DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS

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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 sections, Ellipse, Parabola, Hyperbola, Cycloidal Curves: Cycloid, Epicycloids, Hypocycloid, Involute, Helix, Spiral.

Unit II – Projection of Points & Lines
a) **Projection**: Introduction, Principle of Projection, Method of projection, Planes of projection, Four quadrant, First and Third angle projection, Reference line, symbols for methods of projection, Orthographic projection.
b) **Projection of Point**: Introduction, Projection of 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, True length.

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 plane and parallel to other plane, Perpendicular to one plane and inclined to the other plane, Inclined to both planes.
b) **Projection of solids**: Introduction, Type 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, Method of development, Development of lateral surfaces of right 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.
**DEPARTMENT OF MECHANICAL ENGINEERING**

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**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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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

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:-

Reference Books:-
3. Applied Mathematics for Engineers & Physicists by Louis A. Pipes- TMH.
DEPARTMENT OF MECHANICAL ENGINEERING
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UNIT I - Error Analysis and Roots of Equations

**Approximation and Errors:** Approximate 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


UNIT III - Curve Fitting

**Interpolation:** Difference Table, Interpolation, Newton’s forward and backward interpolation, Newton’s general interpolation formula, Lagrang’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 Differentiation:

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
2. Numerical Methods in Engineering and Science by Dr. B.S. Grewal.

Reference Books:
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SYLLABUS

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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, Season 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, eutectoid, peritectic and peritectoid & other systems. Allotropy of iron and Fe-C diagram.

UNIT - IV

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:

Reference Books:
# DEPARTMENT OF MECHANICAL ENGINEERING

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### UNIT - I

**Introduction**

Basic of stress & strain, Elastic constant, Stress-strain diagram, Hooke’s law, Stresses in the components subjected to multi-axial forces, Temperature stresses, Staticaly indeterminate system.

### UNIT - II

**Bending of beams**

Bending of beams with symmetric section, boundary condition, Pure bending, Bending equation, traverse 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, problem by Macaulay’s method, Direct integration method, Method of super position, Moment Area Method.

### 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

**Principle stresses and strain**

Transformation of plane stresses, Principle stresses, Maximum shear stresses, Mohr’s circle for plane stresses, Plain strain and its Mohr’s circle representation, Principle strains, Maximum shear strain. Combined Loading: Components subjected to bending, torsion & axial loads.

### Text Books:

1. Elements of strength of material – Timoshenko & young- EWP press

### Reference Books:

1. Strength of material – Rider–ELBS
2. Introduction to Solid Mechanics – I.H.Shames–PHI
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SYLLABUS

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UNIT - I Second Law Analysis

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

UNIT – V Thermodynamics of Compressible Fluids

Text Books:

Reference Books:
3. Thermodynamics – S.C. Gupta – Pearson Education
5. Engineering Thermodynamics – K. Ramakrishna – Anuradha Agencies
UNIT - I
Conventional representation of surface finish, Roughness number symbol, Symbols of Machine elements 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:** Drawings of various views of Screw threads, metric and BSW threads, Square thread and multi start threads. Nut bolts, Washers, Setscrew, Locknuts and foundation bolts.

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

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 drawings 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 AutoCAD. The parts are to be shown during practice.

**Text Books:**
UNIT - I
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

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.
UNIT – V


Text Books:-
2. Internal Combustion Engine – V. Ganeshan – TMH

Reference Books:-
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UNIT - I
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.
Dimensional analysis: Methods of dimensional analysis, Rayleigh’s method, Buckingham’s theorem, Limitations, Model analysis, Dimensionless number and their significance, model laws, Reynoldod’s model law, Fraude’s model law, Euler’s model law, Weber’s model law, Mach’s Model law.

Text Books:-

Reference Books:-
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UNIT - I
Energy Methods: Introduction, Principles of superposition, Strain energy, Reciprocal relations, Maxwell Betti theorem, Elastic strain energy in tension and compression, Strain energy in beams subjected to bending and shafts 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 unsymmetric bending, Shear center for angle, Channel and I-sections.
Columns: Struts and Columns, Stability of columns, Euler’s formula for different end conditions, Equivalent load, Eccentric loading, Rankine’s formula.

UNIT – V
Thin Pressure Vessel: 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:

Reference Books:
DEPARTMENT OF MECHANICAL ENGINEERING
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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 of Strain:** Type of strain gauges and their working, Strain gauge circuits, Mcloed gauge, Pirani gauge, 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:-**
4. Automatic Control Systems-Kuo

**Reference Books:-**
1. Engineering Metrology – K.J. Hume - MacDonald and Company
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UNIT – I

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, CO2 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.

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, 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.
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 :

Reference Books :
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS

<table>
<thead>
<tr>
<th>Name of the Subject</th>
<th>Kinematics of Machines</th>
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UNIT-I

UNIT-II
Relative Acceleration: Synthesis of mechanism, Pantograph, Lower pair mechanism, Relative acceleration diagram, Kliens construction, Coroiillis 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

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:

Reference Books:
2. Theory of Machine – Shigley, JE
3. Theory of Machine Jagdish Lal
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS

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Lecture Periods/Week | Tutorial Periods/Week | Practical Periods/Week | Credits |
3                   | 1                        | 3                        | 4+2      |

UNIT -1
Display device: Refresh Cathode ray Tubes, Random Scan and Raster Scan monitors, Colour CRT Monitors, Direct view Storage Tubes, Continuous Refresh and Storage display, LED and LCD Monitors.
Graphic primitives: Points & Lines, Line drawing Algorithm, DDA and Bresenham’s Algorithm.

UNIT -2
Attributes of primitives: Line style, Type, Width, Colour, Character Attributes, Area Filling, Antialiasing.
Fill Algorithm: Scan-Line Polygon Fill algorithm, Boundary Fill Algorithm, Flood Fill Algorithm, Seed fill algorithm.

UNIT -3

UNIT -4
2D Transformation: Basic transformation- Translation, Scaling, Rotation, Reflection, Twist, Matrix Representation, Composite Transformations.
3D Transformation: Basic Transformations, 3D Display parallel & perspective projection.

UNIT -5
Viewing: Viewing world co-ordination system, Normalized co-ordinate system, Device/Image co-ordination system, Window definitions, View port definitions, Viewing transformation.
Clipping: Point clipping, Line clipping, Cohen- Sutherland clipping, Mid point clipping method, Sutherland and Hodgman Clipping.

Note: All the algorithms are to be practiced in the computer Programming Laboratory and practice any computer aided drafting software.

Text Books:

Reference Books:
2. CAD-CAM Theory and Practice-Ibrahim Zeid- TMH Publication.
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS

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UNIT -I
Matrix algebra, the basic concept of FEM, spring and Bar elements, Element stiffness equation, Assembly stiffness equation by direct and inspection approach, Treatment of boundary conditions, Variational method of approximation (Rayleigh Ritz method, method of weighted residuals), potential energy formulation.

UNIT -II
Basic equation in elasticity, Stresses and strains, Compatibility equations, Strain-displacement relations, One dimensional problems, Linear, Quadratic and cubic elements, Shape functions, compatibility and convergence requirements, Co-ordinate system, Numerical Integration, Gauss Legendre quadrature, Application problems.

UNIT -III
Finite element analysis for plane stress and plane strain problem, Strain displacement matrix for 2-D elements, Co-ordinate transformation, global, local and natural co-ordinates, Two dimensional integrals. Application problems. Scalar field problems including heat conduction and flow problems.

UNIT -IV
Stiffness matrix formulation for beam and frame element. Fem equations for plates and shell elements, axisymmetric solid elements, Applications and case studies of plates, shells and axisymmetric solids from structural and thermal viewpoint.

UNIT -V
Introduction of Dynamic analysis, Basic equations, Lagrange’s equation, lumped and consistent mass matrices, Eigen-value problems and Eigen-modes.

Note: Solving case studies using user defined subroutines and FEA software – ANSYS and CAE Linux

TEXT BOOK
1. Fundamentals of Finite Element Analysis by David Hutton.
2. Finite element in engineering by T.R. Chandrupatla and Belegundu.

REFERENCE BOOK
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS

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UNIT – I
Impact of Free Jets: Impulse momentum principle, Force exerted by the jet on stationary flat and curved plate, Hinged plate, Moving plate and Moving curve vanes, Jet propulsion of ship.
Flow around submerge bodies: Force exerted by flowing fluid on a body, Drag and lift, stream lined and bluff body, Drag on sphere and cylinder, Circulation and lift on circular cylinder, Lift of an air foil.

UNIT – II
Introduction to turbo machinery, Basic principles, Classification, Impulse & Reaction type, Fundamental equations, Euler’s equation, Introduction to hydro-electric power plants, major components, Surge tanks etc.
Impulse Turbine: Classification of turbine, Impulse turbine, Pelton wheel, Construction working, work done, Head efficiency and Design aspects, Governing of impulse turbine.

UNIT – III
Reaction Turbine: Radial flow reaction turbine, Francis turbine: construction, working, work done, efficiency, design aspect, advantages & disadvantages over pelton wheel.
Axial flow reaction turbine: Propeller and Kaplan turbine, Bulb or tubular turbine, Draft tube, Specific speed, Unit quantities, Cavitation, Degree of reaction, Performance characteristics, Surge tanks, Governing of reaction turbine.

UNIT-IV
Centrifugal Pumps: Classification of Pumps, Centrifugal pump, Construction, working, Workdone, Heads, Efficiencies, Multistage centrifugal pump, Pump in series and parallel, Specific speed, Characteristic, Net positive suction head, Cavitation.

UNIT – V
Reciprocating Pumps: Classification, Component and working, Single acting and double acting, Discharge, work done and power required, Coefficient of discharge, Indicator diagram, air vessels.

Text Books:

Reference Books:
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS

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UNIT – I

Forging: Principle, types, tools and fixture of forging, forging dies, forging machines, forging design, drop forging die design, upset forging die design, forging practice and process capability, forging defects, Inspection and testing of forged parts.

Extrusion: Principle, extrusion processes, process parameters, extrusion equipment, extrusion defects.

UNIT – II

Rolling: Principle, classification of rolled products, types of rolling, rolling mill train components, roll pass design for continuous mill.

Drawing: Wire drawing, tube drawing: Principle, setup, types.


UNIT – III

Machinability: Concept and evaluation of Machinability, Mechanism of Tool failure, Tool wear mechanism, Tool life, Taylor’s Tool life equation, Machinability index, factors affecting Machinability.

Thermal Aspects in Machining and Cutting Fluid: Source of heat in metal cutting and its distributions, temp measurement in metal cutting, function of cutting fluid, types of cutting fluid.

Jigs & Fixtures: Degree of freedom, principles of location and clamping, locating, clamping and indexing devices, principles of design, design of simple jigs and fixtures.

