w.e.f. July, 2019

B.E. IV SEMESTER MECHANICAL ENGINEERING							
COURSE CONTENTS (AICTE FLEXIBLE CURRICULA)							
ME- 4301	**Applied Thermal Engineering**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Exam Duration	3 Hours	3	-	2	4	70	22

Unit I

Steam Generators: Classification, high-pressure boilers; Lamont, Benson, Loeffler and Velox, performance and rating of boilers, combustion in boilers, heat balance sheet of boilers, super critical boilers, boiler draught.

Unit II

Vapour Power Cycles: Simple steam power cycle, Rankine cycle, Carnot vapour cycle and its limitations, comparison of Rankine and Carnot cycle, effect of boiler and condenser pressure and temperatures on efficiency of Rankine cycle, modified Rankine cycle, reheat cycle, ideal and actual regenerative cycle, feed water heaters, regenerative-reheat cycle, characteristics of ideal working fluid in vapour power cycle, binary vapour cycle, work done and efficiency calculations.

Unit III

Air Compressors: Classification of air compressors, construction and working of various compressors: reciprocating compressor, screw and vane compressor, centrifugal compressor, axial compressor.

Reciprocating Compressor: Ideal and actual indicator diagram, work done for single and multi stage compressor with and without clearance volume, efficiency of compressor: isentropic, isothermal, mechanical and volumetric efficiency; condition for minimum work done in multi stage compression.

Unit IV

Steam Condensers: Introduction, Types of condensers, comparison between jet and surface condenser, effect of back pressure and air leakage on performance of condensers.

Cooling Towers: Types of cooling towers, design of cooling towers.

Theory of Jet propulsion: Introduction to pulse jet and ram jet engines.

Unit V

Gas Dynamics: Velocity of pressure pulse in a fluid, speed of sound, Mach number (M), Mach cone, stagnation properties, one-dimensional steady isentropic flow, Ratio of areas as a function of Mach number, mass flow rate and critical pressure ratio, Normal shock.

Steam Nozzles: Types of nozzles, steady flow energy equation and momentum equation applied in steam nozzles, nozzle efficiency, isentropic and adiabatic flow of steam through nozzles, mass of discharge and condition for maximum discharge (choked flow), super-saturated flow.

Sunil Pungotra

(Dr. H. Kumar)

Recommended Books:

1. Thermodynamics by Gordon J. Van Wylen; Wiley and Sons Inc.
2. Thermodynamics and Heat Engines by R. Yadav; Central Publishing House.
3. Heat Engines by Pandya and Shah; Charotar Books Distributors.
4. An Introduction to Energy Conversion – Vol II. Energy conversion cycles by V. Kadambi and Manohar Prasad; New Age International (P) Ltd.
5. Steam and Gas Turbines by R. Yadav; Central Pub. House.
6. Gas Dynamics by E. Rathakrishan; Prentice-Hall of India.
7. Compressible Fluid Flow by E. Rathakrishan; Prentice-Hall of India.

(Dr. M. K Gupta)

Suggested list of experiments:

1. To study principle and working of Lamont high pressure boiler
2. To study principle and working of Benson high pressure boiler.
3. To study principle and working of Loeffler high pressure boiler.
4. To study principle and working of Velox high pressure boiler.
5. To study principle and working of two stage air compressors.
6. To study principle and working of surface type condensers.
7. To study principle and working of Jet type condensers.
8. To study different type of nozzles.

Course Outcomes (CO's)

After completion of this course the student should be able to:

CO	Statement
CO1	Familiarize with the fundamental understanding of working of high pressure boilers and to analyze performance and its modification parameters.
CO2	Apply vapour power cycles in thermal power stations.
CO3	Classify different types of compressors and evaluate work done and efficiencies.
CO4	Evaluate performance parameters of condensers, cooling towers and heat exchangers.
CO5	Understand compressible fluid flow and apply it in steam nozzles.

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Program Specific Outcomes (PSO's)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	-	1	1	-	-	-	-	1	3	2
CO2	3	3	2	-	-	1	1	-	-	-	-	1	3	1
CO3	3	3	2	1	-	-	-	-	-	-	-	1	3	2
CO4	3	3	3	1	-	-	1	-	-	-	-	1	3	2
CO5	3	3	3	1	-	-	1	-	-	-	-	1	3	2
1 - Low, 2 – Moderate, 3 - High														

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B.E. IV SEMESTER MECHANICAL ENGINEERING							
COURSE CONTENTS (AICTE FLEXIBLE CURRICULA)							
ME-4302	**Fluid Mechanics**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Exam Duration	3 Hours	3	1	2	5	70	22

Unit I

Properties of Fluid: Pressure, density, specific weight, surface tension, capillarity, bulk modulus of elasticity, vapour pressure, viscosity, Newton's law of viscosity.

Fluid Statics: Pressure at a point, pressure variation in static fluid, manometers, forces on plane and curved surfaces, buoyant force, stability of floating and submerged bodies, relative equilibrium.

Unit II

Fluid Kinetics: Types of flow, path lines, streak-lines, streamlines and stream tubes; continuity equation for one and three-dimensional flow, velocity and acceleration of fluid particle, velocity potential, stream function, rotational flow, circulation, flownets, utility and method of drawing flownets, free and forced vortex flow.

Ideal Fluid Flow Theory: Introduction to 2 D flow, source, sink and doublet, flow past cylinder.

Unit III

Fluid Dynamics: Euler's equation, Euler's equation of motion along a streamline, Bernoulli's equation, engineering applications of Bernoulli's equation, Venturimeter, orificemeter, nozzlemeter, rotameter, pitot static probe, current meters, notches and weirs, linear momentum equation for steady flow and its applications, forces on pipe bends, moment of momentum equation and its applications, forces on fixed and moving vanes, momentum correction factor, energy correction factor.

Unit IV

Flow through Pipes: Introduction to laminar and turbulent flow, Reynolds experiment, Critical Reynold's number, relation between shear stress and pressure gradient, laminar flow through circular pipes, Hagen-Poiseuille's equation, laminar flow between parallel plates, velocity distribution in pipes, friction factor, Moody's chart, hydraulic gradient line and total energy line, minor head losses in pipes, pipe networking, transmission of power through pipe.

Boundary Layer Theory: Development of boundary layer, displacement, energy and momentum thickness.

Unit V

Dimensional Analysis: Dimensional analysis, dimensional homogeneity, Rayleigh's method, Buckingham's Pi theorem, physical significance of various dimensionless numbers, similarity laws, model testing and its applications.

Flow over Immersed Bodies: Streamline and bluff bodies, lift and drag coefficients, flow over circular cylinder and aerofoils.

Recommended books:

1. Fluid Mechanics by Som and Biswas; Tata McGraw Hill.
2. Fluid Mechanics by Cengel; McGraw Hill Education.
3. Fluid Mechanics by Modi and Seth; Standard Book House.
4. Fluid Mechanics by Massey; Taylor and Francis.
5. Fluid Mechanics by D.S. Kumar; S.K.Kataria and Sons.

(Dr. M K Gupta) (Dr. Hemant Parmar)

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B.E. IV SEMESTER MECHANICAL ENGINEERING							
COURSE CONTENTS (AICTE FLEXIBLE CURRICULA)							
ME-4303	**Strength of Materials**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Exam Duration	3 Hours	3	1	2	5	70	22

Unit I

Simple Stress and Strains: Introduction, mechanical properties of materials, stress, strain, elastic limit, Hooke's law, analysis of a tapered bar and rod, composite bar, shear stress, shear strain, elastic constants, relationship between elastic constants, thermal stress, strain.

Strain energy: Concepts and problems.

Unit II

Principal Stresses and Strains: Introduction, principal planes, principal stresses and principal strains, methods of determination of stresses in oblique section, analytical and graphical methods for determine the stresses on oblique plane, Mohr's circle.

