MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 2nd YEAR MECHANICAL ENGINEERING,
3rd SEMESTER
Proposed ‘F’ Scheme w.e.f 2010-11

<table>
<thead>
<tr>
<th>Course</th>
<th>Course Title</th>
<th>Teaching Schedule</th>
<th>Marks for class work</th>
<th>Marks for Examination</th>
<th>Total Marks</th>
<th>Duration of Exam</th>
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<td>Mathematics-III or Engineering Economics</td>
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MAT-201-F    MATHEMATICS-III
(Common to CSE, ME, ECE, BME, EE, EEE, E&I, I&C, IT, CE)

L    T     P        Class Work      :   50 Marks
3    2     -        Theory          :   100 Marks
                             Total            :   150 Marks

Duration of Exam.  :   3 Hrs.

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A
Fourier Series and Fourier Transforms: Euler’s formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.
Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

Section-B

Section-C

Section-D
Testing of a hypothesis, tests of significance for large samples, Student’s t-distribution (applications only). Chi-square test of goodness of fit. Linear Programming: Linear programming problems formulation, solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method.

TEXT BOOKS:
1. Engineering Mathematics by Babu Ram (Pearson media Publication)

REFERENCE BOOKS:
4. Probability and statistics for Engineers: Johnson. PHI.
HUM-201-F ENGINEERING ECONOMICS
(Common to CSE, ME, ECE, BME, EE, EEE, E&I, I&C, IT, CE, TT, FAE, TC)

L T P                                Class Work : 50 Marks
3 1 -                                Theory : 100 Marks

Total : 150 Marks
Duration of Exam. : 3 Hrs.

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A


Section-B
Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Section-C
Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.

Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Section-D
Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices.


TEXT BOOKS:
REFERENCE BOOKS:

1. A Text Book of Economic Theory Stonier and Hague (Longman’s Landon)
6. Indian Economy: Rudar Dutt & K.P.M. Sundhram
HUM-203-F    FUNDAMENTALS OF MANAGEMENT
(Common to CSE, ME, ECE, BME, EE, EEE, E&I, I&C, IT, CE)

L    T     P                                Class Work             :  50 Marks
3    1     -                                 Theory                     :  100 Marks

Total                       :  150 Marks
Duration of Exam.  :  3 Hrs.

NOTE: Examiner will set 9 questions in total, with two questions from each section and
one question covering all sections which will be Q.1. This Q.1 is compulsory and of short
answers type. Each question carries equal mark (20 marks). Students have to attempt 5
questions in total at least one question from each section.

Section-A
Meaning of management, Definitions of Management, Characteristics of management,
Management vs. Administration. Management-Art, Science and Profession. Importance of
Principles of Management. The Management Functions, Inter-relationship of Managerial
functions.
Nature and Significance of staffing, Personnel management, Functions of personnel
management, Manpower planning, Process of manpower planning, Recruitment,
Selection; Promotion - Seniority Vs. Merit. Training - objectives and types of training.

Section-B
Production Management: Definition, Objectives, Functions and Scope, Production
Planning and Control; its significance, stages in production planning and control. Brief
introduction to the concepts of material management, inventory control; its importance and
various methods.

Section-C
Marketing Management - Definition of marketing, marketing concept, objectives &
Functions of marketing.
Marketing Research - Meaning; Definition; objectives; Importance; Limitations; Process.
Advertising - meaning of advertising, objectives, functions, criticism.

Section-D
Introduction of Financial Management, Objectives of Financial Management, Functions
and Importance of Financial Management. Brief Introduction to the concept of capital
structure and various sources of finance.

TEXT BOOKS:
   (Kalyani Publishers)

REFERENCE BOOKS:
1. Principles & Practices of Management – L.M. Prasad (Sultan Chand & Sons)
ME- 201-F  THERMODYNAMICS

Sessional   :  50 Marks
L    T     P      Theory   : 100 Marks
3     1     -      Total    : 150 Marks
Duration of Exam         :   3 hrs.

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Section-B

Section-C
Ideal and Real Gases: Concept of an Ideal Gas, Basic Gas Laws, Characteristic Gas Equation, Avogadro’s law and Universal Gas Constant, P-V-T surface of an Ideal Gas. Vander Waal’s Equation of state, Reduced Co-ordinates, Compressibility factor and law of corresponding states. Mixture of Gases, Mass, Mole and Volume Fraction, Gibson
Dalton’s law, Gas Constant and Specific Heats, Entropy for a mixture of non-reactive gases. Problems.

