Minutes of the Meeting of Board of Studies

Department of Mathematics

UIET, CSJM University, Kanpur

The Board of Studies, Online meeting (on Google meet) of Department of Mathematics was held on 19/06/2021 at 11:00 am in UIET, CSJM University. The attendees were:

Prof S.S Mishra , Prof A.K Mishra ,Prof R Rawat, Dr. Varsha Gupta , Dr. Alok Kumar and Dr. D.K Singh.

Syllabus of M.Sc. in Mathematics(to be opened this session) was put forward and a discussion was there on it. Certain suggestions were given which were incorporated.

(Prof. S.S Mishra)

(Dr. Varsha Gupta)

(Prof. A.K Mishra)

(Dr. D.K Singh)

(Prof. Rama Rawat)

(Dr. Alok Kumar)

Minutes of the Meeting of Board of Studies

Department of Mathematics

UIET, CSJM University, Kanpur

The Board of Studies, Online meeting (on Google meet) of Department of Mathematics was held on 23/06/2021 at 04:00 pm in UIET, CSJM University. The attendees were:

Prof A.K Mishra , Prof R Rawat, Dr. Varsha Gupta and Dr. D.K Singh.

Syllabus of B.Sc(Hons.) in Mathematics was put forward and a discussion was there on it. Certain suggestions were given which were incorporated.

(Prof. A.K Mishra)

(Dr. Varsha Gupta)

(Prof. Rama Rawat)

(Dr. D.K Singh)

Proposed Scheme for B.Sc.(Hons)Mathematics

Semesters	Core Courses	DSE Courses
I	**BMC-101:**Calculus **BMC-102:**Algebra	
II	**BMC -201:**Multivariable Calculus **BMC -202:** Ordinary Differential Equations	
III	**BMC -301:**Real Analysis **BMC -302:**Group Theory **BMC -303:**Probability and statistics	
IV	**BMC401:**Mechanics **BMC -402:**LinearAlgebra **BMC403:**Partial Differential Equations	
V	**BMC -501:**SetTheoryandMetricSpaces **BMC -502:**AdvancedAlgebra	**(Any Two)** **BMC -503 & 504 (I)-(vi)** **BMC-(i):**Mathematical Logic **BMC-(ii):**Integral Transforms and Fourier Analysis **BMC(iii):**Linear Programming **BMC -(iv):** Information Theory and Coding **BMC -(v):** Graph Theory **BMC(vi):**Special Theory and Relativity
VI	**BMC -601:**ComplexAnalysis **BMC -602:**NumericalAnalysis	**(Any Two)** **BMC-603 & 604 (i)-(viii)** **BMC -(i):** Discrete Mathematics **BMC -(ii):** Number Theory **BMC -(iii):** Mathematical Finance **BMC -(iv) :** C++ Programming for Mathematics **BMC -(v) :**Cryptography

Semester-I

BMC-101: Calculus

Unit-I: Real number system: Completeness axiom, density of rationals (irrationals) in reals, convergence of a sequence, Sandwich theorem, Monotone sequences, Cauchy Criterion, Subsequence, Bolzano-Weierstrass theorem.

Unit-II: Limit and Continuity ε-δ definition of limit of a real valued function, Limit at infinity and infinite limits; Continuity of a real valued function, Properties of continuous functions, Intermediate value theorem, Geometrical interpretation of continuity, Types of discontinuity; Uniform continuity.

Unit-III: Differentiability, Differentiability of a real valued function, Geometrical interpretation of differentiability, Relation between differentiability and continuity, Differentiability and monotonicity, Chain rule of differentiation; Successive differentiation, Leibnitz's theorem.

Unit-IV: Expansions of Functions Maclaurin's and Taylor's theorems for expansion of a function in an infinite series, Taylor's theorem in finite form with Lagrange, Cauchy and Roche–Schlomilch forms of remainder; Maxima and minima.

Unit-V: Curvature, Asymptotes and Curve Tracing Curvature; Asymptotes of general algebraic curves, Parallel asymptotes, Asymptotes parallel to axes; Symmetry, Concavity and convexity, Points of inflection,

References:

1. Howard Anton, I. