

**First Year B. A. mathematics , Paper – I, Syllabus**

**Semester - II**

**SOLID GEOMETRY**

**Unit - I (12 hrs) : The Plane**

Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

**Unit - II (12 hrs) : The Line:**

Equations of a line; Angle between a line and a plane; The condition that a given line may lie in a given plane; The condition that two given lines are coplanar; Number of arbitrary constants in the equations of a straight line; Sets of conditions which determine a line; The shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines; Length of the perpendicular from a given point to a given line; Intersection of three planes; Triangular Prism.

**Unit-III(12 hrs) : Sphere:**

Definition and equation of the sphere; Equation of the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; Sphere through a given circle; Intersection of a sphere and a line; Power of a point; Tangent plane; Plane of contact; Polar plane; Pole of a plane; Conjugate points; Conjugate planes; Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres; Simplified form of the equation of two spheres.

**Unit - IV (12 hrs) : Cones**

Definitions of a cone; vertex; guiding curve; generators; Equation of the cone with a given vertex and guiding curve; Enveloping cone of a sphere; Equations of cones with vertex at origin are homogenous; Condition that the general equation of the second degree should represent a cone; Condition that a cone may have three mutually perpendicular generators; Intersection of a line and a quadric cone; Tangent lines and tangent plane at a point; Condition that a plane may touch a cone; Reciprocal cones; Intersection of two cones with a common vertex; Right circular cone; Equation of the right circular cone with a given vertex; axis and semi-vertical angle.

### **Unit-V (12 hrs) Cylinders and Conicoids:**

Definition of a cylinder; Equation to the cylinder whose generators intersect a given conic and are parallel to a given line; Enveloping cylinder of a sphere; The right circular cylinder; Equation of the right circular cylinder with a given axis and radius. The general equation of the second degree and the various surfaces represented by it, shapes of some surfaces, Nature of Ellipsoid, Nature of Hyperboloid of one sheet.

**Prescribed Text book:** Scope as in *Analytical Solid Geometry* by Shanti Narayan and P.K. Mittal, Published by S. Chand & Company Ltd. Seventeenth edition: Sections:-2.4, 2.7, 2.9, 3.1 to 3.8, 6.1 to 6.9, 7.1 to 7.8, 8.1, 8.2, 8.6

### **Reference Book:**

1. V.Krishna Murthy & others "A text book of Mathematics for BA/BSc Vol I S.Chand & Company, New Delhi
2. P.K. Jain and Khaleel Ahmed, "A Text Book of Analytical Geometry of Three dimensions", Wiley Eastern Ltd., 1999. Note: Concentrate on Problematic parts in all above units

## **Second year B.A Mathematics , Paper – II, Syllabus**

### **Semester – III**

### **ABSTRACTALGEBRA**

#### **Unit - I (12 hrs) GROUPS**

**Binary operation** - definition and properties; **Groups** - definition and elementary properties; finite groups and group composition tables; Sub groups cyclic subgroups; cosets; Lagranges's Theorem;

#### **Unit - II (12 hrs) Normal subgroups**

**Normal subgroups** - factor groups and simple groups; Criteria for the existence of a coset group, inner automorphisms and normal subgroups, factor groups and simple groups.

**Homomorphism** - Definition and elementary properties; Isomorphism - definition and elementary properties; fundamental theorem of homomorphisms and applications;

### **Unit - III (12 hrs) permutations and cyclic groups**

functions and permutations; groups of permutations; cycles and cyclic notation; even and odd permutations; The alternating groups; Cayley's theorem.

**Cyclic groups** - elementary properties. The classification and cyclic groups, sub groups of finite cyclic groups.

### **Unit - IV (12hrs) Rings-I**

Definition of Ring and basic properties, Boolean Rings, divisors of zero and cancellation laws Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring, some non commutative rings, examples; Subrings; Ideals, Definition and elementary properties, Ideal Generate by a Subset of Ring; Principal Ideal Ring, prime and Maximal ideals,

### **Unit - V (12hrs) Rings-II**

Quotient Rings; Homomorphism (all topics over HM) and Embedding of rings; Euclidian rings and Factorization Theorem, Greatest Common Divisor, Prime Element, Polynomial Rings, Degree of a Polynomial, Division Algorithm. Prime fields.

## **TEXT BOOK**

### **1. ABSTRACT ALGEBRA**

1) "First Course in Abstract Algebra" by JFRALIEH Published by Narosa Publishing House

( Chapters: 1 to 7, 11 to 13, 23, 24.1 to 24.3, 25.1, 25.4, 29 to 31)

## Second year B.A. Mathematics Paper – II, Syllabus

### Semester - IV

#### REAL ANALYSIS

##### Unit - I (12 hrs) REAL NUMBERS

The algebraic and order properties of  $\mathbb{R}$  absolute value and real line, Completeness property of  $\mathbb{R}$ , applications of supremum property; intervals

**Sequences:** Sequences and their limits, Range and Boundedness of sequence, Limit of a sequence and Convergent Sequence, Theorem on Limits, The Cauchy's criterion, properly divergent sequences, Monotone sequences, Limit Point of Sequence, subsequences and the Bolzano-Weierstrass theorem, Cauchy Sequences, Cauchy's first and second theorems on limits for sequences, Cesaro's theorem.

##### Unit - II (12 hrs) REAL NUMBERS

**Series:** Introduction to series, convergence of series. Cauchy's general principle for convergence tests for convergence of series. Series of Non-Negative Terms,  $p$ -test. Cauchy's  $n$ th root test or Root Test, D'Alembert's Test or Ratio test, Cauchy's Condensation Test, Integral Test, Alternating Series, Leibnitz test, Absolute convergence and conditional convergence, semi convergence

##### Unit - III (12 hrs) REAL NUMBERS

**Limits** Real valued Functions, Boundedness of a function, Limits of functions. Some extensions of the limit concept, Infinite Limits. Limits at infinity.

**Continuous functions:** Continuous functions. Combinations of continuous functions. Continuous Functions on intervals, uniform continuity.

##### Unit -IV (12 hrs) DIFFERENTIATION

The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value theorems, Indeterminate forms - L'Hospital's Rules, Generalised Mean value Theorems - Taylor's theorem, Maclaurin's Theorem, Expansion of functions with different forms of remainders, Taylor's Maclaurin's Series, power series representation of functions.

**Unit -V (12 hrs) INTEGRATION**

**Riemann Integration:** Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for R - integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral as the limit of a sum, Mean value Theorems.

**TEXT BOOKS REAL NUMBERS**

"Introduction to Real Analysis" by ROBERT G BARTELY and D.R.SHERBART  
Published by John Wiley (Chapters 3.1 to 3.7, 5.1 to 5.4, 6.1 to 6.4, 7.1 to 7.3, 9.1 to 9.3) **REFERENCE:**

A Text Book of B.Sc mathematics by B.V.S.S Sarma and Published by S.Chand & Company.