Code: MT

Metallurgical Engineering

Engineering Mathematics

**Linear Algebra:** Matrices and Determinants, Systems of Linear Equations, Eigen Values and Eigen Vectors.

**Calculus:** Limit, Continuity and Differentiability; Partial Derivatives; Maxima and Minima; Sequences and Series; Test for Convergence; Fourier Series.

**Vector Calculus:** Gradient; Divergence and Curl; Line; Surface and Volume Integrals; Stokes, Gauss and Green's Theorems.

**Differential Equations:** Linear and Non-Linear First Order ODEs; Higher Order Linear ODEs with Constant Coefficients; Cauchy's and Euler's Equations; Laplace Transforms; PDEs - Laplace, Heat and Wave Equations.

**Probability and Statistics:** Probability and Sampling Theorem, Conditional Probability, Probability Density Function, Mean, Median, Mode and Standard Deviation; Random Variables; Exponential, Poisson, Normal and Binomial Distributions; Correlation and Regression Analysis.

**Numerical Methods:** Solutions of Linear and Non-Linear Algebraic Equations; Integration of Trapezoidal and Simpson's Rule; Single and Multi-Step Methods for Differential Equations.

Metallurgical Engineering


**Physical Metallurgy:** Crystal Structure and Bonding Characteristics of Metals, Alloys, Ceramics and Polymers, Structure of Surfaces and Interfaces, Nano-Crystalline and Amorphous Structures; Solid Solutions; Solidification; Phase Transformation and Binary Phase Diagrams; Principles of Heat Treatment of Steels, Cast Iron and
Aluminum Alloys; Surface Treatments; Recovery, Recrystallization and Grain Growth; Industrially Important Ferrous and Non-Ferrous Alloys; Elements of X-Ray and Electron Diffraction; Principles of Scanning and Transmission Electron Microscopy; Industrial Ceramics, Polymers and Composites; Electronic Basis of Thermal, Optical, Electrical and Magnetic Properties of Materials; Electronic and Optoelectronic Materials.

**Mechanical Metallurgy:** Elasticity, Yield Criteria and Plasticity; Defects in Crystals; Elements of Dislocation Theory - Types of Dislocations, Slip and Twinning, Source and Multiplication of Dislocations, Stress Fields Around Dislocations, Partial Dislocations, Dislocation Interactions and Reactions; Strengthening Mechanisms; Tensile, Fatigue and Creep Behaviour; Super-Plasticity; Fracture - Griffith Theory, Basic Concepts of Linear Elastic and Elasto-Plastic Fracture Mechanics, Ductile To Brittle Transition, Fracture Toughness; Failure Analysis; Mechanical Testing - Tension, Compression, Torsion, Hardness, Impact, Creep, Fatigue, Fracture Toughness and Formability.


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