Section-D
Thermodynamic Relations: Maxwell Relations, Clapeyron Equation, Relations for changes in Enthalpy and Internal Energy & Entropy, Specific Heat Capacity Relations, Joule Thomson coefficient & inversion curve.
Gas power Cycles: Carnot Cycle, Otto Cycle, Diesel Cycle, Dual Cycle, Stirling Cycle, Ericson cycle and Brayton cycle, Problems.

Text Books:

Reference Books:
2. Engineering Thermodynamics – C P Arora, Tata McGraw Hill
ME- 203-F COMPUTER AIDED DESIGN

Sessional :  50 Marks
L  T   P     Theory : 100 Marks
3     1    -     Total : 150 Marks
Duration of Exam :  3 Hrs.

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A
Introduction: Introduction to CAD, Design Process, Introduction to CAM/ CIMS, Importance and Necessity of CAD, Applications of CAD, Hardware and Software requirement of CAD, Basics of geometric and solid modeling, coordinate systems.
Transformations: Introduction, transformation of points and line, 2-D rotation, reflection, scaling and combined transformation, homogeneous coordinates, 3-D scaling, shearing, rotation, reflection and translation, combined transformations.

Section-B
Curves: Algebraic and geometric forms, tangents and normal, blending functions reparametrization, straight lines, conics, cubic splines, Bezier curves and B-spline curves.
Surfaces and Solids: Plane surface, ruled surface, surface of revolution, tabulated cylinder, bi-cubic surface, Bezier surface, B-spline surface, Solid models and representation scheme, boundary representation, constructive solid geometry, sweep representation, cell decomposition.

Section-C
Automation and Numerical Control: Introduction, fixed, programmable and flexible automation, types of NC systems, MCU and other components, NC manual part programming, coordinate systems, G & M codes, Part program for simple parts, computer assisted part programming.
Group Technology: Part families, part classification and coding, production flow analysis, Machine cell design, Advantages of GT.

Section-D
Flexible Manufacturing Systems & Computer aided process planning: Introduction, FMS components, types of FMS, FMS layouts, planning for FMS, advantages and applications Conventional process planning, types of CAPP, Steps in variant process planning, planning for CAPP.

Text Books:
1. CAD/ CAM by Groover and Zimmer, Prantice Hall.
2. CAD/ CAM Theory and Practice by Zeid, McGraw Hill

Reference Books:
1. CAD/CAM (Principles, Practice & Manufacturing Management) by Chirs Mc Mohan & Jimmie Browne, Published by Addison- Wesley.
NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A
Introduction: Force system, dimensions and units in mechanics, laws of mechanics, vector algebra, addition and subtraction of forces, cross and dot products of vectors, moment of a force about a point and axis, couple and couple moment, transfer of a force to a parallel position, resultant of a force system using vector method, Problems involving vector application
Equilibrium: Static and dynamic equilibrium, static indeterminacy, general equations of equilibrium, Varignon’s theorem, Lami’s theorem, equilibrium of bodies under a force system, Problems.

Section-B
Centroid, Centre of mass and Centre of gravity, Determination of centroid, centre of mass and centre of gravity by integration method of regular and composite figures and solid objects.

Section-C
Moment of Inertia: Area moment of inertia, mass moment of inertia, parallel axis and perpendicular axis theorems, radius of gyration, polar moment of inertia, product of inertia, principle axis, problem based on composite figures and solid objects.
Kinematics: Concept of rigid body, velocity and acceleration, relative velocity, translation and rotation of rigid bodies, equations of motion for translation and rotation, problems.

Section-D
Particle Dynamics: Energy methods and momentum methods, Newton’s laws, work energy equation for a system of particles, linear and angular momentum equations, projectile motion, problem.
Shear Force and Bending Moment Diagram for statically determinate beams Classification of beams, types of loads, shear force and bending moment calculation and their graphical presentation, point of inflection, problem.

Recommended Books:-
Engineering Mechanics – Irving H. Shames, PHI Publication
Engineering Mechanics – U.C.Jindal, Galgotia Publication
Engineering Mechanics – A.K.Tayal, Umesh Publication
ME- 207-F MATERIAL SCIENCE

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<td>Duration of Exam : 3 Hrs</td>
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NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A
Crystallography: Review of crystal structure, space lattice, crystal planes and crystal directions, co-ordination number, number of atoms per unit cell, atomic packing factor, Numerical related to crystallography.
Imperfection in metal crystals: Crystal imperfections and their classifications, point defects, line defects, edge & screw dislocations, surface defects, volume defects & effects of imperfections on metal properties.

