राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर
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DEPARTMENT OF MECHANICAL ENGINEERING SYLLABUS

Name of the Subject	Engineering Graphics	Subject Code	ME101
Semester	I & II	Board of Studies	Mechanical Engg.
Maximum Marks	ESE-70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
2	0	4	4

Unit I – Scales & Curves

a) Introduction to Engineering Drawing, Scales: Representative Fraction, Types of Scale, Plain and Diagonal Scale, Scale of chords.

b) Engineering Curves: Conic section, Ellipse, Parabola, Hyperbola, Cycloidal Curves: Cycloid, Epicycloids, Hypocycloid, Involutes, Helix, Spiral.

Unit II – Projection of Points & Lines

a) Projection: Introduction, Principle of Projection, Method of projection, Planes of projection, Four quadrants, First and Third angle projection, Reference line, Symbols for methods of projection, Orthographic projection.

b) Projection of Point: Introduction, Point situated in first, second, third & fourth quadrant.

c) Projection of lines: Introduction, Line parallel to one or both the planes, Line contained by one or both the planes, Line perpendicular to one of the planes, Line inclined to one plane and parallel to other, Line inclined to both the planes.

Unit III – Projection of Planes & Solids

a) Projection of Planes: Introduction, Types of planes, Projection of planes, Projection of planes: perpendicular to both the reference planes, Perpendicular to one and parallel to other plane, Perpendicular to one and inclined to the other plane, Inclined to both the planes.

b) Projection of Solids: Introduction, Types of solid, Projections of solids in simple position, Projection of solids with axes inclined to one of the reference planes and parallel to the other, Projections of solids with axes inclined to both H.P. and the V.P.

Unit IV – Section of Solids & Development of Surfaces

a) Section of Solids: Sectional Planes, Section of solids, True Shape of Section.

b) Development of Surfaces: Introduction, Methods of development, Development of lateral surfaces of right angled solids, Cube, Prisms, Cylinders, Pyramids & Cone.

Unit V – Isometric Projection

Isometric Projection: Introduction, Isometric axes, Lines & planes, Isometric scale, Isometric projection and Isometric view, Conversion of Isometric to Orthographic Projections.

Problems from the above units should also be practiced on computer aided drafting software.

Text Books

(i) "Elementary Engineering Drawing" by Bhatt, N.D., Charotar publishing Co.
(ii) "Engineering Graphics" by K.L. Narayana and P.Kannaiah, Scitech Publications (India) Pvt..Ltd.
(iii)"Engg. Drawing with Auto CAD 2009"- T Jeyapavan, Vikas Publishing House Pvt. Ltd.

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Basic Mech. Engg.	Subject Code	ME102
Semester	I & II	Board of Studies	Mechanical Engg.
Maximum Marks	ESE-35	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
2	1	0	3

UNIT – I

Law of Thermodynamics: Thermodynamic systems, property, control volume, work, heat as path function, first Law of thermodynamics, and its application to non-flow and flow process, equilibrium, various process, second law of thermodynamics, its corollaries, clausius inequality, entropy: point function, principle of increase of entropy, entropy change during various thermodynamic processes, Carnot cycle.

UNIT – II

Air Standard Cycles: Otto, Diesel, Dual combustion cycles there efficiencies, mean effective pressure.
Properties of Steam: Types of Steam, Wet, Saturated and Superheated Steam, calculation of heat value of steam of any value.

UNIT – III

Mechanical Properties of engineering materials : Hardness, Ductility, Malleability, Toughness, Brittleness, Stress – Strain Curve for ductile and brittle material etc. Normal and shear stress, Relation between Elastic constants, Stresses in varying cross sectional area, Composite bars on axial loading.
Introduction to manufacturing : Types of Welding – Gas Welding, Arc. Welding, Equipments used, Different types of Welded joints, Working principle, function & specification of Simple Lathe machine, Shaper.

Text Books :-

1. Thermodynamics – R. Yadav
2. Production Technology – Hajra & Choudhary
3. Strength of Materials – Timoshenko & Young

Reference Books :-

1. Engineering Thermodynamics – P.K. Nag
2. Thermodynamics – Cengel and Boles
3. Manufacturing Process – Bagman
4. Strength of Material – Ryder
5. Strength of Materials – Sadhu Singh

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Mathematics	Subject Code	MA0301
Semester	III	Board of Studies	Mechanical Engg.
Maximum Marks	70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
3	1	0	4

UNIT I - Fourier Series
Euler's Formula, Functions having points of discontinuity, Change of interval, Even & Odd functions, Half range series, Harmonic analysis.

