B.A./B.Sc. (Honours) Part I
Paper I CALCULUS (MM-104)

No of Periods/week 03
Max. Marks: 50 (Examination: 40, Sessional: 10)
Total Lecture: 72

Unit I: Differential Calculus (16 Lectures)

Unit of a function, Intermediate forms, Successive differentiation, Leibnitz theorem, Maclaurin and Taylor series expansions, Angle between radius and tangent, Perpendicular from the pole on the tangent, Pedal equation, Curvature.

Unit II: Differential Calculus (14 Lectures)

Partial differentiation, Total differentials, Euler's theorem on homogeneous functions, Asymptotes, Concavity and Convexity, Points of inflexion, Multiple points, Tracing of curves in Cartesian and polar coordinates.

Unit III: Integral Calculus (14 Lectures)

Gamma function and its properties, Cartesian parametric and polar forms for rectification, Intrinsic equation for Cartesian and polar curves, Volume and surface of solids of revolution, Cartesian and polar forms

Unit IV: Differential Equations (14 Lectures)

Exact differential equations, Integrating factors, change of variables, Total differential equations, Differential equations of first order but not of first degree, Equations solvable for x, y, q, Equations of the first degree in x and y, Clairaut's equations

Unit V: Higher Order Differential Equations (14 Lectures)

Linear differential equations of order n, Homogeneous and non-homogeneous linear differential equations of order n with constant coefficients, Different forms of particular integrals, Linear differential equations with non-constant coefficients, Reduction of order method, The Cauchy-Euler's equation of order n, Legendre's linear equation

Book Recommended

1. Gorarkh Prasad: Differential Calculus, Pothishala Pvt. Ltd., Allahabad (14^{th} Edition - 1997).
2. Gorarkh Prasad: Integral Calculus, Pothishala Pvt. Ltd., Allahabad (14^{th} Edition -2000).
3. Zafar Ahsan: Differential Equations and their Applications, Prentice-Hall of India Pvt. Ltd., New Delhi (2^{nd} Edition -2004).

B.A./B.Sc. (Honours) Part I
Paper II VECTOR ANALYSIS AND GEOMETRY (MM-105)

No of Periods/week 03
Max. Marks: 50 (Examination: 40, Sessional: 10)
Total Lecture: 72

Unit I: General Equation of Second Degree

Intersection of a straight line and a conic, Equation of a tangent to a conic, Condition of tangency, Pair of tangents from a point, Chord of contact of a pair of tangents, Pole and Polar, Conjugate points and lines, Chord with a given middle point, Centre of a conic and diameter, Conjugate diameters.

Unit II: Tracing of Conic and Polar Equations

Nature of conic, Tracing of parabola, ellipse and hyperbola, Asymptotes of the hyperbola, The length and the position of axes of the conic, Polar equation of a conic when focus is at the pole, Directrices, Tracing of the conic $1/r = 1+e\cos\theta$, Asymptotes, Equation of the chord when the vectorial angles of the extremities are given, Equation of the tangent and the normal when the vectorial angle of the point of contact is given.

Unit III: Cylinder and Cone

Equation of a cylinder, Equation of a right circular cylinder, Equation of a cone, Equation of a cone when the vertex is at the origin, Condition for general equation of second degree to represent to a cone, Tangent plane to a cone, Condition of tangency, Reciprocal cone, Cone with three mutually perpendicular generators.

Unit IV: Central Conicoids

The standard equation, The tangent plane, Condition of tangency of plane, Section with a given centre, Locus of the mid-points of a system of parallel chords, The polar plane, Polar lines, Enveloping cone, Classification of central coicoids (Ellipsoid, Paraboloids, Elliptic paraboloid, hyperbolic paraboloid), Conjugate diametral plane and diameters of Ellipsoid, Normals on ellipsoid, Conjugate diameters of ellipsoid.

Unit V: Vector Analysis

Scalar and vector product of three vectors, Product of four vectors, Reciprocal vectors, Vector differentiation, Partial and directional derivative, Orientation Gradient, Divergence and curl.

Book Recommended

1. Ram Ballabh: Coordinate Geometry, Prakashan Kenda, Lucknow.
2. Murray R. Spiegel: Vector Analysis, Schaum Publishing Company, New York.
3. M.A. Pathan and Zafar Ahsan: Vector Analysis, Pragati Prakashan, Meerut, 2003.