UNIT – IV

Grinding: Processes, machines, design consideration for grinding, specification of grinding wheel, process parameters, economics of grinding.


UNIT – V

Unconventional Machining: Advantages, application and limitation, mechanics of metal removal, specific application of following processes - EDM, ECM, USM, EBM and LBM.

Thread Rolling: Principle, Processes, Types of Thread Rolling, and Grinding, advantages and disadvantages.

TEXT BOOKS:

Reference Books:
2. Production Technology – R.K. Jain – Khanna Publisher – New Delhi
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS

<table>
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UNIT – I
Introduction: Definition of Industrial engineering, History & development, Objective of Industrial Engineering, Contribution of Industrial Engineering, Function of Industrial engineer, Place of Industrial engineering in an organization, Related discipline, Management, OR, Statistics, Ergonomics.

Plant Location, Site Selection and Plant Layout: Need for a suitable location, Urban, Suburban, Systems approach, Factors affecting location, Quantitative method for evaluation of plant location, Objectives & Principles of plant layout, Types of layout and their suitability, Software packages for layout analysis.

UNIT – II
Work Study: Productivity and work study, Introduction and definition of Work-study, Prerequisites of conducting a work study.

UNIT – III
Industrial Engineering and Information Technology: Role of IT/ IS in Industry, increasing value of Information Technology, IT as a New Business tool, IT as Business Enabler, IT as business driver, Internet worked enterprise, Internet, Intranet and Extranet, Globalization and IT, Competitive advantage with IT.


UNIT IV
Forms of Business Organization: Types of Industrial Enterprise, Sole proprietorship, Partnership form, Joint stock company, Company’s Act, The Capital and Shares, Private and Public Sector.
Trade Union: Meaning and Origin, Objectives of Trade Union, History of Trade Union in India, Laws related to Trade Union.

UNIT V
Maintenance Management: Objectives and need for maintenance, Types of maintenance, Breakdown, Predictive and Preventive Maintenance, Condition based maintenance system.

Equipment replacement policy: Reasons for replacement, Deterioration, Obsolescence, Depreciation, Methods for depreciation calculation.

Value Engineering & Value Analysis: Definition, Objectives & use of value analysis, Application & techniques.

Text Books:
1. Introduction to Work Study: International Labour Organization Geneva
2. Industrial Engineering and Production Management - Martand Telsang – S Chand & Company

Reference Books:
1. Industrial Engineering & Management – A new perspective, Philip E Hicks, Mcgraw Hill
DEPARTMENT OF MECHANICAL ENGINEERING
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UNIT – I
General Considerations: Selection of Materials, Design Stress, Factor of Safety, Stress concentration factor in tension, bending and torsion, Theories of failures. Notch sensitivity, Design for variable and repeated loadings, Fatigue stress concentration factor, Endurance diagrams, Introduction to fracture mechanics.

UNIT – II
Couplings: Types of couplings, Design of flange and flexible couplings, Compression coupling, Muff coupling.
Shaft and Axles: Transmission shaft, Design against static load, Design for strength, Rigidity and stiffness, Design under continuous loading for fatigue.

UNIT- III
Threaded fasteners: Geometry of thread forms, Terminology of screw threads and thread standards, Specifications of steel bolts, Initial tension, Relation between bolt tension and torque, Design of statically loaded tension joints, Design of bolted joints due to eccentric loading.
Power Screws: Power screws, Force analysis for square and trapezoidal threads, Collar friction, Stresses in screw, Coefficient of friction, Efficiency of thread, Design of power Screw.

UNIT – IV
Riveted Joints: Types of rivet heads, Types of riveted joints, Failure of riveted joint, Strength of rivet joint, Efficiency of riveted joint, Design of riveted joint, Eccentrically loaded riveted joint.
Welded joint: Types of welded joints, Stresses in butt and fillet welds, Strength of welded joints, Location and dimension of weld design, Eccentrically loaded joint, Welded joint subjected to bending moment, Design procedure, Fillet welds under varying loads, Stress relieving techniques.

UNIT – V
Pulley & Flywheel: Flywheel Inertia, Stresses in Flywheel and pulleys, failure criterion.
Chain Drives: Chain drives, Roller chains, Geometric relationships, Dimensions of chain components, Polygonal effect, Power rating of roller chains, Selection of Chain drives.
Belt & Rope Drive: Design of Flat and Round belt drives, V-Belt, Timing belt, Wire Rope.

Text Books:
2. Design of Machine Elements from V.B. Bhandari, TMH Publications.

Reference Books:
DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS

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<th>Dynamics of Machines</th>
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UNIT - I
Cams: Classification of cams and followers, Nomenclature of a radial cam, Description of follower movement, Displacement diagrams, Uniform and modified uniform motion, Simple harmonic motion, Uniform acceleration motion and its modifications, Cycloidal motion, Synthesis of cam profile by graphical approach, Considerations of pressure angle.
Cams with specified contours: Circular arc cam & tangent cam.

UNIT – II
Gear: Types of gears, Gear terminology, Law of gearing, Gear tooth forms, Involute and Cycloid tooth profile, Interference and Undercutting of Involutes teeth, Minimum number of teeth on pinion to avoid interference.
Gear trains: Simple, Compound, Reverted, and Epicyclical gear trains, computation of velocity ratio in gear trains by different methods.

