

B. TECH. 4TH SEMESTER (MECHANICAL ENGINEERING)

FLUID MECHANICS

ME-241

L	T	P	Cr
3	1	-	4

On Semester Evaluation	100
End Semester Evaluation	100
Maximum Time	3 hrs

Note: -

- 1. There will be NINE questions in the question-paper. All questions carry equal marks.**
- 2. First question covers the whole syllabus. It is objective/ short answer type (at least ten questions). Two questions will be taken from each of the four units.**
- 3. Attempt five questions in all. FIRST question is compulsory. Attempt ONE question from each of the other four Units**

UNIT-I

Introduction & Fluid Statics: Fluid properties, Mass density, specific weight, specific volume and specific gravity, surface tension, capillarity, pressure inside a droplet and bubble, compressibility, viscosity-Newtonian & Non-Newtonian fluids, real and ideal fluids, continuum concept. Pascal's law, hydrostatic equation-pressure-density-height relationship, gauge and absolute pressure, simple, differential and sensitive manometers, two liquid manometers. Hydrostatic forces on plane and curved surfaces, center of pressure, buoyancy and stability of immersed and floating bodies, relative equilibrium, determination of metacentric height.

UNIT-II

Kinematics of fluids:- Eulerian and Lagrangian descriptions of fluid flow. Stream, streak and pathlines, types of flows-Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, one two and three-dimensional flows. Flow rate and continuity equation in differential form, rotation & circulation, stream function and velocity potential, flow nets-graphical and experimental methods of drawing flow nets, fluid masses subjected to uniform acceleration.

Fluid Dynamics:- Concept of system and control volume, Euler's equation, Bernoulli's equation, Pitot tube, venturimeter, orificemeter, flow through orifices & mouthpieces, Kinetic and momentum correction factors, potential flow: uniform and vortex flow, free & forced vortex, flow past a Rankine half body, flow past a cylinder with and without circulation.

UNIT-III

Viscous Flow:- Flow regimes & Reynolds 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. Flow through pipes-Hagen-Poiseuille Law, hydraulic gradient and total energy lines, major and minor losses in pipes. Power transmission through pipes, branched pipes- parallel and series.

UNIT-IV

Boundary Layer Analysis: - Boundary layer concept, displacement, momentum and energy thickness of boundary layer. Laminar and turbulent boundary layer flows, drag on a flat plate, boundary layer separation and control, streamline and bluff bodies, lift and drag on a cylinder and an airfoil. Turbulent flow:- Shear stress in turbulent flow, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, Prandtl mixing length hypothesis, hydraulically smooth and rough pipes, velocity distribution in pipes, friction coefficient of smooth and rough pipes.

Text Books:

1. Fluid Mechanics – Streeter V L and Wylie E B, Mc Graw Hill
2. Mechanics of Fluids – I H Shames, Mc Graw Hill
3. Fluid Mechanics – B White
4. Fluid Mechanics – Senjel
5. Boundary Layer Theory – H. Schlichting

References Books:

1. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, TMH
2. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons
3. Fluid Mechanics and Machinery – S.K. Agarwal, TMH, New Delhi

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STRENGTH OF MATERIALS-II ME-242

L	T	P	Cr	On Semester Evaluation	100
3	1	-	4	End Semester Evaluation	100
				Maximum Time	3 hrs

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UNIT I

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

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

UNIT II

Unsymmetrical Bending: Properties of beam cross section, product of inertia, ellipse of inertia, slope of the neutral axis, stresses & deflections, shear center and the flexural axis Numerical.

Thin Cylinders & Spheres: Hoop & Longitudinal stresses & strains in cylindrical & spherical vessels & their derivations under internal pressure, wire wound cylinders, Numerical.

UNIT III

Thick Cylinders & Spheres: Derivation of Lamé's equations, radial & hoop stresses and strains in thick and compound cylinders and spherical shells subjected to internal fluid pressure only, wire wound cylinders, Numerical.

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, Numerical Problems.

UNIT IV

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

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

Text Books:

1. Strength of Materials – G.H.Ryder, Third Edition in SI Units 1969 Macmillan, India
2. Strength of Materials – Sadhu Singh, Khanna Publishers.
3. Strength of Materials – S.S.Rattan

Reference Books:

1. Strength of Materials- Dr. V. S. Parsad, Galgotia Publishers
2. Strength of Materials – Dr. R. K. Bansal, Luxmi Publishers
3. Book of Solid Mechanics – Kazmi, Tata Mc Graw Hill

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THEORY OF MACHINES-II

ME- 243

L	T	P	Cr
3	1	-	4

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End Semester Evaluation	100
Maximum Time	3 hrs

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3. Attempt five questions in all. FIRST question is compulsory. Attempt ONE question from each of the other four Units

UNIT I

D'Alembert's principle, Dynamic Analysis of slider crank mechanism, Engine force analysis; Piston effort, Crank effort, thrust on bearing, thrust along connecting rod, Turning moment on crank shaft, Equivalent dynamical systems, and Inertia force in reciprocating engines by graphical and analytical method. Turning moment and crank effort diagrams for single cylinder and multi-cylinder engines, coefficient of fluctuation of energy, coefficient of fluctuation of speed, flywheel and its function.

UNIT II

Types of gears, terminology, law of gearing, velocity of sliding, cycloidal and involutes profiles of gear teeth, comparison of cycloidal and involute tooth forms, pressure angle, path of contact, arc of contact, No. & pair of teeth in contact, Interference, undercutting, minimum number of teeth, helical gear and spiral gear. Gear trains; simple, compound, reverted, and epicyclical, Solution of gear trains, sun and planet gear, compound epicyclical gear, differential of automobile, torque in gear trains.

UNIT III

Types of brakes, friction brakes, external shoe brakes, band brakes, band and block brakes, internal expanding shoe brake, dynamometers; absorption and transmission. Static and dynamic balancing of rotating parts, balancing of several masses in different planes, balancing of reciprocating mass, balancing of locomotives, effect of partial balancing of locomotives, secondary balancing, balancing of multi-cylinder engine; V-engines, balancing machines.

UNIT IV

Types of governors; watt, Porter, Proell, Hartnell governor, Wilson hartnell governor, Sensitiveness, Stability, Isochronism, Hunting, Effort and power of a porter governor, controlling force, Gyroscope, Gyroscopic couple and its effect on aircraft, naval ships during steering, pitching and rolling, Stability of an automobile (2-wheers)

Text Books:

1. Theory of machines: S. S. Rattan, Tata McGraw Hill Publications
2. Theory of Machines: P.L. Balani

Reference Books:

1. Theory of Mechanism and Machines: Jagdish Lal, Metropolitan Book Co.
2. Mechanism synthesis and analysis: A.H. Soni, McGraw Hill Publications.

B. TECH. 4TH SEMESTER (MECHANICAL ENGINEERING)

PRODUCTION TECHNOLOGY- II ME-244

L	T	P	Cr
3	1	-	4

On Semester Evaluation	100
End Semester Evaluation	100
Maximum Time	3 hrs

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3. Attempt five questions in all. FIRST question is compulsory. Attempt ONE question from each of the other four Units

UNIT-I

Kinematics of Machine Tools

Drives in machine tools for rotation movement, Stepped and step less drives, Mechanical and Hydraulic drives, Individual and group drives, Selection of extreme values of spindle speed on a lathe, Principle of stepped regulation, Layout of spindle speeds. A.P., G.P. and Logarithmic progressions, Kinematics advantage of G. P. for gear box design, Selection of common ratio, Number of steps in a given speed range, Design of all geared head stock.

UNIT-II

Manufacturing Methods

Characteristics of turret Lathes, Turret-indexing mechanism, Tooling equipment for turrets, Tool Layout or turrets, Classification of gear production methods, gear generation, gear hobbing, gear shaping, gear finishing methods; shaving, burnishing grinding, Lapping gear, shaping gear, finishing methods; shaving, burnishing grinding, honing.

UNIT-III

Super Finishing Methods: Introduction to Super Finishing methods: Polishing, Lapping and various lapping methods and Machines, Honing, various Honing methods an machines, Grinding, Buffing, Burnishing, Tumbling.