B.A./B.Sc. (Honours) Part I
Paper III NUMERICAL ANALYSIS (MM-106)

No of Periods/week 03
Max. Marks: 50 (Examination: 40, Sessional: 10)
Total Lecture: 72

Unit I: (15 Lectures) Solution of algebraic and transcendental equations, The bisection and Regula Falsi method, Iteration methods namely, Newton-Raphson method, Generalized Newton's method, Solution of system of linear equations using direct methods such as matrix inversion method, Gauss elimination method, LU decomposition including some iteration methods namely, Jacobi and Gauss Siedel methods, The algebraic eigenvalue problems using power and Householder methods.

Unit II: (15 Lectures) Symbols of Δ, ∇, E, E^{-1}, D, μ and δ and their relations, Newton-Gregory Forward and Backward Difference Formulae, Gauss's, Stirling's and Bessel's formulae, Lagrange's Formula, Divided Differences and their properties, Newton's General Interpolation Formula, Inverse Interpolation Formula, Interpolation with cubic splines.

Unit III: (13 Lectures) Numerical Differentiation and Integration, Numerical Differentiation of tabular and non-tabular functions including error estimations, Numerical Integration using Gauss Quadrature Formulae, Trapezoidal, Simpson's 1/3- and 3/8-Rule, Weddle's Rule and Newton-Cotes Formula.

Unit IV: (14 Lectures) Ordinary Differential Equations, Euler's and Modified Euler's Methods, Picard's Method, Taylor Series Method, Runge-Kutta Methods of 2^{nd} and 4^{th} order, Multi-step Methods, Milne-Simpson Method, Adam Bashforth-Moulton Method, Boundary value Problems using Finite Difference Method.

Unit V: (15 Lectures) Approximation and Difference Equations, Least Square Curve Fitting Procedures, Different type of approximations, Least Square Polynomial Approximation, Chebyshev Polynomials and its applications in various approximations, Difference Equations, Solution of Simple Difference Equations, First Order Homogeneous Linear Difference Equations, Higher Order Homogeneous Linear Difference Equations, Non-homogeneous Linear Difference Equations, Higher Order Homogeneous Linear Difference Equations with Constant and variable Coefficients.

Text Books:

1. **S.S. Sastry,** Introductory Methods of Numerical Analysis (Third Ed.), Prentice Hall of India (Ltd.) New Delhi-110001, 1999.

Reference Books:

1. M.K. Jain, S.R.K. Iyenger and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International (P) Ltd., 1999.
2. H.C. Saxena, Finite Difference and Numerical Analysis, S. Chand & Company Ltd. New Delhi, 1998.

B.A./B.Sc. (Honours) Part II
Paper I DIFFERENTIAL EQUATIONS (MM-204)

No of Periods/week 03
Max. Marks: 50 (Examination: 40, Sessional: 10)
Total Lecture: 72

Unit I: Higher Order Linear Differential Equations (14 Lectures)

Methods of undetermined coefficients and variation of parameters, Series solution of differential equations, Frobenius method, Bessel and Legendre differential equations and their series solutions.

Unit II: Ordinary Simultaneous Differential Equations and Laplace Transforms (14 Lectures)

Solution of a system of linear differential equation with constant coefficients, An equivalent triangular system, Degenerate case Laplace transforms, Linearity of Laplace transforms, First shifting property, Transforms of derivatives and integrals, Inverse Laplace transforms, Unit step function, Second shifting property, Convolution and periodic function theorems, Solution of linear differential equations using Laplace transforms.

Unit III: Partial Differential Equations (14 Lectures)

Formation and solution of a partial differential equations easily integrable, Linear (Lagrange's) and nonlinear partial differential equation of first order, Charpit's methods, Homogeneous partial differential equations with constant coefficients.

Unit IV: Partial Differential Equations (16 Lectures)

Non-homogeneous partial differential equations with constant coefficients, Classification of second order linear partial differential equations, Method of separation of variables, Fourier series, Even and odd functions and their Fourier series, Change of interval, Vibration of stretched string, One and two dimensional heat flow, Laplace equation in Cartesian form.

