - Global and Indian energy scenario, Need of Renewable energy, need, Renewable and non-renewable energy sources, energy and environment,

Solar Radiation: Solar constant, Definitions of basic earth-sun angles. Types of Solar radiation,Measurement of solar radiation using Pyrheliometer, Pyranometer and Sunshine Recorder, estimation of solar radiation intensity. **(7 hrs)**

UNIT II

Solar thermal systems. Low temperature applications: solar water heating, space heating, drying. High temperature applications, dish and parabolic collectors. Central tower solar thermal power plants.

Solar Photovoltaic Systems: Basic principle of power generation in a PV cell ; Types of photovoltaic cell, Application of PV ; Brief outline of solar PV stand- alone system ; Storage and Balance of system. **(8 Hrs)**

Unit III

Wind Energy Systems: Potential of wind electricity generation in India and current scenario. Types of turbines, Coefficient of Power, Betz limit Wind electric generators, Power curve; wind characteristics and site selection; Wind farms for bulk power supply to grid. **(7 Hrs.)**

Unit IV

Biomass Energy: Biomass: Sources and Characteristics; Wet biogas plants; Biomass gasifies: Classification and Operating characteristics; Updraft and Downdraft gasifies; Gasified based electricity generating systems. Introduction to biodiesel and ethanol as alternative fuels, properties of bio fuel **(7 Hrs.)**

Unit V

Ocean Energy: Tidal power plants: single basin and two basis plants, Ocean Thermal Electricity Conversion (OTEC), Electricity generation from Waves.
Geothermal Energy: Principle, Geothermal sites in India; Geothermal power plants.
Fuel Cells: Principles, types of fuel cells, **(7 Hrs.)**

UNIT VI

Fuel Cells: working principle, types of fuel cells, applications.

Geothermal Energy Resources: Hot Dry Rock system, Vapor dominated, liquid dominated, flash steam, binary fluid and total flow concept of power generation. **(8Hrs)**

Books Recommended:

Text Books:-

1. Solar Energy; S.P. Sukhatme; TMH
2. Non-Conventional Energy Sources; G.D. Rai; Khanna Publications
3. Non-Conventional Energy Sources; B. H. Khan

Reference Books:-

1. Treatise on Solar Energy; H.P. Garg; John Wiley & Sons.
2. Renewable Energy Conversion, Transmission and Storage; Bent Sorensen; ElsevierPublication
3. Renewable Energy; Godfrey Boyle; Oxford University Press, Mumbai
4. Renewable Energy Sources and Emerging Technology; D.P. Kothari, K.C. Singal, Rakesh Ranjan; PHI

6ME05 OPEN ELECTIVE-II
AUTOMOBILE ENGINEERING

Course Learning Objectives:

1. To study the Introduction of automobiles, engine types and working of SI and CIengines.
2. To study the fuel feed systems, their types and to understand the basics of coolingsystem.
3. To study the electrical system, Battery capacity and its ratings, starter motor drive and to understand the basics of Ignition system.
4. To study the basics of transmission system, clutches, gear boxes and to understandthe principle of differential.
5. To study the braking system, steering system, wheel balancing and alignment and to study the introduction of power steering.
6. To study the basics of suspension system, shock absorbers and to study the types of lubricants and lubrication system, crankcase ventilation.

Course Outcomes (COs):

1. Understand the basics of automobile engineering and its components.
2. Analyze &develop about the cooling system and its function.
3. Understand basic concept of transmission system and types of gears box, basic concept of electrical system and ignition system.
4. Apply the knowledge of suspension and lubrication.

UNIT I: Introduction, Classification of automobiles, chassis layout, basic working of SI and CI Engines, engine parts, engine types, multiple cylinder engines. **(7 Hrs)**

UNIT II: Fuel feed systems- fuel feed systems for petrol and diesel engines, Basic principles of Multipoint Fuel Injection Systems(MPFI) and Common Rail Diesel Injection Systems(CRDI). Cooling system: purpose, Air cooling and liquid cooling system, radiator, by pass recirculation system, antifreeze mixtures. **(7 Hrs)**

UNIT III: The electrical system. Battery Capacity, standard capacity ratings, starter motor drive-Bendix drive. Ignition system:- Battery coil ignition system, Electronicignition system **(7 Hrs)**

UNIT IV: Transmission system:- Layout, Working principle of clutch, single plate friction clutch and multi plate clutch, Gear Boxes:- Sliding mesh, constant mesh gear box, Propeller shaft, Hotchkiss drive, torque tube drive, differential. **(8 Hrs)**

UNITV: Braking system: Mechanical, hydraulic brakes, power brakes and vacuum brakes. Steering system:- Function, types of linkages, steering gears, wheel balancing, wheel alignment, camber, castor, king pin inclination, toe-in& toe-out & their effects, Introduction to power steering.**(7 Hrs)**

UNIT VI: Suspensions: shock absorbers, Rigid axle and independent suspension system, Auto lubrication:-Types of lubricants, their ratings, multi viscosity oils. Engine lubrication: - types of lubricating systems, full pressure system, dry sump system, crankcase ventilation. **(6Hrs)**

Books RecommendedText Books:-

1. Automobile Engineering- Vol. I & II; Kirpal Singh; Standard Publishers Distributors
2. Automobile Engineering; R.K. Rajput; Laxmi Publications, New Delhi

Reference Books:-

1. Automotive Mechanics; Crouse & Anglin; TMH.
2. Automotive Mechanics; J. Heitner; East West Press
3. Automotive Mechanics; S. Srinivasan; TMH.

6ME06 DESIGN OF MACHINE ELEMENTS-LAB.

Course learning objective:

1. To study the basic design principles
2. To familiarize with use of design data books & various codes of practice
3. To make conversant with preparation of working drawings based on designs

Course Outcome: After successfully completion of this course students will be able to:

1. Design various machine elements like joints, springs, couplings etc., under various conditions
2. Convert design dimensions into working/manufacturing drawing
3. Use design data book/standard codes to standardize the designed dimensions

Practical Term Work:

At least six exercises based on the following:

1. Design of Cotter or Knuckle joint.
2. Design & drawing of screw jack.
3. Design & drawing of Riveted joints.
4. Design & drawing of leaf spring.
5. Design of shaft on the basis of various loading.
6. Design and drawing of Coupling (any one type).
7. Design and drawing of Journal Bearing Plumber Block Type).
8. Design and drawing of connecting rod in IC Engine.
9. Design and drawing of Flywheel.
10. Determine Hydrodynamic lubrication profile using Journal Bearing Apparatus.

6ME07 DYNAMICS OFMACHINES-LAB.

Practicals:-

At least eight practical from the following list:

1. Study of static force analysis of mechanism. (any 2 problem)
2. Determining the inertia forces of connecting rod
3. Determination of gyroscopic couple using motorized gyroscope.
4. Study of vehicle dynamics.
5. To study the longitudinal vibration of helical spring and to determine the frequency and time period of oscillation theoretically and experimentally.
6. Experiment on free and damped vibration of systems with one degree of freedom.
7. Experiment on forced damped vibration of systems with one degree of freedom.
8. Experiment on free damped torsional vibration.
9. To verify the Dunkerley's rule.
10. To determine the natural frequency of free torsional vibration of single rotor system.
11. To determine the natural frequency of free torsional vibration of two rotor system.
12. Experiment on whirling speed of shaft.
13. Experiment on static balancing of rotating masses.
14. Experiment on dynamic balancing of rotating masses.

6ME08 PROF. ELECTIVE I – LAB
TOOL ENGINEERING–LAB.

Course learning objective:

1) To study the basic geometries of different cutting tools,
2. To study cutting forces involved in machining operation using tool dynamometer.
3. To understand the steps involved in designing and drawing of various tools.
4) To understand the design and operation of various types of Jigs and Fixtures.

Course Outcome: On completion of this course students will be able to :

1. Create the design of single and multi-point cutting tools.
2. Create the design of multipoint tools like twist drills, reamers, broach and milling cutters & press working dies like punching, blanking and drawing.
3. Analyze the real time problems of work holding by designing jigs and fixtures.

TERM WORK:

(Any Six of the following)-

1. Design & Drawing of single point cutting tool.
2. Design & Drawing of Form Tools(Using Graphical Method).
3. Measurement of forces in Orthogonal cutting by Lathe Tool Dynamometer.

4. Measurement of forces & Torque in Drilling by Drill Tool Dynamometer.
5. Study of geometric Elements & Forces in Multi-Point Cutting Tool.
6. Design & drawingof Post Drill Jig.
7. Design & Drawing of Turnover Drill Jig.
8. Design & Drawing of Milling Fixture.
9. Design & Drawing of Turning Fixture.
10. Design & Drawing of Compound Die.
11. Design & Drawing of Progressive Die
12. Design & Drawing of Drawing die.

Practical Examination: Practical exam shall consist of viva-voce based on the term work and theory syllabus.

6ME08 PROF. ELECTIVE I – LAB
NON-CONVENTIONAL ENERGY SYSTEMS–LAB.

Any six practical's will be based on the following topics :-

1. Study of Pyrheliometer and measurement of direct radiation.
2. Study of pyranometer and measurement of global and diffuse radiation.
3. Study of sunshine recorder and measurement of sunshine hours.
4. Study and testing of a flat plate recorder.
5. Study of biogas plant.
6. Study of photovoltaic system,
7. Study of various types of Wind mill.
8. Study of various solar equipments.

6ME08 PROF. ELECTIVE I – LAB
CAD & SIMULATION

Practicals:-

Any six practical's from the list should be performed.

1. Creation of 2D drawing (Sketching Module) of any mechanical machine component using any modeling/drawing software.
2. Creation of isometric view from given orthographic view of any mechanical machine part using any modeling software.
3. Creation of 3D drawing of any mechanical machine part using any modeling software.
4. Creation of assembly of Knuckle joint/ Cotter joint using any modeling software.
5. Creation of sheet metal component using any modeling software.
6. Simulation of Four bar chain mechanism using any modeling software.
7. Simulation of Slider cranks chain mechanism using any modeling software.

6ME09 RESEARCH SKILLS – LAB

Students will have to perform one task from each group.

Group A

To design/fabricate any one system of the following:

1) Model based upon science principles.
2) Purely mechanical model for the betterment of rural life
3) Electromechanical model
4) Computer based model using any CAD software
5) Pneumatic/hydraulic system for industrial/social application.

6) Automated system for industrial/social application.
7) A system using non-conventional energy source
8) Aurdino/IoT based system for industrial/domestic application

Group B

Prepare a research report on any one of the following:

1) To set a manufacturing unit of any product.
2) Market research for launching a new product.
3) Study of any Small Scale Industry.
4) Collection and analysis of data for any research problem.
5) Study of Intellectual Property Right (IPR) process.
6) Study of various sources of finance/government schemes to set a new business.