Press and Die Design: Introduction, classifications of presses and dies, wear action in die cutting operations, center of pressure, mathematical calculation of center of pressure, clearances, cutting forces, punch dimensioning.

UNIT-IV

Machine Tools Vibration and Dynamometry

Introduction, effects of vibration no-machine tools, cutting conditions, work piece and tools life, source of vibration, machine tool chatter, Need for measuring forces, basic requirements of measuring techniques, design requirements of dynamometers, 3-divisional turning dynamometer and its calibration, drill dynamometers.

Suggested reading:

1. Manufacturing science:
Ghosh and Malik, E.W. Press
2. Principles of metal cutting:
Sen and Bhattacharya, New Central Book.
3. Metal cutting principles:
Shaw, MIT Press Cambridge
4. Manufacturing analysis:
Cook, Adisson-Wesley
5. Modern machining processes:
Pandey and Shan, Tata McGraw Hill Publications

B. TECH. 4TH SEMESTER (MECHANICAL ENGINEERING)

MACHINE DRAWING

ME-245

L	T	P	Cr
2	0	3	3

On Semester Evaluation	100
End Semester Evaluation	100
Maximum Time	3 hrs

Note: The Examiner will set two questions from each unit. The students have to attempt three questions taking one from each unit.

The questions from Unit1 and Unit 2 will carry 20marks each while questions from Unit3 will carry 60 marks.

UNIT-I

Introduction to Bureau of Indian Standards (BIS) of engineering drawing, Limits fits and tolerances (linear and geometric tolerances), surface finish symbols and their elements.

Screw Threads & Threaded fasteners: Types of V threads, square threads, conventional & detailed representation of internal and external threads, Types of Nuts: Hexagonal, square, ring nut, wing nut, castle nut, capston nut

Gears: Gear terminology, IS conventions, representation of assembly of spur gears, helical gears, bevel gears, worm and worm wheel.

UNIT-II

Orthographic views from isometric views of machine parts / components, exercises on Couplings, Cotter and knuckle joint, Riveted Joints and Welded Joints.

UNIT-III

Assembly drawing with sectioning and bill of materials from given detail drawings of assemblies: Lathe tail stock, Machine vice, Pedestal Bearing, Steam stop Valve, Drill Jigs and milling fixtures.

Text Books:

A textbook of machine drawing: by P.S. Gill (SK Kataria Publishers).

A textbook of machine drawing: by ND Bhatt & VM Panchal (Charotar Publishing House)

Reference Books:

A textbook of machine drawing: by Luxmi Narayan & Mathur

B. TECH. 4TH SEMESTER (MECHANICAL ENGINEERING)

MATERIAL SCIENCE

ME-246

L	T	P	Cr
4	0	-	4

On Semester Evaluation	100
End Semester Evaluation	100
Maximum Time	3 hrs

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3. Attempt five questions in all. FIRST question is compulsory. Attempt ONE question from each of the other four Units

UNIT I

Crystallography: Review of crystal structure, space lattice, crystal planes and crystal directions, coordination 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.

UNIT II

Solid solutions and phase diagram: Introduction to single and multiphase solid solutions and types of solid solutions, importance and objectives of phase diagram, 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.

Heat Treatment: Principles, purpose, classification of heat treatment processes, annealing, normalizing, stress relieving, hardening, tempering, hardenability, carburizing, nitriding, cyaniding, flame and induction hardening. Allotropic transformation of iron and steel, Properties of austenite, ferrite, pearlite, martensite.

UNIT III

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: process of fracture, types of fracture, fatigue failure, characteristics of fatigue, fatigue limit, mechanism of fatigue, factors affecting fatigue, failure analysis.

UNIT IV

Creep and 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, types of corrosion, effect of corrosion, prevention of corrosion.