UNIT II - Laplace Transform
Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t^n, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

UNIT III – Partial Differential Equation
Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

UNIT IV – Complex Variables
Derivative, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Flow problem, Complex integration, Cauchy theorem, Cauchy integral formula, Taylor & Laurent series, Singularity, Residue, Evaluation of real definite integrals.

UNIT V - Statistics
Random variables, Discrete & continuous probability distributions, Expectation, Mean & Standard Deviation, Moments & moment generating function, Distributions- Binomial, Poisson and Normal distributions.

Text Books :-
1. Higher Engg. Mathematics by Dr. B.S. Grewal– Khanna Publishers.
2. Advanced Engg. Mathematics by Erwin Kreyszig – John Wiley & Sons.

Reference Books :-
1. Advanced Engg.Mathematics by R.K. Jain and S.R.K. Iyengar – Narosa Publishing House.
2. Applied Mathematics by P.N.Wartikar & J.N. Wartikar. Vol- II– Pune Vidyarthi Griha Prakashan,Pune.
3. Applied Mathematics for Engineers & Physicists by Louis A. Pipes- TMH.

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Numerical Techniques	Subject Code	ME0301
Semester	III	Board of Studies	Mechanical Engg.
Maximum Marks	70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
3	1	3	4+2

UNIT I - Error Analysis Roots of Equations

Approximation and Errors:, Approximation number and significant Figures, Absolute, Relative and percentage error, Round of errors, Truncated errors, Accuracy of series approximations, Taylor's series, Exponentials series, Logarithmic series etc. Error propagation in functions of single and multiple variables.

Roots of Equations : Roots of algebraic, Transcendental and polynomial equation, Approximate roots, Real roots using bracketing methods, Bisection method and Regula- Falsi method, Real roots using open method, Secant method, Iterative method, Complex roots of polynomial equations.

UNIT II - Solution of Coupled Equations

System of coupled equations, Unique solution, Singular solution, III conditional equations, Cramer's rule, Matrix method, Method of leading coefficients, gauss elimination – pitfalls of elimination, Division by zero, Round off errors, Scaling effect, Gauss Jordan, Gauss Seidal, convergence criteria of – Gauss, Newton Raphson's Method.

UNIT III - Curve Fitting

Interpolation : Difference Table, Interpolation, Newton's forward and backward interpolation, Newton's general interpolation formula, Lagrange's Interpolation, Gauss Central, Difference interpolation, Spline fitting – Cubic spline.

Regression : Regression Analysis, Least square analysis, Formation of Normal Equation, Linear Regression, Polynomial regression, Exponential Geometric and Trigonometric regression, Multiple regression.

UNIT IV - Numerical Differential

First, Second and Higher Order Differentiation Formula.

Numerical Integration : Newton's Cotes Integration, Trapezoidal rule, Simpson's one third and three eighth rule, Integration of equations, Romberg Integration, Gauss quadrature.

Solution of Ordinary Differential Equation : Euler's Method, Modified Euler's Method, Runge Kutta's Method Milene's Method.

UNIT V - Solutions of Partial Differential Equations by Finite Difference Technique :

Finite difference method, partial Difference Equation : Elliptic, Parabolic and Hyperbolic Solution of Laplace and Poisson's equation by finite difference method, Iteration and relaxation techniques.

Computer Lab :

All methods are to be practiced using high level programming language such as FORTRAN,C, C++.

TEXT BOOKS

1. Numerical Methods for Engineers by Steven C, Chapra and Raymond P. Canale, McGraw Hill International Editions.
2. Numerical Methods in Engineering and Science by Dr. B.S. Grewal.

Reference Books :

1. Numerical Methods Analysis by J. Scarborough.

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Material Science	Subject Code	ME0302
Semester	III	Board of Studies	Mechanical Engg.
Maximum Marks	70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
3	1	0	4

UNIT - I

Structure of Materials: Crystalline structure of solid: Concept of unit cell and space lattice, Miller Indices, Crystal structure determination by X-ray diffraction, Crystal imperfections.

Solidification of Metals and Alloys : Mechanism of solidification, nucleus formation and crystal growth, Metal ingot structure-dendritic and columnar grains, grain boundaries, grain growth, effect of grain size on properties of metals, polytropic transformation.

UNIT - II

Elastic and Plastic Deformation: Material properties like strength, hardness, toughness, ductility, brittleness etc. and their importance in manufacturing. Quantitative evaluation of these properties with destructive testing methods. Mechanism of plastic deformation, role of dislocations, slip and twinning. Strain hardening, Seasons cracking, Baushinger effect, yield point phenomena and related effects, Cold working and Hot working processes, effect on properties like recovery, recrystallization, grain growth, grain size etc.

UNIT - III

Phase Diagrams: Phase and phase equilibrium : solidification of pure metals and alloys, phase diagrams of monotectic, eutectic, eutectiod, Peritectic and peritectoid & other systems. Allotropy of iron and Fe-C diagram.

UNIT - IV

Heat Treatment : Introduction, purpose of heat treatment, T-T-T curve and micro constituents in steel heat treatment processes like hardening, tempering, annealing, normalizing, Effects of heat treatment on properties of materials. Surface treatment processes.

UNIT - V

Engineering Materials : Classification, structure, general properties and applications of Cast Iron, Steel, brass, Bronze, bearing metals, light metal alloys, sintered carbide.

Text Books :

1. Engineering Physical Metallurgy – Lakhtin – CBS Publishers & Distributors
2. Materials Science- Narang – CBS Publishers & Distributors

Reference Books :

1. Elements of Material Science & Engg. - Van Vlack. – Addison – Wesley longman, 6th Edn., New York 2. Physical Metallurgy - Clark & Varney, East West Edn., New Delhi
2. Engineering Materials - Woulf series.
3. Material Science & Engg. – A first course – V. Raghavan – PHI (P) Ltd., Delhi, 2003
4. A Text Book of Material Science & Metallurgy – O.P. Khanna – Dhanpat Rai & Sons – New Delhi
5. Physical Metallurgy Principles – Robert E Reed Hill – Affiliated East-West Press Pvt. Ltd., New Delhi, 2004

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Mechanics of Solid-I	Subject Code	ME0303
Semester	III	Board of Studies	Mechanical Engg.
Maximum Marks	70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
3	1	3	4+2

UNIT - I

Introduction

Basic of stress &strain , Elastic constant, Stress-strain diagram, Hook's law, stresses in the components subjected to multi-axial forces, Temperature stresses, Statically indeterminate system.

UNIT - II

Bending of beams

Bending of beams with symmetric section, boundary condition, pure bending, bending equation, transverse shear stress distribution in circular, hollow circular, I & T section.

UNIT - III

Deflection of beam

Relation between slope deflection and radius of curvature, solution of beam deflection, Direct integration method, Macaulay"s method, Moment Area method, Method of superposition.

UNIT - IV

Torsion

Deformation in circular shaft due to torsion, basic assumption, torsion equation, stresses in elastic range, angular deflection, hollow and stepped circular shaft.

Spring : Closed and open coil helical spring subjected to axial load, spring in parallel & series.

UNIT - V

Principal stresses and strain

Transformation of plane stresses, principal stresses, maximum shear stresses, Mohr"s circle for plane stresses, Plain strain and its Mohr's circle representation, principal strains, maximum shear strain.

Combined Loading : Components subjected to bending, torsion & axial load.

Text Books :

1. Elements of strength of material – Timoshenko & young- EWP press
2. Mechanics of Solids – Beer & Johnson, Tata McGraw Hill Publications.

Reference Books :

1. Strength of material – Rider – ELBS
2. Introduction to solid mechanics – I.H. Shames – PHI
3. Strength of Materials – R.K. Rajput – Dhanpat Raj & Sons
4. Strength of Materials – Dr. Sadhu Singh – Khanna publication.

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Applied Thermodynamics	Subject Code	ME0304
Semester	III	Board of Studies	Mechanical Engg.
Maximum Marks	70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
3	1	3	4+2

UNIT - I Second Law Analysis

Introduction to the second law of Thermodynamics, The Clausius inequality, Entropy, Principle of increase in entropy, T-ds relation. Availability – Second law analysis of Closed system, Second law analysis of steady –flow system, Irreversibility

UNIT - II Thermodynamic Relationships

Helmholz and Gibbs functions, Coefficient of Volume expansion and isothermal compressibility, Differential relations of internal energy, Maxwell's Relation, C_p C_v relations, T-ds equations, Clapreyon equation, Kelvin coefficient.