Unit V: Calculus of Variations (14 Lectures)

The variation of a functional and Euler's equations, Externals, Functional depending on n unknown functionals, Functionals depending on higher derivatives, Variational problems in parametric form, Isoparametric problem, Canaonical form of Euler's equation, Functionals depending on functions of several variables.

Book Recommended

1. Zafar Ahsan: Differential Equations and Their Applications, Prentice Hall of India Pvt. Ltd., New Delhi (Second Edition - 2004).
2. W.E. Boyee and R.C. DiPrima: Elementary Differential Equations and Boundary Value Problems, John Wiley and Sons (1977).
3. I.M. Gelfand and S.V. Fomin: Calculus of Variations, Prentice Hall, Englewood Cliffs, New Jersy, 1963.

B.A./B.Sc. (Honours) Part II
Paper II ADVANCED CALCULUS (MM-206)

No of Periods/week 03
Max. Marks: 50 (Examination: 40, Sessional: 10)
Total Lecture: 72

Unit I: Partial Differentiation

Functions of several variables, Partial derivatives, implicit functions, Limits and continuity, derivatives, composite functions, differential functions, homogeneous functions, Euler's theorem, Higher derivatives, Simultaneous equations, Jacobians, inverse of transformation.

Unit II: Partial Differentiation (Continued)

Dependent and independent variables, Differential and directional derivatives, Taylor's theorem, Jacobian's of implicit functions, Inverse of transformations, Change of variable, functional dependence and equality of cross derivatives.

Unit III: Application of Partial Differentiation

Maximum and minima for functions of two variables, sufficient conditions, Functions of three variables, Quadratic form, Relative extrema, Lagrange's multipliers, one relation between two variables, One relation among three variables, Two relations among three variables, Envelopes and Evolutes of families of plane curves.

Unit IV: Multiple Integrals

Definition, Properties and evaluation of double as well as triple integrals, related results, Iterated integrals and change in order of integration.

Unit V: Line and Surface Integrals

Definition, Properties and evaluation of line as well as surface integrals, related problems, Green's theorem and deductions, Stoke's theorem.

Book Recommended

1. D. Widder: Advanced Calculus, (Second Edition), Prentice Hall of India Pvt. Ltd., New Delhi, 1994.
2. S.C. Malik and S. Arora: Mathematical (Second Edition), Wiley Eastern Ltd., New Delhi, 1994..
3. N. Piskunov: Differential and Integral Calculus, Vol. I and II, CBS Publishers and Distributors, New Delhi, 1994.

B.A./B.Sc. (Honours) Part II
Paper III ALGEBRA – I (MM-207)

No of Periods/week 03
Max. Marks: 50 (Examination: 40, Sessional: 10)
Total Lecture: 72

Unit I:

Binary operations, Definition of group with examples and elementary properties, Subgroups, Order of group, Statement of Lagrange's theorem, Homomorphism of groups, kernel of homomorphism, Definition of isomorphism, Introduction to rings, subrings and fields with examples and elementary properties.

Unit II:

Vector spaces, Subspaces, sum of subspaces, Span of a set, Linear dependence and independence, dimension and basis, dimension theorem.

Unit III:

Linear transformation and its properties, range and kernel of a linear transformation, rank and nullity of linear transformation, Rank-nullity theorem, inverse of linear transformation.

Unit IV:

The space $L(u,v)$ of linear transformation and its dimension, composition of linear transformation, matrix associated with a linear transformation, linear transformation associated with matrix, matrix as a linear transformation and its rank and nullity.

Unit V:

Elementary row operations and row reduced echelon form, inverse of a matrix, Application of matrices to a system of linear equations, Eigen-vectors and characteristic equation of matrix, Cayley-Hamilton theorem and its use in finding inverse of matrix.

Book Recommended:

1. V. Krishnamurthy, V.P. Mainra and J.L. Arora: An Introduction to Linear Algebra (II, III, IV, V).
2. Surjeet Singh: Algebra (Unit I).

B.A./B.Sc. (Honours) Part III
REAL ANALYSIS: MM-308

Unit – I: Elements of Point Set Theory on R (16 LECTURES) Sets, Intervals: Open and closed, Bounded and unbounded sets: Supremum and infimum, Neighbourhood of a point, Open sets and results, Limits points of a set, Bolzano – Weierstrass Theorem, Closed sets and related results, Countable and uncountable sets, The Heine –Borel covering Theorem, Compact sets and related results.

Unit – II: Limits and Continuity of Functions on R (16 LECTURES) Limit of a function, Theorems on algebra of limits, Limit or a function, Sequential approach, Cauchy's criteria for finite limits, Continuous functions, Discontinuous functions, Theorems on continuity, Properties of continuous functions on closed intervals, Uniform continuous functions and related results, Functions of bounded variation and their properties, variation function and related results, Jordon theorem.

Unit – III: Differentiation of Functions on R (16 LECTURES) Definitions of derivatives and related results, Increasing and decreasing functions, Darboux's theorem, Rolle's theorem, mean value theorems of differential calculus and their applications, Taylor's theorem with various forms of remainder, Maculaurin's theorem, Taylor's infinite series, Maculaurin's infinite series expansion of some functions.

Unit – IV: Real Sequences and Infinite Series (16 LECTURES) Sequences: Bounded and convergent limit, Points of a sequence, Bolzano – Weierstrass Theorem, Limit inferior and superior, Theorems for convergence sequences, non-convergent (divergent) sequence, Cauchy's general principle of convergence, Theorems on algebra of sequences (statement only) and their application, monotonic sequences, Infinite series and their convergence, Theorem non algebra of limits of series (without proof), Series of positive terms: the comparison, Cauchy's root and D' Alembert ratio tests (without proof) and their applications, Alternating series, Leibnitz test, absolute and conditional convergence, Series of arbitrary terms, Abel's and Dirichlet's tests.

Unit – V: Riemann Integration (16 LECTURES) Definition and existence of Riemann integral, Inequalities for Riemann integrals, Refinement of partitions, Darboux's theorem, Theorems on conditions of integrability, Theorems on integrability of the sum, difference, quotient and product of integrable functions (without proof), Theorems on integrability of the modulus and square of integrable functions, The Riemann integral as a limit of sums, Theorems on integrable functions, The fundamental theorem, first mean value, Theorems of integral calculus, Integartion by parts, Change of variables, Second mean value theorem.

Unit – VI: Riemann Stieltjes Integration and Fourier Series (16 LECTURES) Definition and existence of the integral, Refinement of partitions, Conditions of integrability and related results, Integral as a limit of sums and related results, Fourier series, Bessel's inequality, Dirichlet's criteria of convergence of Fourier series, Fourier series for even and odd functions, Fourier series on $[0,2\pi]$, $[-1,1]$ and $[0,1]$, where 1 is a real number.

BOOKS RECOMMEND:

1. S.C. Malik and Savita Arora: Mathematical Analysis, Second Edition, Wiley Eastern Limited, New Age International Limited, New Delhi, 1994.
2. D. Somasundram and B. Chaudhary: A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1987.

REFERENCE BOOKS:

1. S.L. Gupta and Nisha Rani: Principles of Real Analysis, Vikas Publ. House Pvt. Ltd., New Delhi, 1995.
2. T.M. Appostol: Mathematical Analysis, Second Edition, Narosa Publishing House, New Delhi, 1987.

B.A./B.Sc. (Honours) Part III

METRIC SAPCES AND COMPLEX ANALYSIS: MM-309

Part A: Metric Spaces

Unit – I (16 LECTURES) Definition and examples of metric spaces, inequalities of Holder and Minkowski, Properties of metrices, bounded and unbounded metric spaces, Diameter of a set, distance between two sets, Neighbourhoods open sets, accumulation point, closure of a sets, interior, exterior and frontier points, Dense sets and separable metric spaces, denseness in itself and perfect sets.

Unit – II: (16 LECTURES) Convergence of sequences in metric spaces, Cauchy sequence and complete metric spaces, Cantor's intersection theorem and Bair's category theorem, connected and disconnected sets and their properties, totally disconnected sets and related results.

Unit – III: (16 LECTURES) Open cover and compact metric spaces, Sequentially compact metric spaces, The equivalence of two kind of compactness and Finite intersection property, ε-net and totally bounded metric spaces, Arzela theorem (statement only), Continuous mapping between two metric spaces, uniform continuity, the continuous mappings of connected and compact sets, Uniform convergence and continuity.