UNIT - III

UNIT- IV
Gyroscope: Gyroscopic forces and couple, Gyroscopic effect in Airplanes, Ship motion and Vehicles moving on curved path.

UNIT- V

Text Books:
2. The Theory of Machines - Thomas Bevan, - CBS/ Cengage Publishers

Reference Books:
DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS

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UNIT – I

**Impulse Turbine:** Steam turbine, Principal of operation of steam turbine, Types, Impulse turbine compounding of steam turbine- pressure compounded velocity compounded and pressure – velocity compounded impulse turbine, Velocity diagram for impulse turbine, Force on the blade and work done, Blade or diagram efficiency, Gross stage efficiency. Influence of ratio of blade to steam speed on blade efficiency in a single stage impulse turbine. Efficiency of multi-stage turbine, Impulse blade sections, Choice of blade angle. Blade height in velocity compounded impulse turbine.

UNIT – II

**Impulse Reaction Turbine:** Velocity diagram, Degree of reaction, Impulse-reaction turbine with similar blade section and half degree of reaction (Parson’s turbine), Height of reaction Turbine blade section, Internal losses in steam turbine Nozzle, Losses, Blade friction losses, Disc friction losses, Blade windage losses or partial admission losses, Gland leakage or clearance losses, Leaving velocity or residual loss, Carry loss.

UNIT – III

**State Point Locus and Reheat Factor:** Factor-Stage, Efficiency of impulse turbines, Stage point locus of an impulse turbine, State point locus for multistage turbine reheat factor. Internal efficiency, Overall Efficiency, Relative efficiency, Governing of steam turbine. Throttle governing, Nozzle governing, Bypass governing. Combination of throttle and nozzle, Governing and combination of bypass and throttle governing. Effect of governing on the performance of steam turbine.

UNIT – IV

**Gas Turbine:** Classification of gas turbine, Simple open cycle gas turbine, Ideal and actual cycle (Brayton Cycle) for gas turbine, Optimum pressure ratio for maximum specific output in actual gas turbine, Regeneration, Reheat and inter cooling and effect of these modification on efficiency and output, Closed cycle gas turbine.

UNIT – V

**Turbo Compressors:** Introduction, Classifications of Centrifugal compressors – components, Working, Velocity diagrams, Calculations of power and efficiencies, Slip factor, Surging and choking power and efficiencies.

**Axial Flow Compressor:** Construction and working, Velocity diagram, Calculation of power and efficiencies, Degree of reaction, Work done factor, Stalling, Comparison of centrifugal and axial flow compressor.

**Text Books:**

**Reference Books:**
1. Turbine compressors and Fans – S.M. Yahya – TMH
2. Gas Turbine – V. Ganeshan – TMH
DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS

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UNIT – I
Boilers: Classification of boilers, Boiler Mountings & Accessories, Draught & its classification, chimney height & diameter calculation, efficiency of a chimney, Draught Losses.

UNIT – II

UNIT – III
Direct Energy Conversions: Tidal Energy conversion, OTEC, MHD Power System, Geothermal Energy Conversion Technique, Thermo-electric effects, Thermo-electric & thermionic converters

UNIT – IV
Jet Propulsive Devices: Types of jet engines, Principal and operation, thrust, energy flow through jet and variation of pressure and temperature, and velocity of fluid, Thermodynamics of turbo jet, efficiency and performance, Turbo prop, Ram jet, Pulse jet, Comparison of various propulsive devices.

UNIT – V

Text Books:

Reference Books:
1. Fundamental of Compressible Fluid Dynamics – P. Balachandran – PHI
DEPARTMENT OF MECHANICAL ENGINEERING

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UNIT – I

**Basic Concepts and Functions of Management**: Definition, Management, Science or art? System approach to Management, Social responsibility of Manager, Social responsibility and Social responsiveness, ethics and management, Functions of Management.

**Management of Organizations**: Nature and purpose of organizing, Formal and informal organization, Types of organization structure- Line and Staff concept, Functional design, Multi divisional form, Conglomerate form and Matrix form of organizations. Mechanistic and Organic structure, Flat and Tall Structure, Span of Control, Differentiation and Integration, Centralization and Decentralization. Fayol’s guidelines for effective management: Division of Labour, Unity of Command, Unity of direction, Authority, Discipline, Initiative.

UNIT – II


UNIT – III


UNIT – IV

**Management Information System**: Role of information in decision making, Definition of MIS, computer based user machine system, integrated system, MIS v/s Data processing, subsystem of an MIS, MIS, DSS and Expert system. Evolution and effectiveness of Information system.

**Enterprise Resource Planning**: Introduction to ERP, Brief history of ERP, Importance and advantages of ERP to a company, Risks and benefits of ERP, ERP Implementation Strategies, Common ERP Packages.

UNIT – V

**Flexible Systems Management**: Definition of Flexibility, Connotation of flexibility, Systematic concept of flexibility, Foundation of flexible system management, Types of flexibility and its applications in management of modern organizations. Flexy tools, SAP-LAP Analysis.
Text Books:

1. Essential of Management: H. Koonz and h. Weihrich.
2. MIS conceptual foundation, structure and development, G B Davis & M H Olson.
3. Flexibility in Management, Sushil, Vikas publication, New Delhi.
DEPARTMENT OF MECHANICAL ENGINEERING

SYLLABUS

<table>
<thead>
<tr>
<th>Name of the Subject</th>
<th>Automobile Engineering</th>
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UNIT-I

Chassis & Frame: Layout of chassis & its main components, Types of frames, Conventional frames & unitized Chassis.