Equation of state:

Ideal gas equation of state, Real gas deviation with ideal gas, Vander waals equation, Evaluation of its constants, Virial expansions, Limitations of the equation. The law of corresponding states.

UNIT – III Vapour and Vapour Power Cycle

Properties and processes in ideal vapour, Use of steam tables and Molier's diagram in determination of steam properties, energy and entropy calculations.

Carnot and Rankine cycle as applied to steam power plants, Reheat cycle, Ideal regenerative cycle, Practical regenerative cycle, Characteristics of ideal working fluids, Binary vapour cycle.

Unit – IV Reciprocating Air Compressors

Classification of air compressors, Advantages, Disadvantages of reciprocating compressors, Working of reciprocating compressor, Equation of work (with & without clearance) volumetric efficiency, Multistage compressors, Efficiency of compressor, Effect of atmospheric condition on output of Compressors, Thermodynamic analysis of reciprocating compressor, Intercooler & External cooler.

Unit – V Thermodynamics of Compressible Fluids

Isentropic flow, Stagnation conditions, Stagnation enthalpy, Temperature, Pressure, Density, Flow through available area, Duct, Converging nozzle, Convergent divergent nozzle, Operation of convergent divergent nozzle for different back pressures. Flow with friction and heat transfer, Fanno flow, Rayleigh flow. Flow of steam through nozzle, throat area for maximum discharge, supersaturated Flow in nozzle.

Text Books :

1. Engineering Thermodynamics – P.K. Nag – TMH Publishers
2. Thermodynamics & Thermal Engineering – J. Selwin Rajadurai – New Age International Publishers

Reference Books :

1. Thermodynamics – C.P. Arora – TMH Pub.
2. Thermal Science & Engineering – D.S. Kumar – S.K. Kataria & Sons
3. Thermodynamics – S.C. Gupta – Pearson Education
4. Thermodynamics- An Engineering Approach – Cengal & Boles – McGraw Hill
5. Engineering Thermodynamics – K. Ramakrishna – Anuradha Agencies

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Machine Drawing	Subject Code	
Semester	III	Board of Studies	Mechanical Engg.
Maximum Marks	70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
4	1	0	5

UNIT - I

Conventional representation of surface finish, Roughness number symbol, Symbols of machine elements symbol and welded joints.

Limits, Fits and Tolerances : General aspects, Nominal size and basic dimensions Definitions, Basis of fit or limit system, Systems of specifying tolerances, Designation of holes, Shafts and fits, Commonly used holes and shafts.

Fasteners : Drawing of various views of Screw threads, metric and BSW threads, Square thread and multi start threads.nut bolt, Washers, Setscrew, Locknuts and foundation bolts.

Riveted joints : Forms and proportions of river heads, Different views of different types of riveted Lap and butt joint.

UNIT - II

Drawings of various views of

Shaft joints : Cotter joint and Knuckle joint. Keys & Shaft coupling : Muff, Flanged, Flexible, Universal and Oldhams coupling, Shaft bearing : Solid and bush bearing, Plummer block, Footstep bearing. Pipe joint : Flanged joint, Socket and Spigot joint, Hydraulic joint, Union joint, Gland & Stuffing Box, Expansion joint. **Pulley :** Belt pulley, V belt pulley, Fast and loose pulley, Speed cone pulley, Built up pulley.

Gears: Spur gear in mesh with approximate construction of tooth profile, Rack and pinion.

UNIT – III

Assembly and detailed drawing of

Engine Parts : Piston, Stuffing box, cross head, Vertical & Horizontal engine, Connecting rod, Crank, Eccentric.

Valves : Steam stop valves, Feed check valve, Safety valves, Blow off cock.

NOTE – Study of assembly production drawing/ blue print are to be practiced in the tutorial/practical. Few drawings are to be practiced on Auto CAD. The parts are to be shown during practice.

Text Books

1. Machine drawing- N.D.Bhatt., published by R.C. Patel Charotar Book Stall Tulshi Sadan, Station Road, Annad, India.
2. Machine drawing – P.S. Gill S.K. Kataria & Sons Delhi.
3. Machine drawing – T . jones.