Section-B
Solid solutions and phase diagram: Introduction to single and multiphase solid solutions and types of solid solutions, importance and objectives of phase diagram, systems, phase and structural constituents, cooling curves, unary & binary phase diagrams, Gibbs’s phase rule, Lever rule, eutectic and eutectoid systems, peritectic and peritectoid systems, iron carbon equilibrium diagram and TTT diagram.

Section-C
Deformation of Metal: Elastic and plastic deformation, mechanism of plastic deformation, twinning, conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain ageing, work hardening, Bauschinger effect, season cracking. Recovery, re-crystallization and grain growth.
Failures of metals: Failure analysis, fracture, process of fracture, types of fracture, fatigue, characteristics of fatigue, fatigue limit, mechanism of fatigue, factors affecting fatigue.

Section-D
Creep & Corrosion: Definition and concept, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep.
Corrosion: Mechanism and effect of corrosion, prevention of corrosion.
Plastic, Composite and Ceramics: Polymers, formation of polymers, polymer structure and crystallinity, polymers to plastics types, reinforced particles-strengthened and dispersion strengthened composites. Ceramic materials: Types of ceramics, properties of ceramic, ceramic forming techniques, mechanical behavior of ceramic.
Text Books:


Reference Books:
ME-209-F  MACHINE DRAWING

L  T  P  Sessional : 50 Marks
1 -  3  Practical Examination : 50 Marks
Total : 100 Marks
Duration of Exam : 4 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section A
Introduction graphic language classification of drawing, principal of drawing, IS codes for machine drawing, lines, scales, section dimensioning, standard abbreviation, – Limits , fits and Tolerance ( Dimensional and Geometrical tolerance ) , Surface finish, Gears : Gear terminology, I.S. convention representation of assembly of spur gears, helical gears, bevel gears , worm and worm wheel.

Section B
Free hand sketching: Need for free hand sketching of standard parts and simple machines components.

Section C
Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies: Lathe Tail stock, Machine vice, Pedestal bearing

Section D
Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies Steam stop valve, Stuffing box, Drill jigs and Milling fixture.

Text Books:

Reference Books:
ME- 211- F COMPUTER AIDED DESIGN LAB

Sessional : 25 Marks
Practical Examination : 25 Marks
Total : 50 Marks
Duration of Exam: 3 Hrs

The students will be required to carry out the following exercises using educational software (AutoCAD, I-DEAS, Pro-Engineer etc).

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension.

2. Layout drawing of a building using different layer and line colors indicating all Building details. Name the details using text commands, Make a title Block.

3. To Draw Orthographic projection Drawings (Front, Top and side) of boiler safety valve giving name the various components of the valve.

4. Make an Isometric dimensioned drawing of a connecting Rod using isometric grid and snap.

5. Draw quarter sectional isometric view of a cotter joint.

6. Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion.

7. Draw 3D models by extruding simple 2D objects, dimension and name the objects.

8. Draw a spiral by extruding a circle.

Note:-
1. At least seven experiments are to be performed in the semester.
2. At least five experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.
ME- 213- F      ENGINEERING MECHANICS LAB

Sessional : 25 Marks
L   T   P      Practical Examination : 25 Marks
-    -   2          Total : 50 Marks
Duration of Exam: 3 Hrs

List of Experiments:

1. Verification of reciprocal theorem of deflection using a simply supported beam.
2. Verification of moment area theorem for slopes and deflections of the beam.
3. Deflections of a truss-horizontal deflections & vertical deflections of various joints of a pin-jointed truss.
4. Elastic displacements (vertical & horizontal) of curved members.
5. Experimental and analytical study of 3 hinged arch and influence line for horizontal thrust.
6. Experimental and analytical study of behavior of struts with various end conditions.
7. To determine elastic properties of a beam.
8. Experiment on a two-hinged arch for horizontal thrust & influence line for Horizontal thrust.
9. Experimental and analytical study of a 3 bar pin jointed Truss.
10. Experimental and analytical study of deflections for unsymmetrical bending of a Cantilever beam.