Part B: Complex Analysis

Unit – IV (16 LECTURES) Complex number system, exponential forms, powers and roots, Functions of complex variables, Mappings limits, continuity derivatives, C-R equation, sufficient conditions, polar conditions, Analytic functions, Harmonic functions.

Unit – V: (16 LECTURES) Line integrals, Cauchy Goursat Theorem, Simply connected domains, Cauchy integral formula, Derivatives of Analytic functions, Morera's Theorem, Louvlien Theorem, Fundamental Theorem of Algebra, Maximum modules principle convergence of sequence and series, Taylor's series, Laurent series.

Unit – VI: (16 LECTURES) Bilinear transformation, and their properties and classification, Definitions and examples of conformal mappings, Zeros of analytic function, Residues and the theorem of Residue, Residue at poles, Evaluation of improper real integrals, Define integral involving sines and cosines.

BOOKS RECOMMEND:

1. E.T. Copson: Metric Spaces, Cambridge University Press, 1968.
2. R.V. Churchill and J.W. Brown: Complex Variables and Applications, McGraw Hill International Book Company, London.

REFERENCE BOOKS:

1. P.K. Jain and Khalil Ahmad: Metric Spaces, Narosa Publishing House, New Delhi, 1973.
2. Huzoor H. Khan: Complex Analysis, Hamza Publishers – Delhi.

B.A./B.Sc. (Honours) Part III
ABSTRACT ALGEBRA: MM-310

Part A: Metric Spaces

Unit – I (16 LECTURES) Groups, subgroups, cyclic groups, Lagranges's theorem, isomorphism, automorphism, inner automorphism, homomorphism, normal subgroups, commutator subgroups.

Unit – II: (16 LECTURES) Quotient groups, isomorphism theorems, direct product, permutation groups, Cayley's theorem, conjugate classes, class equation, Cauchy's theorem.

Unit – III: (16 LECTURES) Syllow Theorems, Solvable groups, central series, nilpotent groups, composition series, Jordan-Holder theorem.

Unit – IV (16 LECTURES) Rings, integral domains, Skew fields, Characteristic of ring, Isomorphism, homomorphism, quotient field, ideals, Simple rings, quotient rings, isomorphism theorem, prime and maximal ideals.

Unit – V: (16 LECTURES) Factorization, irreducible and prime elements, Euclidean domains, Principal ideals domains, polynomials rings, roots of polynomials, factorization of polynomials, Eisentein's criterian, Gauss Theorem.

Unit – VI: (16 LECTURES) Recall of vector spaces and linear transformations, quotient spaces, isomorphism theorems, Isomorphism theorems, space L(V,V'), dimension of L(V,V'), dual spaces, orthogonal complement, minimal polynomial, inner product spaces, Schwarz's inequality, Bessel's inequality, Orthonormal basis, Gram-Schmidt orthogonalization process, Bessel's inequality.

BOOKS RECOMMEND:

1. N.S. Gopalakrishnan: University Algebra.
2. Krishnamurthy, Namira and Arora: An Introduction to Linear Algebra.

B.A./B.Sc. (Honours) Part III
MECHANICS: MM-311

Unit – I (16 LECTURES) (Revision of resultant coplanar forces at a point, Lami Theorem, Parallel forces), Vector moment of a force, Varignon's Theorem on moments, Resultant of a couple, Resultant of coplanar forces, Equation of the line of action of the resultant, Equilibrium of a rigid body, Conditions of equilibrium of three forces body.

Unit – II: (16 LECTURES) Friction, Law of static and kinetic frictions, Equilibrium of a rigid body on inclined rough plane, Equilibrium of a ladder, Cables, suspension and parabolic cables, Intrinsic and Cartesian equations of a catenary, Sag and span, maximum tension in a cable.

Unit – III: (16 LECTURES) Virtual work, Principle of virtual work, Determination of the tension in a string and thrust in a rod, Solutions of problems involving equilibrium by principle or virtual work, Centre of gravity, Determination of the centre of gravity by integration, Centre of gravity of arcs, plane areas, enclosed areas, solids of revolution and surfaces of revolution, Centre of gravity when density varies.

