

PRINCIPAL SUBJECT AREA

MATHEMATICS

100 LEVEL COURSES

MT 100 Mathematics for Biological Sciences (2 credits)

Sets and inequalities, Linear equations, Quadratic equations, Functions and graphs, Trigonometric Functions, Limits, Derivatives, Curve sketching, Maximum-minimum problems, Exponential and logarithmic functions, Techniques of integration, Areas and volumes, partial derivatives, Introduction to vectors, Matrices and determinants.

Recommended Texts:

1. *Mathematics for Biological Sciences*, J.C. Arya and R.W. Lardner

MT 101 Vector Methods (2 credits)

Vector algebra: Introduction to vectors, Linear combinations, Linear dependence and independence. Bases and dimension, Scalar product. Vector product. Triple scalar product. Triple vector product. Solutions of vector equations involving products.

Vector Geometry: Collinear Vectors, Coplanar vectors, Vectors equation of a line, Vector equation of a plane, Tetrahedron, Parallelepiped, pyramid and the prism, Coplanar and skew lines, Intersecting and parallel planes Cylindrical polar coordinates, Spherical polar coordinates, Simple surfaces: Sphere- Cone, Cylinder, Cosine and Sine formulac in Spherical Trigonometry.

Vector Functions of a Single Scalar Variable: Differentiation, Integration, Space curves, Tangent and normals.

Recommended Texts:

1. *Elementary Vector Analysis*, C.E. Weatherbum
2. *Vector Analysis*, M.D. Raisinghania

MT 102 Introduction to Probability Theory (3 credits)

(Same as ST102)

MT 103 Differential Equations (2 credits)

First Order Ordinary Differential Equations: Review of fist order equations, Exact equations, Clairaut's equation, Ricarti's equation.

Higher Order Ordinary Differential Equations: Linear equations with constant coefficients, Wronskian, Differential operators, Undetermined coefficients. Variation of parameters.

Recommended Texts:

1. *A First Course in Differential Equations*, D.G. Zill
2. *Differential Equations*, H.T.H. Piaggio

MT 104 Abstract Algebra I (3 credits)

Number Theory: Euclid's Algorithm, Greatest common divisor and least common multiple, and their Relationship, Solution of Linear Diophantine equations in two variables, Linear congruences, Systems of linear Congruences having he same modulus, Chinese Remainder Theorem.

Relations, Functions and Binary Operations: Equivalence relation. Partitions, Orbits and transversals functions a subset of a relations, bijective functions, inverse of a function.

Permutations: Theorems on the product of disjoin cycles, Transpositions and the uses, parity and signature of a permutation.

Group Theory: Group Tables, Subgroups, Elementary properties of Cyclic groups, Dihedral group of order $2n$ and its properties, Symmetric and Alternating group: Direct product of two groups, Identification of non-isomorphic groups of order up to 10.

Recommended Texts:

1. *A First course in Abstract Algebra*, J.B. Fraleigh
2. *Elementary Number Theory*, D.M. Burton

MT 105 Real Analysis I (3 credits)

Real number system as a complete ordered field, Complex number system, Topology of the real line, Neighborhoods, Sequences and limits, Limit theorems, Monotonic Sequences, Limit Concept of a Real-Valued Function, Algebra of limits, Continuity, Monotonic functions, Differentiability, Rolle's Theorem, Mean-Value Theorems, L'Hospital's Rule, Riemann Integral and the basic properties. Fundamental theorem of Calculus, Improper integrals.

Recommended Texts:

1. *Elementary Real Analysis*, H.G. Eggleston
2. *Analysis*, S.R. Lay

MT 106 Classical Mechanics I (3 credits)

(Prerequisite: MT 105)

Motion of a particle in a plane: Velocity and acceleration components in Cartesian and polar coordinates, Newton's second law: Inertial frame, Use of polar coordinates, Impulse- Momentum Integral Work-Energy Integral.

Constrained motion: Motion in a space curve. Use of intrinsic coordinates, Varying mass: Mass increasing or decreasing at a constant rate.

Dynamics of a system particles: Linear momentum and equation of the center of mass. Angular Momentum, Kinetic energy, Equations for impulsive motion, Rotation of a rigid body about a fixed axis: Kinetic Energy of rotation and energy Conservation equation, Forces exerted on the axis of revolution, Angular Momentum and impulse, conservation of angular momentum about a fixed axis.

Plane motion of a rigid body: Instantaneous center of a lamina, Motion of the center of mass, motion relative to the center of mass, Equations of motion and their use, Kinetic energy and energy conservation equation, Angular momentum about any axis, conservation of linear momentum/angular momentum.

Recommended Texts:

1. *Textbook of Dynamics*, F.Chorlton
2. *New Tertiary Mathematics*, C.Plumpton

NOTE: MT 104 and MT 105 are compulsory for students who offer Mathematics as a principal subject.