Note:-
1. At least eight experiments are to be performed in the semester.
2. At least six experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.
ME- 215-F MATERIAL SCIENCE LAB.

Sessional : 25 Marks
Practical Examination : 25 Marks
Total : 50 Marks
Duration of Exam: 3 Hrs

List of Experiments:

1. To study crystal structures of a given specimen.
2. To study crystal imperfections in a given specimen.
3. To study microstructures of metals/ alloys.
4. To prepare solidification curve for a given specimen.
5. To study heat treatment processes (hardening and tempering) of steel specimen.
6. To study microstructure of heat-treated steel.
7. To study thermo-setting of plastics.
8. To study the creep behavior of a given specimen.
9. To study the mechanism of chemical corrosion and its protection.
10. To study the properties of various types of plastics.
11. To study Bravais lattices with the help of models.
12. To study crystal structures and crystals imperfections using ball models.

Note:-
1. At least ten experiments are to be performed in the semester.
2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.
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# MAT-201-F MATHEMATICS-III

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## Section-A
Fourier Series and Fourier Transforms: Euler’s formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.
Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

## Section-B
Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.
Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and formula.

## Section-C
Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent’s series. Zeros and singularities of complex functions, Residues. Evaluation of real integrals using residues (around unit and semi circle only).

## Section-D
Testing of a hypothesis, tests of significance for large samples, Student’s t-distribution (applications only), Chi-square test of goodness of fit.
Linear Programming: Linear programming problems formulation, solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method.

**TEXT BOOKS:**
1. Engineering Mathematics by Babu Ram (Pearson media Publication)

**REFERENCE BOOKS:**
4. Probability and statistics for Engineers: Johnson. PHI.
HUM-201-F  ENGINEERING ECONOMICS

L  T  P              Class Work : 50 Marks
3  1  -              Theory : 100 Marks
                              Total : 150 Marks
                                      Duration of Exam. : 3 Hrs.

NOTE: Examiner will set 9 questions in total, with two questions from each section and
one question covering all sections which will be Q.1. This Q.1 is compulsory and of short
answers type. Each question carries equal mark (20 marks). Students have to attempt 5
questions in total at least one question from each section.

Section-A
Definition of Economics - various definitions, Nature of Economic problem, Production
possibility curve Economic laws and their nature. Relation between Science, Engineering,
Technology and Economics.

Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of
equi-marginal utility - its practical application and importance.

Section-B
Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of
demand curve, Elasticity of demand, measurement of elasticity of demand, factors
effecting elasticity of demand, practical importance & applications of the concept of
elasticity of demand.

Meaning of production and factors of production; Law of variable proportions, Returns to
scale, Internal and External economics and diseconomies of scale.

Section-C
Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost,
money cost, real cost opportunity cost. Shape of average cost, marginal cost, total cost
etc. in short run and long run.

Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly,
Monopolistic Competition (Main features of these markets)

Section-D
Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect
of changes in demand and supply on prices.

Nature and characteristics of Indian economy (brief and elementary introduction),
Privatization - meaning, merits and demerits. Globalisation of Indian economy - merits and
demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement.

TEXT BOOKS:

REFERENCE BOOKS:
1. A Text Book of Economic Theory Stonier and Hague (Longman’s Landon)
6. Indian Economy: Rudar Dutt & K.P.M. Sundhram
ME-202-F MANUFACTURING TECHNOLOGY-I

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NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

**Section-A**

Metal Cutting & Tool Life: Introduction, basic tool geometry, single point tool nomenclature, chips types and their characteristics, mechanics of chips formation, theoretical and experimental determination of shear angle, orthogonal and oblique metal cutting, metal cutting theories, relationship of velocity, forces, and power consumption, cutting speed, feed and depth of cut, coolant, temperature profile in cutting, tool life relationship, tailor equation of tool life, tool material and mechanism.

Economics of Metal Machining: Introduction, elements of machining cost, tooling economics, machining, economics and optimization, geometry of twist, drills and power calculation in drills.

**Section-B**

Metal forming Jigs and Fixtures: Introduction, Metal blow condition, theories of plasticity, conditions of plane strains, friction, conditions in metal working, wire drawing, theory of forging, rolling theory, no slip angle, and foreword slip, types of tools, principles of locations, locating and clamping devices, jigs bushes, drilling jigs, milling fixtures, turning fixtures, boring and broaching fixtures, welding fixtures, different materials, for jigs and fixtures, economics of jigs and fixtures.

