Mechanical Engineering

Part I: Engineering Mathematics

Linear Algebra*:* Matrix algebra; Systems of Linear Equations; Eigen Values and Eigenvectors.

Calculus*:* Functions of Single Variable; Limit, Continuity and Differentiability; Mean value Theorems; Evaluation of Definite and Improper Integrals; Partial derivatives, Total Derivative, Maxima and Minima, Gradient, Divergence and Curl, Vector Identities, Directional Derivatives, Line, Surface and Volume Integrals, Stokes, Gauss and Green's Theorems.

Differential equations*:* First Order Equations (Linear and Nonlinear); Higher Order Linear Differential Equations with Constant Coefficients; Initial and Boundary Value Problems, Laplace and Fourier Transforms; Solutions of one Dimensional Diffusion and wave Equations and Laplace Equation.

Complex variables*:* Analytic Functions; Cauchy's Integral Theorem; Taylor and Laurent Series; Residue Theorem.

Probability and Statistics*:* Definitions of Probability and Sampling Theorems; Conditional Probability; Mean, Median, Mode and Standard Deviation; Random Variables; Poisson, Normal and Binomial Distributions. Least Squares, Correlation and Regression and Covariance.

Numerical Methods*:* Numerical Solutions of Linear and Non-Linear Algebraic Equations; Finite Differences, Numerical Integration, Runga – Kutta Methods.

Part II: Mechanical Engineering

MACHINE DESIGN

Strength of Material: Mechanical Properties and Testing, Deflection of Beams, Torsion of Shafts, Columns & Struts, Strain Energy, Pressure Vessels, Composite Materials, its Classification and Processing Methods, Advanced Mechanics of Solids

Theory of Machines: Mechanisms and Machines, Gear and Gear Trains, Cams, Engine Dynamics, Governors, Balancing, Gyroscope

Design of Machine Elements: Design for Production, Belt, Rope and Chain Drives, Design of Shafts, Bearings, Springs, Tribology

Mechanical Vibrations: Fundamentals of Vibration, Vibration of Single Degree of Freedom Systems, Vibration of Multi Degree of Freedom Systems, Vibration of Continuous Systems, Static and Dynamic Testing of Machine Tools

THERMAL ENGINEERING

Thermodynamics and Fluid Mechanics: Zeroth, First and Second Laws of Thermodynamics, Availability & Irreversibility, Pure Substances, Air Standard Cycles,

Fluid Mechanics and Computational Fluid Dynamics

Internal Combustion Engines: Combustion in S.I. & C.I. Engines, Lubrication & Cooling Systems, Engine Testing and Performance, Supercharging, Gas Turbines and Jet Propulsion, Power Plant Engineering, Automobile Engineering

Heat and Mass Transfer: Basic Laws, Conduction, Extended Surface Conduction, Convection, Thermal Radiation, Heat Exchangers, Mass Transfer

Refrigeration and Air-Conditioning: Air Refrigeration System, Vapour Compression Refrigeration System, Vapour Absorption Systems and Refrigerants, Psychrometry, Air Conditioning

PRODUCTION ENGINEERING

Manufacturing Technology: Workshop Practices, Fundamental Machine Tool Operations, Ferrous Materials, Non-Ferrous Metals and Alloys, Ceramics, Plastics and Other Materials, Casting, Welding, Bulk Metal Forming Processes, Forging, Extrusion, Rolling, Non-Conventional Manufacturing Processes

Machine Tool Engineering: Fundamental of Metal Cutting, Machine Tool Design, Machine Tool Structures, Gear Box Design, Machine Tool Testing, Vibration in Machine Tools, NC, CNC and DNC Machine Tools, Automation in Manufacturing, FMS, CIMS

CAD/CAM: Fundamentals of Computer Aided Design, Geometric Transformation, Plane Curves, Geometric Modelling, Application of CAD Techniques to Finite Element Mesh Generation, Computer Aided Manufacturing, Additive Manufacturing (Rapid Prototyping),

Robotics & AGVs

Industrial Management: Production and Productivity, Work Study and Ergonomics, Plant Layout and Material Handling, Production Planning and Control, Inventory Control, Computer Aided Process Planning, Group Technology, Concurrent Engineering, Reverse Engineering, Statistical Quality Control, Total Quality Management.