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Internal Combustion Engine	Subject Code	
Semester	IV	Board of Studies	Mechanical Engg.
Maximum Marks	70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
3	1	3	4+2

UNIT - I

Introduction : Introduction of Internal and external combustion engine and their comparison, four stroke cycle S.I. and C.I. engine, Two stroke engine, Comparison of four stroke and two stroke engines, Comparison of S.I. and C.I. engine, Classification of I.C. Engine, Valve timing diagram for S.I. and C.I. engines, effect of valve timing and engine speed on volumetric efficiency, reasons for ignition and injection advance, dual fuel, multi-fuel and Wankel Rotary engine.

Cycles : Reasons for deviation of actual cycle from air standard cycles, variation specific heats and cycle analysis, Fuel air cycles and their analysis, Actual cycles and their analysis. Purpose and Thermodynamic cycle of supercharging.

UNIT - II

Fuels : Basic requirement of I.C. Engine fuels, Requirement of an ideal gasoline, Structure of petroleum, Effect of fuel structure on combustion, Volatility of liquid fuels, Effect of volatility on engine performance for starting, Vapour lock, Acceleration, Percolation, Carburetor icing, and crank case dilution.

Combustion : Determination of stoichometric air fuel ratio, Fuel-air and exhaust gas analysis for a given combustion process. Combustion in S.I. and C.I. engines, Detonation, Pre-ignition , Knocking, Antiknock rating of fuels Octane number, Critical compression ratio, HUCR, performance number, Cetane number, Dopes.

UNIT – III

Carburetor : Properties of air-petrol mixtures, Mixture requirement, Simple carburetor, limitation of simple carburetor, Modern carburetor, Main metering system, Idling system, Economizer system, Acceleration pump and cold starting system. Nozzle lip, Venturi depression, Calculation of fuel jet and venturi throat dia for given air fuel ratio. Petrol Injection system, Electronic fuel injection, advantage and disadvantage of petrol injection, Multi point Fuel Injection System.

UNIT – IV

Ignition System : Battery and magneto ignition system and their comparative study, Spark plug heat range, Electronic ignition system, Firing order, Ignition timing, Centrifugal and vacuum ignition advance.

Injection System : Requirement, type , Fuel pump, Type of fuel injector, Type of nozzle, Atomization, Spray penetration and spray direction, Multiple point fuel injection system.

Cooling System : Cooling requirement, Air cooling, liquid cooling, Type of liquid cooling system, Advantage and disadvantage of air cooling and water cooling system, Antifreeze mixture.

Lubrication System : Function of lubricating system, Properties of lubricating oil, Wet sump, Dry sump and mist lubrication system.

Governing of I C Engine : Necessity of governing, Various methods of governing

UNIT – V

Testing and Performance : Performance parameters, Measurements of brake power, Indicated power, Friction power, Fuel and air consumption, Exhaust gas calorimeter, Calculation of various performance parameter, Heat balance sheet. Performance current for S.I. and C.I. engine with load and speed.

Emission and Pollution : SI Engine and CI Engine emissions and its control and comparison. Effect of pollution on Human health and bio sphere.

Text Books :

1. A Course in Internal Combustion Engines – M.L. Mathur & R.P. Sharma – Dhanpat Rai & Sons
2. Internal Combustion Engine – V. Ganeshan – TMH

Reference Books :

1. A Course in Internal Combustion Engine – V.M. Domkundwar – Dhanpat Rai & Sons
2. Internal Combustion Engine – R. Yadav – Central Publishing House, Allahabad
3. Fundamental of Internal Combustion Engine – Paul W. Gill, James H. Smith, Eugene J. Ziurys – Oxford and IBH Publishing Company
4. Internal Combustion Engines – R.K.Rajput – Laxmi Publications

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Fluid Mechanics	Subject Code	
Semester	IV	Board of Studies	Mechanical Engg.
Maximum Marks	70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
3	1	3	4+2

UNIT - I

Properties of fluid : Fluid, ideal and real fluid, Properties of fluid : Mass density, Weight density, Specific volume, Specific gravity, Viscosity, Surface tension, Capillarity, Vapour pressure, Compressibility and bulk modulus. Newtonian and non-Newtonian fluids.