Theories of failures

Unit III

Stresses in Beam: Simple and pure bending, theory of bending, bending equation, flexural rigidity, bending stresses in beam, section modulus for various shapes of beam section, composite beam, strength of beam, shear stresses in beam, shear stress distribution in different section.

Columns: Euler's and Rankine formulae.

Unit IV

Deflection of Beams: Relation between slope, deflection and radius of curvature, double integration method, Macaulay method, moment area method, Castigliano's theorem, Maxwell reciprocal theorem.

Unit V

Torsion of Shafts: Introduction, shear stress, circular shaft, torsion formula, torsional rigidity, hollow, stepped and composite shafts, Helical spring.

Thin and Thick walled cylinder: Stresses due to internal pressure, compound cylinders.

Recommended Books:

1. Strength of Materials by Ryder; Palgrave McMillan.
2. Mechanics of Solids by Popov; Prentice Hall.
3. Strength of Materials by Gere and Timoshenko; PWS Publishing Company.
4. Mechanics of Materials by R.C. Hibbeler; Prentice Hall.
5. Strength of Materials by S.S. Rattan; Tata McGraw Education.
6. Strength of Materials by R.K. Bansal; S. Chand Publisher.

Suggested list of experiments:

1. Study of 100 Ton and 60 Ton Universal testing machine.
2. To conduct tensile test on M.S. specimen.
3. To conduct compression test on wooden piece.
4. To conduct bend test on M.S. specimen.
5. Study of Impact testing machine.
6. To Conduct Izod and Charpy test on impact testing M/c.
7. Study of Rockwell hardness testing machine.
8. To conduct Rockwell hardness test on different material specimen.
9. Study of Brinell Cum Vicker's hardness tester.

(Dr. Sunil Punjabi) (Dr. M.K. Gupta) (Dr. Hemant Kumar)

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B.E. IV SEMESTER MECHANICAL ENGINEERING							
COURSE CONTENTS (AICTE FLEXIBLE CURRICULA)							
ME-4304	**Manufacturing Process**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Exam Duration	3 Hours	4	0	2	5	70	22

Unit I

Metrology: Standards of measurements, linear and angular instruments; slip gauges, comparators, sine bar, angle gauges, clinometers, tape gauge, screw thread measurements.

Unit II

Pattern Making: Pattern and pattern making, pattern allowances, types of patterns, pattern design considerations, core, core boxes, Design of Gating systems.

Foundry: Molding and core sands and their properties, moulding machines, centrifugal casting, die casting shell moulding, cupola description and operation, lost wax moulding, continuous casting.

Unit III

Forging and Rolling: Theory and application of forging processes, principle of drop and horizontal forging machines, optimum forging temperature.

Rolling Mechanisms: General description of machines and process, rolling of structural sections plates and sheets, hot and cold rolling technique.

Extrusion: Introduction, backward, forward impact and hydrostatic extrusion, forming and electro hydraulic forming.

Unit IV

Press Working: Description and operation of processes, process of shearing, bending, forging and drawing press, tool dies, auxiliary equipment, safety devices, stock feeders, scrap cutters, requirements of stock material, type of press dies.

Unit V

Welding: Gas welding, electric arc welding, A.C. and D.C.welding machines and their characteristics, flux and electrodes,electric resistance welding processes, solid state welding, fusion welding processes, thermit, TIG and MIG welding, atomic hydrogen welding, soldering and brazing, gas cutting.

Spinning: Introduction to spinning, type of spinning.

Recommended Books:

1. Workshop Technology by Chapman; Taylor and Francis.
2. Manufacturing Process by Begeman; John Wiley.
3. Manufacturing Engineering and Technology by Kalpakjian and Schmid; Pearson Education.
4. Manufacturing Science by Ghosh and Mallik; East-West Press.
5. Workshop Technology (Vol. I) by B.S. Raghuwanshi; Dhanpat Rai and Company.
6. Elements of Workshop Technology (Vol. I) by Hajra Choudhury; Media Promoters and Publishers.

(Dr. Sunil Punjabi) (Dr. M K Gupta) (Dr. Hemant Parmar)