Metrology: Measurement, linear and angular simple measuring instruments, various clamps, screw gauge, sine bar, auto-collimator, comparator- mechanical, electrical, optical, surface finish and its measurements, micro and macro deviation, factors influencing surface finish and evaluation of surface finish.

**Section-C**

Machine tools: Introduction, constructional features, specialization, operations and devices of basic machine tools such as lathe, shaper, planner, drilling machining, and milling machine, indexing in milling operation, working principles of capstan and turret lathes.


**Section-D**


TEXT BOOK:
1. Manufacturing Engineering Technology, K. Jain, Pearson Education
3. Principles of Manufacturing Materials and Processes, James S.Campbell, TMH.
4. Welding Metallurgy by G.E.Linnert, AWS.
ME-204-F   KINEMATICS OF MACHINE

L T P  Sessional : 50 Marks
3 1 -  Theory : 100 Marks
     Total : 150 Marks
     Duration of Exam : 3 Hrs.

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Introduction: mechanism and machines, kinematics links, kinematics pairs, kinematics chains, degree of freedom, Grubler’s rule, kinematics inversion, equivalent linkages, four link planar mechanisms, straight line mechanisms, steering mechanisms, pantograph, problems.

Kinematics Analysis of Plane Mechanisms: displacement analysis, velocity diagram, velocity determination, relative velocity method, instantaneous center of velocity, Kennedy’s theorem, graphical and analytical methods of velocity and acceleration analysis, problems.

Section-B

Cams: Classification of cams and followers, disc cam nomenclature, construction of displacement, velocity and acceleration diagrams for different types of follower motions, analysis of follower motions, determination of basic dimension, synthesis of cam profile by graphical methods, cams with specified contours, problems.

Gears: fundamental law of gearing, involute spur gears, characteristics of involute and cycloidal action, Interference and undercutting, center distance variation, path of contact, arc of contact, non standard gear teeth, helical, spiral bevel and worm gears, problems.

Section-C

Gear Trains: synthesis of simple, compound and reverted gear trains, analysis of epicyclic gear trains, problems.

Kinematics synthesis of Mechanisms: function generation, path generation, Freudenstein’s equation, two and three position synthesis of four bar and slider crank mechanisms by graphical and analytical methods, precision positions, structural error; Chebychev spacing, transmission angle, problems.

Section-D

Friction: Types of friction, laws of friction, motion along inclined plane, screw threads, efficiency on inclined plane, friction in journal bearing, friction circle and friction axis, pivots and collar friction, uniform pressure and uniform wear.

Belts and pulleys: Open and cross belt drive, velocity ratio, slip, material for belts, crowning of pulleys, law of belting, types of pulleys, length of belts, ratio of tension, centrifugal tension, power transmitted by belts and ropes, initial tension, creep, chain drives, chain length, classification of chains.

TEXT BOOKS:
REFERENCE BOOKS:
   New age International.
NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A
Simple Stresses & Strains: Concept & types of Stresses and strains, Poison’s ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hook's law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical.
Compound Stresses & Strains: Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principle stresses & strains and principal-planes, Mohr’s circle of stresses, Numerical.

Section-B
Shear Force & Bending Moments: Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contra-flexure under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii) combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.
Torsion Of Circular Members: Torsion of thin circular tube, solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, equivalent torque, effect of end thrust. Numericals.

Section-C
Bending & Shear Stresses in Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with combined bending, torsion & axial loading of beams. Numericals.
Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler’s formulae for the elastic buckling load, Eulers, Rankine, Gordon’s formulae Johnson’s empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Numerical.

Section-D
Slope & Deflection: Relationship between bending moment, slope & deflection, Mohr’s theorem, moment area method, method of integration, Macaulay’s method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numerical.
Fixed Beams: Deflections, reactions and fixing moments with SF & BM calculations & diagrams for fixed beams under (i) concentrated loads, (ii) uniformly distributed load and (iii) a combination of concentrated loads & uniformly distributed load.

TEXT BOOKS:

**REFERENCE BOOKS:**

ME-208-F   FLUID MECHANICS

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Section-A
Fluid Properties and Fluid Statics: Concept of fluid and flow, ideal and real fluids, continuum concept, and properties of fluids, Newtonian and non-Newtonian fluids. Pascal’s law, hydrostatic equation, hydrostatic forces on plane and curved surfaces, stability of floating and submerged bodies, relative equilibrium, Problems.
Fluid Kinematics: Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net, Problems.