Fluid statics : Pressure, Pascal's law, Hydrostatic law, Pressure measurement, Hydrostatic force on submerged plane and curved surface, Buoyancy and Flotation, Liquid in relative equilibrium.

UNIT - II

Fluid kinematics : Description of fluid motion, Langragian and Eulerian approach, Type of fluid flow, Type of flow lines-path line, Streak line, Stream line, Stream tube. Continuity equation, Acceleration of a fluid particle, Motion of fluid particle along curved path, Normal and tangential acceleration, Rotational flow, Rotation and Vorticity, Circulation, Stream and potential function, Flow net, Its characteristics and utilities, Vortex motion .

UNIT – III

Fluid dynamics : Euler's Equation, Bernoulli's equation and its practical application, Venturimeter, Orifice meter, Nozzle Pitot tube. Impulse momentum equation, Momentum of Momentum equation, Kinetic energy and Momentum correction factor.

UNIT – IV

Laminar & Turbulent flow : Reynold's experiment, Shear stress and pressure gradient relationship, Flow of viscous fluids in circular pipe, and between two parallel plates, Coutte flow, Shear stress & velocity distribution for turbulent.

Flow through pipes : Loss of energy in pipes, Hydraulic gradient and total energy line, pipe in series and parallel, Equivalent pipe power transmission through pipe, Water hammer in pipes.

UNIT – V

Internal flows : Friction factor, Darcy-Weisbach friction factor, Moody's diagram, Boundary Layer theory, Boundary layer equation, Laminar and turbulent boundary layer and its growth over flat plat. Momentum boundary layer and its solutions, separation of boundary layer and its control.

Dimentional analysis : Methods of dimensional analysis, Rayleigh's method, Buckingham's theorem, Limitations. Model analysis, Dimensionless number and their significance, model laws, Reynolod's model law, Fraude's model law, Euler's model law, Weber's model law, Mach's Model law.

Text Books :-

1. Hydraulics and fluid Mechanics by Modi and Seth, 12th ed. 1998, Standard Book House, Delhi
2.Fluid Mechanics and Hydraulic machines by R.K. Bansal, 8th ed. 2002, Laxmi publication (P) Ltd.
3.Fluid Mechanics & machinery – C.P. kotharaman & R. Rudramoorthy New Age Pub.

Reference Books :-

1. Mechanics of Fluid – B.S. Massey – English Language Book Society (U.K.)
2.Fluid Mechanics by V.L. Streeter & E.B. Wylie, 1st SI metric ed. 1981, McGraw Hill Book Company.

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Mechanics of Solid - II	Subject Code	
Semester	IV	Board of Studies	Mechanical Engg.
Maximum Marks	70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
3	1	0	4

UNIT - I

Energy Methods: Introduction, Principles of superposition, Strain energy, Reciprocal relations, Maxwell Betti theorem, Elastic strain energy relation in tension and compression, Strain energy in beams subjected to bending and shaft to torsion. Impact loading in tension and bending, first & second theorem of Castigliano and its applications.

UNIT- II

Fixed Beams : Fixed beam subjected to different types of loads and couples, Calculations of fixing moments and reactions at supports, deflection, Effect of sinking of support.

Continuous beams : Continuous beams subjected to different type of loads and couples, beams with overhang, beams with one end fixed, Clapeyron's theorem, Effect of sinking of supports

UNIT-III

Bending of curved bars : Stresses in bars of small initial curvature, Winkler-Bach theory, Stresses in bars of large initial curvature, Deflection of Crane hooks, Chain links, circular rings, stresses in circular rings.

UNIT-IV

Unsymmetrical Bending : Introduction to unsymmetrical bending, Stresses and deflection in unsymmetrical bending, shear center for angle, Channel and I-sections.

Columns: Struts and Column, Stability of columns, Euler's formula for different end conditions, Equivalent load, Eccentric loading, Rankine's formula.

UNIT – V

Thin Pressure Vessels : Thin Pressure Vessels, Circumferential and longitudinal stresses in thin cylindrical shells and thin spherical shell under internal pressure,

Thick Pressure Vessel : Stresses in thick and compound cylinders.