Unit – IV (16 LECTURES) Kinematics and kinetics, Tangential, normal radial and transverse components of velocity and acceleration, Motion on a projectile without resistance, Projectile motion up and down and inclined plane, Tangent problems, Paraboliod of safety.

Unit – V: (16 LECTURES) Motion in a resisting medium including projectiles, Upward and downward motion in a resisting medium, Motion of particles of varying mass, Central orbits, Stability of circular orbit, Keplar's laws of planetary motion.

Unit – VI: (16 LECTURES) Plane impulsive motion, Direct and oblique impact, Loss of energy during impact, Impact against a fixed plane, Simple Harmonic motion, Motion of a simple pendulum, Uniform circular motion, Conical pendulum, Motion on a smooth curve in a vertical plane, Cycloidal motion.

BOOKS RECOMMEND:

1. Synge and Griffith: Principle of Mechanics.
2. M.A. Pathan: Statics

REFERENCE BOOKS:

1. Johnson and Bear: Vector Mechanics for Engineers.
2. Zafar Ahsan: Lecture Notes on Mechanics.

B.A./B.Sc. (Honours) Part III

SET THEORY, NUMBER THEORY AND DIFFERENTIAL GEOMERTY: MM-312

Unit – I (16 LECTURES) Cartesian product of sets, Equivalence relation and partition, Fundamental theorem of equivalence relation, Equivalent sets, Denumerable sets, Countable sets, Cardial numbers, Power of continuum, Cardinal arithmetic, Inequalities in cardinals, Cantor's theorem.

Unit – II (16 LECTURES) Schrodar Bernstein theorem, Continum hypothesis, partially and totally ordered sets, Similar sets, well-ordered sets, Ordinal numbers, Ordinal arithmetic, well-ordering theorem, Axiom of choice Zorn's lemma.

Unit – III (16 LECTURES) Division algorithm, greatest common divisor, least common multiple prime numbers, unqiue factorization theorem, Relatively prime integers, Euler's function, Congruences, Complete set of residues (mod m), Euler's theorem, ordered of an element (mod m).

Unit – IV (16 LECTURES) Linear congruences, Chinese remainder Theorem, algebraic congruences, (mod p), Lagrange's Theorem, Wilson's Theorem, Algebraic congruences with composite modules.

Unit – V (16 LECTURES) Space curves, Examples, Plane curves, Parameterization of curves (Generalized and natural parameters) change of parameter regular curves and singularities, Contact of curves, Contact of a curve and a plane, Frenet trihedron, Osculating plane, Serret-Frenet formulae, Involutes and Evaluates, Fundamental Theorem for space curves, Surfaces in R^3 – parametric curves on surfaces, Tangent plane, First fundamental form angle between two curves on a surface, Area of a surface.

Unit – IV (16 LECTURES) Second fundamental form on a surface, Gauss and Weingrten formulae, Goddazi equation and Gauss theorem, Curvature of a curve on a surface, Geodesic curvature and normal curvature, Geodesic principal directions and lines of curvature, Rodrigue formula.

BOOKS RECOMMEND:

1. Seymour Lipschutz: Set Theory and Related Topics.
2. J. Hunter: Number Theory
3. David M. Burton: Elementary Number Theory
4. A. Goetz: Differential Geometry, Springer Verlag.
5. S.I. Husain: Lecture notes on Differential Geometry.

B.A./B.Sc. (Honours) Part III

PROGRAMMING IN C AND NUMERICAL ALGORITHMS: MM-313

Unit – I (16 LECTURES) Basic components of a digital computer assembelers, Compliers, Low and high level languages, Choice of method, Algorithm, Flow chart, Conversion of decimal numbers to binary numbers and vice-versa, Addition, subtraction, multiplication and division of binary numbers, Conversion of octal and hexadecimal numbers into decimal and binary numbers and vice-versa.

Unit – II (16 LECTURES) Relative error, Round off error, Inherent error, Truncation error, Character set, C tokens, Keywords, Identifiers, Constants, variable Data type, Declaration and assignment statements. Arithmetic, relational, logical, assignment, increment decrement conditional and special operators, Arithmetic expression, type conversion expression, Input and output operators.

