

MATHEMATICS

FOR

DEGREE STUDENTS



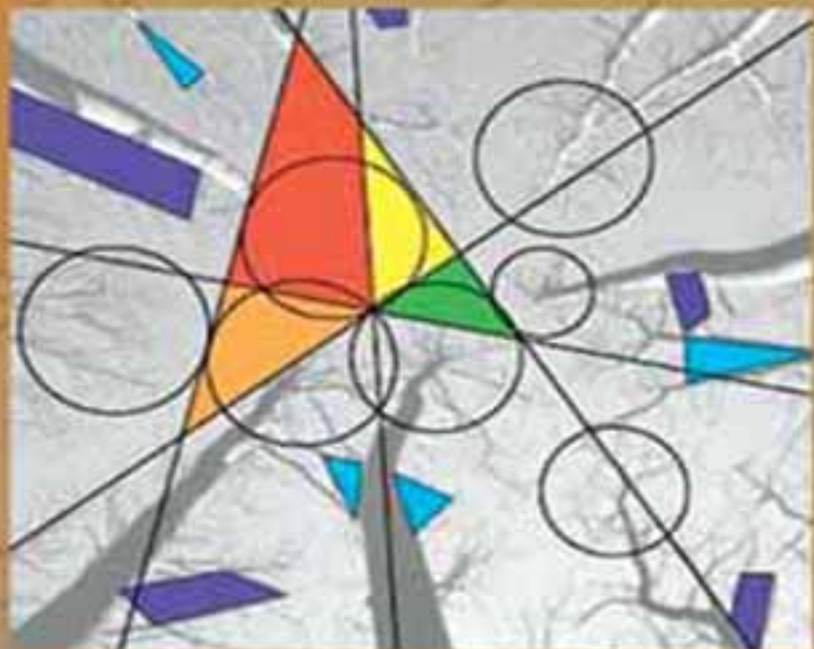
B Sc First Year

AS PER UGC MODEL CURRICULUM

- Algebra and Trigonometry
- Differential & Integral Calculus
- Ordinary Differential Equations
- Vector Analysis and Geometry

Dr. P.K. MITTAL

S. CHAND



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FOR
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B Sc First Year

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- Algebra and Trigonometry
- Calculus (Differential & Integral) and Ordinary Differential Equations
- Vector Analysis and Geometry

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PREFACE

I feel pleasure in presenting this book to the teachers and students of B.Sc.–I year of all the Indian Universities. The book has been prepared keeping in view the syllabi prepared by different universities on the basis of UGC Model Curriculum. The present book has evolved out of my experience of more than three decades of classroom teaching at B.Sc. level.

The following have been added to make the book student-friendly :

- Illustrative Solved Examples.
- Uptodate Questions added of different important Indian Universities.
- Objective Type Questions given as per the requirement of the topic.
- The Questions that have been provided in the Exercise are as per latest pattern of Examination.
- All the important subjects like Algebra, Trigonometry, Differential Calculus, Integral Calculus, Differential Equations, Vector Analysis and Geometry given in the single volume book.

I have tried my level best to make the book useful and fruitful for B.Sc. I year students. I acknowledge my sincere thanks to S. Chand & Company Ltd. for giving me an opportunity to prepare this book.

I will look forward to receive valuable and useful suggestions from our users for further improvement in the book.

Dr. P.K. Mittal

RISHIKESH
(Uttarakhand)

UGC MODEL SYLLABUS

BA/B Sc (HONOURS) PART-I MATHEMATICS

BMH 101 (a & b) ALGEBRA AND TRIGONOMETRY

ALGEBRA

(Duration : Two Semesters/One Year)

Mappings : Equivalence relations and partitions. Congruence modulo n .

Symmetric. Skew symmetric. Hermitian and skew Hermitian matrices. Elementary operations on matrices. Inverse of a matrix. Linear independence of row and column matrices. Row rank, column rank and rank of a matrix. Equivalence of column and row ranks. Eigenvalues, eigenvectors and the characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix. Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Theorems on consistency of a system of linear equations.

Relations between the roots and coefficients of general polynomial equation in one variable. Transformation of equations. Descartes's rule of signs. Solution of cubic equations (Cardan method). Biquadratic equations.

Definition of a group with examples and simple properties. Subgroups. Generation of groups. Cyclic groups. Coset decomposition. Lagrange's theorem and its consequences. Fermat's and Euler's theorems. Homomorphism and Isomorphism. Normal subgroups. Quotient groups. The fundamental theorem of homomorphism. Permutation groups. Even and odd permutations. The alternating groups A_n . Cayley's theorem. Introduction to rings, subrings, integral domains and fields. Characteristic of a ring.