Text Books :-

1. Advanced Mechanics of Materials–A.P. Boresi and O.M. Sidebottom–John Wiley & Sons.
2. Strength of Material – G.H. Rider – Machmillan.
3. Mechanics of Material – J.M. Gere and S.P. Timoshenko – CBS publisher.
4. Strength of Material – R.K. Rajput – S.Chand & Company.

Reference Books :-

1. Mechanics of Material – F.P. Bear & E.E. Johnston – McGraw Hill
2. Strength of Material, vol. I and II – S.P. Timo Shenko – EWP Press
3. Strength of Material – Dr. Sadhu Singh – Khanna Publishers

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Measurement and Control	Subject Code	
Semester	IV	Board of Studies	Mechanical Engg.
Maximum Marks	70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
3	1	2	4+1

UNIT - I

Generalized Measurement System : Introduction - Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, Units of measurement, Static and dynamic performance characteristics of measurement devices, Calibration, Concept of error, Sources of error, Statistical analysis of errors sensors and Transducers – Types of sensors, Type of transducers and their characteristics.

UNIT - II

Measurement : Measurement of displacement and angular velocity. Measurement of pressure: Gravitational direct acting, Elastic and indirect type pressure transducers. Measurement of very low pressure – Mcleod gauge and Pirani gauge. Measurement of temperature : Measurement of temperature by thermometers, Bimetallic, Thermocouples, Thermistors and pyrometers-total radiation and optical pyrometers, Thermocouples, RTDs, Pyrometers, Pyrometeric Cones.

Measurement of Strain : Type of strain gauges and their working, Strain gauge circuits, Mcleod guage, Pirani guage, Temperature compensation. Strain rosettes. Analysis of strains, Measurement of force and torque.

UNIT- III

Measurement of flow : Obstruction meters, Variable head meters, Hot wire and magnetic meters, Ultrasonic flow meters. Vibration and noise measurement : Seismic instruments, Vibration pick ups and decibel meters.

Data acquisition system : Introduction to data acquisition systems, Single and multi channel systems, Microprocessors and PC based data acquisition systems. Input – output devices signal transmission and Processing. Devices and systems.

UNIT- IV

Metrology : Standards of measurement. Linear and angular measurement devices and systems limit gauges, Gauge blocks. Measurement of geometric forms like straightness, Flatness, Roundness and Circularity, principles and application of optical projectors, Tool makers, Microscope, Autocollimators etc. Principle and use of interferometers, Comparators, Measurement of screw threads and gears, Surface texture measurement.

UNIT- V

Control: Open Loop and Close Loop control, Transfer function, Stability Equations, Feed back systems.

Text Books :-

1. Measurement Systems, Application and Design – E.O. Deoblein - McGraw Hill
2. Mechanical Measurements and Control – D.S. Kumar – S.K. Kataria & Sons
3. Mechanical Measurements – G. Beckwith Thomas G. – Pearson Education
4. Automatic Control Systems-Kuo

Reference Books :-

1. Engineering Metrology – K.J. Hume - MacDonald and Company
2. Engineering Metrology – I.C. Gupta - Dhanpat Rai & Sons
3. Mechanical & Industrial Measurements – R.K. Jain – Khanna Publishers.

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Manufacturing Science - I	Subject Code	
Semester	IV	Board of Studies	Mechanical Engg.
Maximum Marks	70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
3	1	2	4+1

UNIT – I

Introduction to Manufacturing Processes: Importance of manufacturing processes, classification, economic and technological definitions of manufacturing processes.

Foundry Practice

Pattern making - Types, material, allowances, core – types, materials and its properties.

Mould Making and Casting - Types of sand moulding, design considerations, moulding machines & moulding procedure, moulding sand – types, properties, composition and applications, Casting defects.

Special Casting Processes - Investment casting, centrifugal casting, shell moulding, CO_2 moulding, slush casting, die casting.

UNIT – II

Welding : Principles of Welding, survey and allied processes

Arc Welding : TIG and MIG processes and their parameter selection, atomic hydrogen welding, welding of cast iron, welding electrode – types, composition, specification.

Resistance Welding : Principle, equipment and processes. Thermit Welding, brazing & soldering, Internal and external welding defects, Inspection & testing of weld.

UNIT – III

Machine Tool Technology

Cutting Tool – Types, requirements, specification & application

Geometry of Single Point Cutting Tool – Tool angel, Tool angle specification system, ASA, ORS and NRS

Mechanics of Metal Cutting : Theories of metal cutting, Chip formation, types of chips, chip breakers, Orthogonal and Oblique cutting, stress and strain in the chip, velocity relations, power and energy requirement in metal cutting .