Unit – III (16 LECTURES) If statement and its various forms, Switch statement, Go to statement, WHILE statement, Do statement and its various forms, One and two dimensional arrays.

Unit – IV (16 LECTURES) Character string, String initialization and declaration, String handling functions, Forms of C function, Return values and their types, Calling a function, Category of functions, Handling of non-integer functions, Nesting of functions, Recursion, Functions with arrays, Variables in function, ANSI C Functions.

Unit – V (16 LECTURES) Pointers, Pointers initialization and declaration, Accessing a variable through pointers expressions, Pointer increments and scale factor, Pointers and array, Pointers and character strings, Structure definition, Structure initialization, Comparison of structure variables, Arrays within structures, Structures within structures, Structures and functions.

Unit – VI (16 LECTURES) Gauss elimination and Gauss Seidel method, LU decomposition method, Newton's interpolation formulae, Divided differences, Tropezoidal and Simpson's rule for integration, Three point and five point formulae to approximate the derivative of a function, Euler's and Euler's modified methods, Range – Kutta methods.

BOOKS RECOMMEND:

1. T.C. Bortee: Digital Computer Fundamentals, McGraw Hill Book Company, Singapore, 1985.
2. E. Balagurusamy: Programming in ANSI C, Tata McGraw Hill Publishing Company Limited, 1998.
3. B.S. Gottfied: Theory and Problem of Programming with C, Tata McGraw Hill Publishing Company Limited, 1998.
4. M.K. Jain, S.R.K. Iyenger and R.K. Jain: Numerical methods for Scientific and Engineering Computations, New Age International (P) Ltd., New Delhi, 1995.

B.A./B.Sc. (Honours) Part III
INTEGRAL EQUATIONS AND OPTIMIZATION: MM-314

Unit – I (16 LECTURES) Linear integral Equations of the first and second kind, Volterra and Fredholm integral equations, Relations between differential and integral equations, Solution of Volterra and Fredholm, Integral equations by the methods of successive substitutions and successive approximations, Iterated and resolvent kernels, Neumann series reciprocal functions, Volterra's solutions of Fredholm equations.

Unit – II (16 LECTURES) Fredholm theorems, Fredholm associated equation, Solution of integral equations using Fredholm's determinant and minor, Homogeneous integral equations, Integral equations with separable kernels, The Fredholm alternatives.

Unit – III (16 LECTURES) Symmetric kernels, fundamental theorems on symmetric equations, Hilbert Schmidt Theory for symmetric kernels, solution of symmetric integral equations.

Unit – IV (16 LECTURES) Various definition of O.R., Scope of O.R., Formulation of problems linear programming in matrix notation, Graphical solution of L.P.P. feasible solution, basic solution, basic feasible solution, Optimal solution, degenerate basic feasible solution, Convex set, extreme point of a convex set, convex cone and polarity, Fundamental theorem of linear programming, convex and concave functions and their properties, Differentiable convex function, Simplex method.

Unit – V (16 LECTURES) Big M method, Two phase method, Definition of dual problem, Relationship between primal and optimal solutions, economic interpolation of duality, Dual Simplex method, Primal dual computations, Weak duality theorem, Strong duality theorem, Complementary slackness theorem.

Unit – VI (16 LECTURES) Formulation of transportation problem (T.P.), Determination of the starting solution by North – West – Corner method, least cost method, Vogel's approximation method, Iteration computations of the algorithms (To find optimal solution of T.P.), Formulation of assignment problem, the Mungarian method.

BOOKS RECOMMEND:

1. Integral Equations by Shanti Swarup, Krishna Media (P) Ltd. Meerut, India, 1982.
2. (Reference Book) Linear Integral Equations by W.V. Lovitt, Dover Publications, Inc. New York, 1950.
3. (Practice Book): Mathematical Methods for Physics and Engineering by K.F. Riley, M.P. Hobson and S.T. Bence, Cambridge University Press, U.K., 1997.
4. (Operation Research) An Introduction by H.A. Toha, Macmillan Publishing Company Inc., New York.
5. Nonlinear Programming theory and Algorithms by M.S. Bazarra, H.D. Sheral and C.M. Shetty, John Wiley and Sons, Inc., 1993.