Springs: Purpose, Types namely leaf, Coiled, Rubber, Air, Torsion bar, S stabilizer, Telescopic damper.

Suspension system: Objects & principles of suspension, system, Types, Rigid axle & Independent suspension for front & rear ends, Simple & double arm parallel & perpendicular type of suspension system, Gas filled suspension system.

UNIT – II


Fluid flywheel: Characteristics, Construction, principles of working.

UNIT – III

Gear Box: Object of Gear Box, Air, Rolling & Gradient resistance, Necessity of Gear Box: Tractive effort variation with speed, Types of Gear Boxes: Sliding mesh, Constant mesh, Synchronmesh, Automatic transmission, Overdrive, Lubrication of gear box. Torque converter: Principles of working, characteristics, Torque converter with direct drive, Testing of automobiles.

UNIT – IV

Universal Joint, Types, propeller shaft, slip joint.


Front Axle: Live & dead axle, Stub axle.

Back Axle: Hotch kiss drive, Torque tube drive.

Tyres: Types specification, Causes of tyre wear & rim.


UNIT – V

Steering system: Types of steering gears, Reversibility of steering, Center point steering, Steering geometry namely caster, Camber, King pin inclination, Toe in, Toe out, cornering power, Under & over steer; power steering, effect of shimmy, Condition of true rolling, Calculation of turning radius. Correct steering equation and related problems.

Text Books:
2. Automotive Mechanics – Heitner

Reference Books:
1. Automobile Engineering - Dr. N. K. Giri – Khanna Publishers
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS

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UNIT - I
Air Pollution: Introduction
Air Pollution, sources & classification of air pollutants, aerosols, Primary & secondary air pollutants, Photochemical Air pollution, Effect of air pollution on human health, vegetation and materials, Pollutant concentration, types, relationship between different concentration
Air pollution indices, determination of index, Air pollution legislation & regulations (1981 & 1986)

UNIT - II
Air pollution: Transportation & Major Industries
Air pollution due to automobiles, types of emission from IC Engines, Effect of various operating variables on exhaust emission, control of emissions from IC Engines.
Air pollution from major industries: Fe & Steel Industry, Thermal Power Plants Cement Industries.
Smoke, measurement of smoke and its control.

UNIT – III
Meteorological Aspects of Air pollutant Dispersion
Temperature Lapse rates & stability, wind velocity and turbulence, Plume Behaviour, Dispersion of air pollutants, the Gaussian Plume Model.

UNIT – IV
Air Pollution Sampling & Measurement
Types of pollutant sampling techniques and measurement, Ambient Air Sampling, collection of gaseous air pollutants and particulate pollutants, stack sampling techniques, analysis of air pollutants.

UNIT – V
Air Pollution control methods & Equipment
Air pollution source correction methods: Process changes, equipment modification/ machinery replacement etc.
Control equipments: Objectives and choice of control equipment, Setting chamber, Inertial separators, Cyclones, filters, Electrostatic Precipitator, Scrubbers.

Text Books:
UNIT – I

UNIT – II

UNIT – III

UNIT – IV

UNIT – V
Motion Planning and Control of Robot Manipulators: Trajectory planning of Tobotic Manipulator: Joint Space and Cartesian Space techniques. Open and Close Loop control, Linear control schemes, Examples of Control models.

Text Books:

Reference Books:
UNIT-I
**Introduction:** Various modes of heat transfer, Fourier’s, Newton’s and Stefan Boltzman’s Law, Combined modes of heat transfer, Thermal transfer, Thermal diffusivity, Overall heat transfer coefficient.

**Conduction:** The thermal conductivity of solids, Liquids and gases, Factors influencing conductivity measurement. The general differential equation of conduction, One dimensional steady state conduction, Linear heat flow through a plane and composite wall, Tube and sphere, Critical thickness of insulation, Effect of variable thermal conductivity, Conduction with heat generation in slab and cylinders, Spheres.

UNIT-II
**Fins:** Conduction convection system, Extended surfaces rectangular, Triangular, Circumferential and pin fins, General conduction analysis, Fins of uniform and non-uniform cross sectional area. Heat dissipated by a fin. Effectiveness and efficiency of fins, Approximate solution, Design of fins for maximum heat transfer, Solution for different boundary condition, Use of fin analysis for measuring temperature error of Thermometer.

**Transient/Unsteady State Heat Conduction:** System with negligible internal resistance, Lumped capacity method and its Validity. Unsteady state conduction through finite and semi-infinite slab without surface resistance, convection boundary conditions. Solution through Heisler’s chart.

UNIT-III
**Forced Convection:** Physical Mechanism of Forced Convection, Dimensional analysis for forced convection, velocity and Thermal Boundary layer, Flow over plates, Flow across cylinders and spheres, Flow in tubes, Reynold’s analogy.

**Natural Convection:** Physical Mechanism of Natural Convection, Dimensional analysis of natural convection; Empirical relationship for natural convection.

UNIT-IV
**Two Phase Heat Transfer:** Boiling heat transfer, Pool boiling, Boiling regimes and boiling curve, Next transfer correlations in pool boiling, Condensation heat transfer, Film condensation, Derivation for the average heat transfer coefficient ‘h’ for the case of laminar film condensation over vertical plate, Heat transfer correlation for inclined plates, Vertical tubes, Horizontal bank tubes.