UNIT – IV

Machine Tools

Lathe : Introduction, type, specification, construction, work holding devices & tools, mechanism and attachments for various operations, taper turning, thread cutting operations on Lathe, capston and turret lathe.

Shaper : Introduction, type, specification, Quick return Mechanisms, Table feed mechanism, work holding devices, shaper operations.

Slotter & Planner : Introduction, specification, types of drives, types of machines.

Milling Machine : Introduction, specification, types, mechanisms and attachments for milling, milling operations, Indexing-simple, compound and differential.

UNIT – V

Drilling : Introduction, drill nomenclature, types of drilling machines, other operations like counter boring, counter sinking, spot facing etc.

Reaming : Introduction, description of reamers, type of reaming operations.

Boring : Introduction, types of boring machines, boring operations, boring tools

Broaching : Introduction, types of broaches, nomenclature of broach, types of broaching machines.

Surface finishing operations : Honing, lapping, super finishing, polishing, buffing, process parameters and attainable grades of surface finish.

Text Books :-

1. Manufacturing Technology (Vol. – I & II) – P.N. Rao – Tata McGraw Hill Pub. Company, New Delhi
2. A Text Book of Production Technology(Manufacturing Processes) – P.C. Sharma – S. Chand and Company Ltd., New Delhi.

Reference Books :-

1. Manufacturing Science – A. Ghosh & A.K. Mallik – East West Press Pvt. Ltd., New Delhi
2. Manufacturing Engineering and Technology – S. Kalpakjian & S.R. Schmid – Addision Wesley Longman, New Delhi
3. Production Technology – R.K. Jain – Khanna Publishers, New Delhi
4. A Text Book of Production Technology (Vol. I & II) – O.P. Khanna – Dhanpat Rai & Sons, New Delhi.
5. Shop Theory-James Anderson and Earl E Tatra, T Tata McGraw Hill, New Delhi.
6. Manufacturing Process (Vol-I&II)-H.S. Bawa-Tata McGraw Hill Pub. Company, New Delhi.

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DEPARTMENT OF MECHANICAL & ENGINEERING

SYLLABUS

Name of the Subject	Kinematics of Machines	Subject Code	
Semester	IV	Board of Studies	Mechanical Engg.
Maximum Marks	70	Minimum Marks	
Lecture Periods/Week	Tutorial Periods/Week	Practical Periods/Week	Credits
4	1	0	5

UNIT-I

Relative velocity : Elements, pairs, Mechanism, Four bar chain and its inversion, Velocity diagrams, Relative velocity method, Instantaneous centre method.

UNIT-II

Relative Acceleration : Synthesis of mechanism, Pantograph, Lower pair mechanism, Relative acceleration diagram, Kliens construction, Coroillis component of acceleration.

UNIT-III

(a) Inertia force analysis : Effective force and inertia force on link, Inertia force on reciprocating engine. Inertia force in four bar chain mechanism.

(b)Turning moment diagram and flywheel : Turning moment diagram for single and multi cylinder internal combustion engine, Coefficient of fluctuation of speed. Coefficient of fluctuation of energy, Flywheel.

UNIT-IV

Governors : Characteristics of centrifugal governors, Gravity controlled governors, Porter and proell. Spring controlled centrifugal governor: Hartung, & hartnell governor. Performance parameter : Sensitivity, stability, Isochoronism, Governor effort and power.

UNIT -V

(a) Friction: Friction in turning pair, Application of friction circle in slider crank and four mechanism; Pivot and collar friction, Thrust bearing.

(b) Brakes and dynamometer : Simple block and shoe brake, Band brake, Band and block brake, and internal expanding shoe brake; Absorption dynamometer, Transmission dynamometer.

Text Books :-

1. Theory of machine – S.S.Ratan-Tata McGraw Hill.
2. Theory of machine – Thomas Beven – CBS Publishers.

Reference Books :-

1. Theory of mechanism and machine – A. Ghosh, A.K. Mallik –EWP Press.
2. Theory of Machine – Shigley, JE
3. Theory of Machine – Jagdish Lal
4. Theory of machine – J.E. Singh – McGraw Hill.