Section-B
Fluid Dynamics: Concept of system and control volume, Euler’s equation, Bernoulli’s equation, venturimeter, orifices, orificemeter, mouthpieces, kinetic and momentum correction factors, Impulse momentum relationship and its applications, Problems.
Compressible Fluid Flow: Introduction, continuity momentum and energy equation, sonic velocity, propagation of elastic waves due to compression of fluid, propagation of elastic waves due to disturbance in fluid, stagnation properties, isentropic flow, effect of area variation on flow properties, isentropic flow through nozzles, diffusers, injectors, Problems.

Section-C
Viscous Flow: Flow regimes and Reynolds’s number, Relationship between shear stress and pressure gradient, uni-directional flow between stationary and moving parallel plates, movement of piston in a dashpot, power absorbed in bearings. Problems.
Flow Through Pipes: Major and minor losses in pipes, Hagen-Poiseuilli law, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes, Problems.

Section-D
Boundary Layer Flow: Boundary layer concept, displacement, momentum and energy thickness, von-karman momentum integral equation, laminar and turbulent boundary layer flows, drag on a flat plate, boundary layer separation and control. Streamlined and bluff bodies lift and drag on a cylinder and an airfoil, Problems.
Turbulent Flow: Shear stress in turbulent flow, Prandtl mixing length hypothesis, hydraulically smooth and rough pipes, velocity distribution in pipes, friction coefficients for smooth and rough pipes, Problems.

TEXT BOOKS:
REFERENCES BOOKS:

1. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, TMH
**ME-210-F  STEAM & POWER GENERATION**

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**Section-A**

Introduction: Components of Steam Power System, Carnot Cycle, Rankine Cycle, Modified Rankine Cycle, p-v, h-s and T-s diagram for Rankine and Modified Rankine Cycle, Mollier’s diagram, use of steam table, Problem

Steam Generators: Purpose, Classification of boilers, Fire tube and water tube boilers, Mountings and accessories, description of Lancashire, Locomotive, Babcock Wilcox boilers, draught, design of natural draught chimney, artificial draught, mechanical draught, efficiency of boiler and heat balance.

**Section-B**

Steam Nozzles: Function of steam nozzles, shape of nozzles for subsonic and supersonic flow of steam, Steady state energy equation, continuity equation, nozzle efficiency, critical pressure ratio for max. Discharge, design of steam nozzle, problems.

Steam Engine: Working of steam engine, single acting and double acting steam engine, compounding of steam engine, ideal and actual indicator diagram, mean effective pressure, diagram factor, mechanical efficiency, thermal efficiency of steam engine.

**Section-C**

Steam Turbine: Classification of steam turbine, impulse turbine, working principle, compounding of impulse turbine, velocity diagram, power output and efficiency of a single stage impulse turbine, reaction turbine, working principle, degree of reaction, velocity diagram, power output, efficiency, condition for max. Efficiency, governing of steam turbines, problem.

Improved Turbines: Back pressure and pass out turbines, Regenerative feed heating cycle, Binary vapour cycle.

**Section-D**

Steam Condensers: Classification of condensers, sources of air leakage in condensers, effect of air leakage in condenser, vacuum efficiency, condenser efficiency, air pumps, cooling water calculation, and problem.

Fuel and Combustion: Classification of fuels – solid, liquid and gaseous fuels, calorific values of fuels, stochiometric air fuel ratio, excess air requirement, analysis of exhaust gases, problem.

**RECOMMENDED BOOKS:**

2. Heat Engineering – V.P.Vasandani and D.S.Kumar, Metropolitan Book Co. Pvt. Ltd.
3. I.C.Engines - M.L.Mathur and Sharma Dhanpat Rai & Sons
4. Thermal Engineering - P.L.Balaney Khanna Publisher
ME-212-F KINEMATICS OF MACHINES LAB

Sessional : 25 Marks
Practical : 25 Marks
Total : 50 Marks

Duration of Exam: 3 Hrs.