**Heat Exchangers:** Different types of heat exchangers; Determination of heat exchanger performance, Heat exchanger transfer units, Analysis restricted to parallel and counter flow heat exchanger (LMTD and NTU method)
UNIT-V


**Introduction to Mass Transfer:** Mass and mole concentrations, Molecular diffusion, Eddy diffusion, Molecular diffusion from an evaporating fluid surface, Introduction to mass transfer in laminar and turbulent convection Combined heat and mass transfer, the wet and dry bulb thermometer.

**Text Books:**

**Reference Books:**
UNIT I

General Linear Programming Problems: Introduction, Maximization and minimization of function with or without Constraints, Formulation of a linear programming problem, Graphical method and Simplex method, Big M method, Degeneracy, Application of Linear Programming (LPP) in Mechanical Engineering.

UNIT II
The Transportation Problems: Mathematical formulation, Stepping stone method, Modified Distribution Method, Vogels Approximation Method, Solution of balanced and unbalanced transportation problems and case of Degeneracy.


UNIT III
Waiting Line Theory: Basic queuing process, Basic structure of queuing models, Some commonly known queuing situations, Kendall’s notation, Solution to M/M/1: ∞/FCFS models.

Network Analysis: CPM/PERT, Network Representation, Techniques for drawing network, Resource smoothing and levelling, Project cost, Optimum project duration, Project crashing, Updating, Time estimation in PERT

UNIT IV
Decision Theory and Game Theory: Decision making, Steps in decision theory approach, Decision making under certainty, Uncertainty and under condition of risk, Decision Tree, Theory of Games, Two person zero sum game, Methods for solving two person zero sum game.

Simulation: Basic concept of simulation, Applications of simulation, Merits and demerits of simulation, Monte Carlo simulation, Simulation of Inventory system, Simulation of Queuing system.

Text Books:
1. Operation Research, Sasien Yaspan
2. Operation Research – N. D. Vohra – TMH
Name of the Subject: Refrigeration and Air Conditioning
Subject Code: ME 20713 (ME)
Semester: VII
Board of Studies: Mechanical Engg.
Maximum Marks: 70
Minimum Marks: 25
Lecture Periods/Week: 3
Tutorial Periods/Week: 1
Practical Periods/Week: 3
Credits: 4+2

UNIT-I

UNIT-II
Multi-stage systems: Concept of flash gas removal using flash tank, inter cooling, with flash gas removal and inter cooling, use of flash tank for flash gas removal only, limitations of multi-stage systems.
Multi-Evaporator systems: Applications, Comparison, advantages, Systems using single compressor and a pressure reducing valve with: Individual expansion valves & multiple expansion values, Systems with multi compression, inter cooling and flash gas removal, with individual compressors and multiple expansion valves, Cascade systems.

UNIT-III
Gas Cycle Refrigeration: Limitation of Carnot and reversed Carnot Cycle, Modified Cycle, Reversed Bell-Colemann, Actual Bell-Colemann Cycle, Application of Aircraft Refrigeration, Different methods: Simple, Evaporative, Boot Strap, Boot Strap with evaporative, Reduced ambient, Regenerative and comparison of different air cooling system in Air Craft.

Cooling Tower: Types and performance evaluation, efficient system operation, Flow control strategies and energy saving opportunities, Assessment of cooling towers.

UNIT-IV
Psychrometry, estimating properties of moist air, psychrometry chart, Straight line law, adiabatic saturation and thermodynamic wet bulb temperature, psychrometer and the precautions, psychrometric processes and their representation, various psychrometric processes, equations for heat and mass transfer rates, Concept of SHF, By pass factor and ADP, Air washer and its use.

UNIT-V
Inside and Out Side Design Condition:
Fixing suitable indoor and outdoor design conditions, criteria, thermal comfort, metabolic rate, heat balance equation, equations for all modes of heat losses from the skin, thermo-regulatory mechanism. Factors affecting thermal comfort, thermal indices, presents ASHRE comfort chart, Concept of Predicted Mean Vote (PMV) and percent of people Dissatisfied (PPD), criteria used for selecting outside design conditions and present typical summer design conditions.
Psychometric calculations, Simple summer air conditioning system with 100% re-circulated air, various Summer air conditioning systems with ventilation and with zero and non zero by pass factor, with re-heat for high latent cooling load applications, Selection guidelines for supply air conditions.
Text Books:
1. Refrigeration And Air Conditioning by C.P. Arora, Tata McGraw-Hill
2. Refrigeration And Air Conditioning by R.K. Rajput Kaston Publication
3. Refrigeration And Air Conditioning by Arora & Domkundwar, Dhanpat raj Sons

Reference Books:
1. Refrigeration And Air Conditioning by stooker W.F.
2. Refrigeration And Air Conditioning by ahmadaul Ameen, PHI publication
DEPARTMENT OF MECHANICAL ENGINEERING
SYLLABUS

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UNIT-I
General Sources of power, Importance of Central Power Stations, Types of power stations – steam, Nuclear, Diesel and hydro – Elements of modern power stations (Steams only) brief layout and arrangement of elements and complements, Sitting of different power stations, Foundation, Elements of Electric power systems primary and secondary distribution substations (in brief).

UNIT – II
Steam Power Plant: Steam power plants selection of working medium, Heat Balance in steam cycles, Heat rates, Comparison of efficiencies gas loop, Fuels and fuel handling System and Ash handling System, Air pre-heater, Feed water pre-heaters, Steam re-heaters, Dearators, Feed water treatment, Pumping and regulation water walls, Modern developments in steam boilers, Important instrumentation and piping of gas and water loop. Factors to be controlled from maximum efficiency and variable output.