Engineering alloys: Heat resistant, corrosion resistant, super alloys, carbon and alloys tool steels and high-speed steels, ceramics: preparation and applications

Text Books:

1. Material Science - Narula, Narula and Gupta. New Age Publishers
2. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpat Rai & Sons

Reference Books:

1. Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi
2. Mechanical Metallurgy, George E.Dieter
3. Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons., Delhi.
4. Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi

B. TECH. 4TH SEMESTER (MECHANICAL ENGINEERING)

FLUID MACHINES LAB

ME-24P1

L	T	P	Cr	On Semester Evaluation	120
-	-	2	1	End Semester Evaluation	80
				Maximum Time	2 hrs

List of Experiments

1. To study and perform test on the Pelton wheel and to plot curves Q, P, V/S N at full, three fourth & half gate opening.
2. To study and perform test in the Francis Turbine and to plot curves Q, P V/S N at full, three- fourth & half gate opening.
3. To study and perform test on the Kaplan Turbine and to plot curves Q, P V/S N at full, three- fourth & half opening.
4. To study and perform test on Centrifugal Pump and to plot curves η , P V/S Q
5. To study and perform test on a Hydraulic ram and to find its Rankine, Abussion efficiencies.
6. To study and perform test on a Reciprocating pump and to plot the P and η V/s H.
7. To study and perform test on a Gear Pump and to plot the curves Q, P V/s Pressure rise.
8. To study the working principle of Hydraulic press.

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THEORY OF MACHINES LAB- II

ME-24P2

L	T	P	Cr
-	-	2	1

On Semester Evaluation	120
End Semester Evaluation	80
Maximum Time	2 hrs

LIST OF EXPERIMENTS

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

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PRODUCTION TECHNOLOGY-11 LAB

ME-24P3

L	T	P	Cr
-	-	3	2

On Semester Evaluation	120
End Semester Evaluation	80
Maximum Time	3 hrs

List of Experiments:-

1. To perform a job on milling machine.
2. To cut spur gear teeth on milling machine
3. To cut rack cutting, helical gear cutting on milling machine
4. To study and perform jobs on the various grinders.
5. To perform a job using TIG welding.
6. To study the working of CNC lathes Trainer.
7. To study the profile projector & gauges.
8. To make a job on lathe machine using copy turning attachment.
9. To cut multi slots and Flat surface on a shaper machine.
10. To perform drilling and boring job using lathe machine
11. To test the welding joint using the magnetic particle and dye penetrate test.

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GENERAL PROFICIENCY AND FITNESS

ME-247

L T P Cr
- - - 1

At the end of each year students will be evaluated on the basis of their performance in various fields. The evaluation will be made by the panel of experts/examiners/teachers to be appointed by the HOD/principal/Director of the College. A specimen performa indicating the weightage to each component/activity is given below:-

Name : _____ College Roll No. _____

Roll No. _____

Branch _____ Year of Admission _____

I. Academic Performance (30 marks)

Marks obtained in the Semester

I
II
III
IV
V
VI
VII

II. Extra Curricular Activities (30 Marks)

(a) Indoor Games _____

(b) Outdoor Games _____

© Essay Competition

Scientific _____

Technical _____

Exhibitions _____

Debate _____

(d) Fine Arts

Drama _____

Dance _____

Music _____

Painting _____

(e) Activities

Hobby Club _____

N.S.S. _____

H ostel Mgt _____

Any other _____

III. Educational tours/visits/Membership of Professional Societies (10 marks)

1. _____

2. _____

3. _____

4. _____

5. _____

IV. Contribution in NSS Social Welfare Floor Relief/draught relief/Adult Literacy mission/Literacy Mission/Blood Donation/Any other Social Service (10 Marks)

1. _____

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2. _____
3. _____
4. _____
5. _____
6. _____

V. Briefly evaluate your academic & other performance & achievements in the Institution (10Marks)

VI. Performance in Viva voce before the committee (10 Marks)

*Marks obtained I()+II()+III()+IV()+V()+VI()=**Total Marks :

Member

Member

Member

Member

**B. TECH. 4TH SEMESTER (MECHANICAL ENGINEERING)
SEMINAR**

ME-24A

L	T	P	Cr	On Semester Evaluation	200
0	0	0	A		

Students will give a presentation on emerging technical topics.