List of Experiments:

1. To study various types of Kinematic links, pairs, chains and Mechanisms.
2. To study inversions of 4 Bar Mechanisms, Single and double slider crank mechanisms.
3. To plot slider displacement, velocity and acceleration against crank rotation for single slider crank mechanism.
4. To find coefficient of friction between belt and pulley.
5. To study various type of cam and follower arrangements.
6. To plot follower displacement vs cam rotation for various Cam Follower systems.
7. To generate spur gear involute tooth profile using simulated gear shaping process.
8. To study various types of gears – Helical, cross helical worm, bevel gear.
9. To study various types of gear trains – simple, compound, reverted, epicyclic and differential.
10. To find co-efficient of friction between belt and pulley.
11. To study the working of Screw Jack and determine its efficiency.
12. Create various types of linkage mechanism in CAD and simulate for motion outputs and study the relevant effects.
13. Creation of various joints like revolute, planes, spherical, cam follower and study the degree of freedom and motion patterns available.
14. To design a cam profile by using the requirement graph using on-line engineering handbook and verify the same using a 3D mechanism on CAD.

Note: 1. At least Ten experiments are to be performed in the Semester.

2. At least eight experiments should be performed from the above list. However these experiments should include experiments at Sr. No. 12, 13 and 14. Remaining two experiments may either be performed from the above list or as designed & set by the concerned institution as per the scope of the syllabus.
ME- 214-F STRENGTH OF MATERIAL-I LAB

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List of Experiments:

1. To study the Brinell hardness testing machine & perform the Brinell hardness test.
2. To study the Rockwell hardness testing machine & perform the Rockwell hardness test.
3. To study the Vickers hardness testing machine & perform the Vickers hardness test.
4. To study the Erichsen sheet metal testing machine & perform the Erichsen sheet metal test.
5. To study the Impact testing machine and perform the Impact tests (Izod & Charpy).
6. To study the Universal testing machine and perform the tensile test.
7. To perform compression & bending tests on UTM.
8. To perform the sheer test on UTM.
9. To study the torsion testing machine and perform the torsion test.
10. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.
11. To determine Mechanical Advantage and Efficiency of Single and Double Purchase Winch Crab.
12. To determine Mechanical Advantage and Efficiency of Worm and Worm Gear of Single, Double and Triple start.
14. To find Moment of Inertia of a Fly Wheel.

Note:
3. At least ten experiments are to be performed in the semester.

4. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.
List of Experiments:

1. To determine the coefficient of impact for vanes.
2. To determine coefficient of discharge of an orificemeter.
3. To determine the coefficient of discharge of Notch (V and Rectangular types).
4. To determine the friction factor for the pipes.
5. To determine the coefficient of discharge of venturimeter.
6. To determine the coefficient of discharge, contraction & velocity of an orifice.
7. To verify the Bernoullis Theorem.
8. To find critical Reynolds number for a pipe flow.
9. To determine the meta-centric height of a floating body.
10. To determine the minor losses due to sudden enlargement, sudden contraction and bends.
11. To show the velocity and pressure variation with radius in a forced vertex flow.
12. To verify the momentum equation.

Note:

1. At least ten experiments are to be performed in the semester.
2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.
ME-218-F  STEAM & POWER GENERATION LAB

L  T  P
-  -  2

Sessional : 25 Marks
Practical/Viva : 25 Marks
Total : 50 Marks
Duration of Exam. : 3 Hrs.

List of Experiments:

1. To study low pressure boilers and their accessories and mountings.
2. To study high pressure boilers and their accessories and mountings.
3. To prepare heat balance sheet for given boiler.
4. To study the working of impulse and reaction steam turbines.
5. To find dryness fraction of steam by separating and throttling calorimeter.
6. To find power output & efficiency of a steam turbine.
7. To find the condenser efficiencies.
8. To study and find volumetric efficiency of a reciprocating air compressor.
9. To study cooling tower and find its efficiency.
10. To find calorific value of a sample of fuel using Bomb calorimeter.
11. Calibration of Thermometers and pressure gauges.

Note:

1. At least ten experiments are to be performed in the semester.
2. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.
GP-202-F GENERAL PROFICIENCY
(Common to CSE, IT, ECE, EE, E&I, I&C, EEE, CE, BM)

L   T   P       Sessional : 50 Marks
-   -   2         Total : 50 Marks

Duration of Exam: 3 Hrs

- Quiz & Aptitude,
- Comprehension,
- Communication for Specifics,
- Let’s speak,
- Composition Skills – Formal Letter Writing based on the trends in practice in corporate culture.
- Training on etiquettes & manners should be carried further and be observed during the general classes
- Ethics in Engineering