UNIT – III
Hydro Electric power station – Potential power with reference to rainfall and catchments area, Water storage, Equipment used in hydro electric power stations, Characteristics of hydraulic turbines, Comparison of the factors governing the cost of hydro steam and diesel power stations.

Diesel power station – Application of Diesel in power field, Suitability of diesel engines for bulk power, Layout of Diesel Power Plant, Advantages and limitations of diesel, Power stations, Performance Characteristics.

UNIT – IV
Nuclear Power Station: Evolution of nuclear energy from atoms by fission and fusion, Chain reactions, Fission materials, Types of reactors, gas cooled, Boiling water liquid, Metal cooled and fast reactor, Arrangements of various elements in a nuclear power station, Steam cycles and boilers coolant heat exchangers, Reactor control, Reactor shielding and safety methods.

UNIT – V
Variable load problems: Idealized and realized load curves, Effect of variable load on plant design and operation variable load operation and load dispatch.

Power station Economics: Source of income, Cost of plant and production, Elements of cost, depreciation and replacement theory of rates.

Text Books:

Reference Books:
UNIT I


UNIT II


UNIT III

UNIT IV
Group Technology: Introduction to group technology, Part families, Part and classification, Three Parts Classification & Codes system, Group technology Machine cell design, Benefits and Limitation of Group technology.

Data base Management: Design Database concept, Objective, Data structures, Creation of Data Files in application Program and relational Database management system.

UNIT V
Computer Aided Design of Planer Mechanism: Kinematic synthesis, Type, Number, Dimension Synthesis: Function generation, Path generation, Motion generation, Approximate synthesis and Tchebyshev’s spacing of accuracy points, Freudenstein’s equation for four bar link mechanism and slider crank mechanism by displacement method and vector method; Angular velocities and acceleration, coupler curves.
**Text Books:**
2. CAD/CAM-Milkell P. Groover, Emory W.Zimmer-Pearson Education
3. Theory of mechanism and Machine-Ghosh and Malik-EWP

**Reference Books:**
1. Computer numeric control-T.Jeyapoovan, Robert Quesada-Pearson Education
UNIT-1
**Spur Gears**: Introduction, Types of failure, design requirements, gear terminology, design analysis, stress concentration, dynamic load, surface compressive stress, beam strength, plastic deformation, gear materials, design procedure, design as recommended by AGMA. Gear Lubrication.

UNIT-2
**Helical Gears**: Terminology of Helical Gears, Virtual number of teeth, Tooth proportions, Force analysis, Beam strength, Effective Load on gear tooth, design procedure.
**Bevel Gears**: Terminology of Bevel Gears, Force Analysis, Beam strength, effective load on gear tooth, design procedure, design as recommended by AGMA.

UNIT-3
**Rolling Contact Bearings**: Types of ball and roller bearing, Selection of bearing for radial and axial load, Bearing life, design procedure, mounting and lubrication.

UNIT-4
**Spring**: Spring Materials and their Mechanical Properties, Equation for stress and deflection, Helical coil springs of circular section for tension, compression and torsion, Dynamic loading, Fatigue loading, Wahl line. Leaf spring and disc springs.

UNIT-5
**Brakes**: Introduction, Block Brake, design procedure, Internal Expanding Shoe Brake, design procedure, Band brakes, design procedure, Disc brake, design procedure.
**Clutches**: Introduction, Friction materials, Torque transmitting capacity, Single & Multiple plate clutch, Centrifugal clutches, Cone clutch.

Text Books :-

Reference Books :
# DEPARTMENT OF MECHANICAL ENGINEERING

## SYLLABUS

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<th>Production Management</th>
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**UNIT-I**

**Production Management:** Definition, Objectives, Scope, Benefits, Functions of production management, Place of production management in an organization, Types of production system, Product life cycle, Product design and development, production cycle.

**Costing and Cost Analysis:** Elements of costs, Break even analysis, Incremental costs, make or buy decision.

**Sales Forecasting:** Purposes, Methods – Delphi, Linear regression, Economic indicators, Time-series analysis, Adjustment for seasonal variations, Moving average, Exponential smoothing.

**UNIT-II**

**Material Management:** Objectives and functions of materials management, Organization of materials management, MRP I and MRP II.

**Procurement:** Objectives of purchase department, Purchase responsibilities and organization, Types of purchasing, Purchase procedures, Import and Export.

**Stores Keeping:** Stores management, Functions of stores, Classification of materials, Standardization of materials, Identification and maintenance of layout of stores, Physical control of materials, Pricing of stores, Issuing of stores.

**UNIT-III**

**Production Planning and Control:** Functions, Organization, Master Scheduling, Aggregate planning and strategies, Materials requirement planning, Product structure tree, Routing, Loading, Scheduling – forward and backward, Dispatching – priority rules, Sequencing, Johnson’s algorithm for n jobs and two machines, Gantt’s chart, Bar chart, Flow process chart.

**Materials Handling:** Principles of materials handling, Unit load, Types of materials handling equipment, Relation between materials handling and plant layout.

**UNIT – IV**

**Inventory Control:** Objective, Scope and functions of inventory control, Inventory control techniques, Economic ordering quantity, Periodic ordering quantity, A.B.C. analysis, General idea regarding inventory control under risk and uncertainty.