TRIGONOMETRY

De Moivre's theorem and its applications. Direct and inverse circular and hyperbolic functions. Logarithm of a complex quantity. Expansion of trigonometrical functions. Gregory's series. Summation of series.

BMH 102 (a & b) CALCULUS

DIFFERENTIAL CALCULUS

(Duration : Two Semesters/One Year)

ϵ - δ definition of the limit of a function. Basic properties of limits. Continuous functions and classification of discontinuities. Differentiability. Successive differentiation. Leibniz theorem. Maclaurin and Taylor series expansions. Asymptotes. Curvature. Tests for concavity and convexity. Points of inflexion. Multiple points. Tracing of curves in Cartesian and polar coordinates.

INTEGRAL CALCULUS

Integration of irrational algebraic functions and transcendental functions. Reduction formulae. Definite integrals. Quadrature. Rectification. Volumes and surfaces of solids of revolution.

ORDINARY DIFFERENTIAL EQUATIONS

Degree and order of a differential equation. Equations of first order and first degree. Equations in

which the variables are separable. Homogeneous equations. Linear equations and equations reducible to the linear form. Exact differential equations. First order higher degree equations solvable for x , y , p . Clairaut's form and singular solutions. Geometrical meaning of a differential equation. Orthogonal trajectories. Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations.

Linear differential equations of second order. Transformation of the equation by changing—the dependent variable/the independent variable. Method of variation of parameters.

Ordinary simultaneous differential equations.

BMH 103 (a & b) VECTOR ANALYSIS AND GEOMETRY

VECTOR ANALYSIS

(Duration : Two Semesters/One Year)

Scalar and vector product of three vectors. Product of four vectors. Reciprocal Vectors. Vector differentiation. Gradient, divergence and curl. Vector integration. Theorems of Gauss, Green, Stokes and problems based on these.

GEOMETRY

General equation of second degree. Tracing of conics. System of conics. Confocal conics. Polar equation of a conic.

Plane, The Straight line and the plane. Sphere, Cone Cylinder.

Central conicoids. Paraboloids. Plane Sections of Conicoids. Generating lines. Confocal Conicoids. Reduction of Second degree equations.

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BMH 101 (a & b) Algebra & Trigonometry

- Algebra
 - Trigonometry
-

ALGEBRA

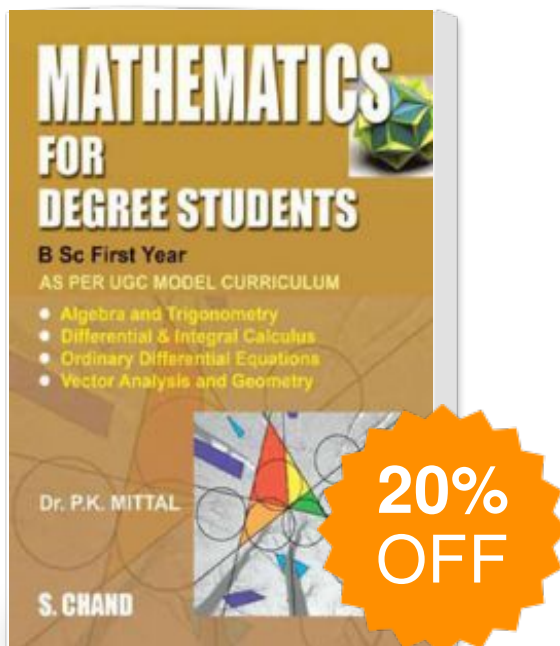
Mappings. Equivalence relations and partitions. Congruence modulo n .

Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary operations on matrices, inverse of a matrix. Linear independence of row and column matrices. Row rank, column rank and rank of a matrix. Equivalence of column and row ranks. Eigen values, eigen vectors and the characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix. Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Theorems on consistency of a system of linear equations.

Relation between the roots and coefficients of general polynomial equation in one variable. Transformation of equations. Descartes' rule of signs. Solution of cubic equations (Cardon method). Biquadratic equations.

Definition of a group with examples and simple properties. Subgroups. Generation of groups. Cyclic groups. Coset decomposition. Lagrange's theorem and its consequences. Fermat's and Euler's theorems. Homomorphism and isomorphism. Permutation groups. Even and odd permutations. The alternating groups. Cayley's Theorem. Introduction to rings, sub rings, integral domains and fields. Characteristic of a ring.

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