**Supply Chain Management:** Introduction, Definition of supply chain, Major derivers of supply chain, Supply Chain Strategies, A model for strategy formulation in SCM. Information Systems in supply chain.

**UNIT – V**

**Quality Control:** Difference between inspection and quality control, Acceptance sampling, Procedure’s risk and Consumer’s risk, Operating characteristic curve for single sampling plan, AQL Quality of conformance, Quality of design, Economics of quality, SQC charts for variables and attributes.
**Text Books:**
2. Industrial Engineering & Production Management – Martand Telsang – S. Chand & Co.,

**Reference Book:**
2. Quality Planning and Analysis, Juran and Gryna
3. Production and operations Management by – Adam and Ebert – PHI –
UNIT-I
Cooling and Heating Load Calculations: Estimation of Solar Radiation
Solar radiation, Constant and irradiation, geometry, Latitude, all basic and derived angles, vertical and tilted surfaces, Calculation of direct, diffuse and reflected radiation using ASHRAE solar radiation model.

Solar radiation through fenestration Ventilation and Infiltration
Need, effects of fenestration, Estimation of heat transfer rate, Solar heat Gain Factor(SHGF) and Shading Coefficient, external shading, shaded area of fenestration, heat transfer rate through windows with overhangs, ventilation, Infiltration, heat transfer rate due to infiltration and ventilation.

UNIT-II
Heat Transfer through Buildings – Fabric Heat Gain/Loss
One-dimensional, steady state heat transfer through homogeneous, non-homogeneous walls, air spaces, composite walls of the buildings, unsteady heat transfer through opaque walls and roofs, analytical method to solve the 1-D, transient heat transfer problem, numerical methods used to solve the transient heat transfer problem, semi-empirical method based on Effective temperature, Difference or Cooling Load Temperature difference CLTD.

UNIT-III
Selection of Air Conditioning Systems
Thermal distribution systems and their functions, Selection Criteria for air conditioning systems, Classification of air conditioning systems, Working principles, Advantages, Disadvantages and applications of all air systems, namely: Single duct, (constant volume, single zone systems, multi zone systems, variable air volume (VAV) systems), Dual duct, constant volume and variable volume systems, Outdoor air control in all air systems, all water systems, air-water systems, unitary refrigerant based systems.

UNIT-IV
Transmission of Air in Air Conditioning Ducts
Air Handling Unit (AHU) and it’s functions, need, airflow through ducts, Bernoulli and modified equations, Static, dynamic, datum and total head, Fan Total Pressure (FTP) and power input, pressure loss, frictional pressure drop, dynamic pressure drop in various types of fittings, Static regain.

Design of Air Conditioning Ducts
Requirements, Rules for duct design, Classification, Commonly used methods, Principle of velocity, equal friction, and static regain methods, Performance of duct systems, System balancing and optimization, fans and fan laws, Interaction between fan and duct.
UNIT-V
Space Air Distribution
Requirements, Performance Index and space Diffusion Effectiveness Factor, Design buoyancy effects, deflection of air jets, Behavior of free-stream jets, Definitions of drop, throw, Spread and entrainment ratio, Behavior of circular jets, rectangular jets, Characteristics of different types of air distribution devices, Return air inlets, Airflow pattern inside conditioned spaces.

Ventilation for cooling
Use, comparison between natural and mechanical ventilation, Characteristics of natural ventilation, airflow rate due to wind and stack effects, general guidelines, forced ventilation using electric fans, interior air movement, unit ventilators, whole house fans and solar chimneys.

Text Books:
1. Refrigeration and Air Conditioning by C. P. Arora, TMH Publication.
3. Refrigeration and Air Conditioning by Arora & Domkundwar, Dhanpat Rai and Sons.

Reference Books:
1. Refrigeration and Air Conditioning by Stooker W.F.
2. Refrigeration and Air Conditioning by Ahmadul Ameen, PHI Publication
DEPARTMENT OF MECHANICAL ENGINEERING
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UNIT I
FUNDAMENTAL OF ENERGY
Energy sources, classification, importance of non-conventional energy sources, advantages and disadvantages of non-conventional energy sources, environmental aspect of energy, energy storage-necessity of energy storage, energy storage methods.

UNIT II
SOLAR ENERGY
Extraterrestrial radiations and terrestrial radiations, depletion of solar radiation, air mass, solar radiation geometry, solar time, solar day length, solar radiation measurement on horizontal and inclined surfaces.
Solar thermal system-solar collectors, classification, performance indices. Liquid flat plate collector-their component, efficiency, solar thermal system applications.
Solar photovoltaic systems: solar cell fundamentals, solar cell, module, panel and array construction and Application.

UNIT III
BIOMASS ENERGY
Photosynthesis process, biomass resources.
Biofuels: biofuel classification, biofuel production process.
Energy farming: advantages and dangers of energy farming,
Biogas: anaerobic digestion for biogas, digester sizing.

UNIT IV
CHEMICAL ENERGY SOURCES
Fuel cells: design, principle, classification, types, advantages and disadvantages.
Hydrogen energy: properties, methods of hydrogen production, Storage, advantages and disadvantages and application.

UNIT V
WIND ENERGY
Definition, origin of wind, factor affecting the distribution of wind on the surface of the earth, nature of wind, wind turbines, components of wind turbine, wind energy conversion, wind energy conversion systems.
Introduction: Tidal energy, Wave energy, Ocean thermal energy.
Text Book:


Reference Books: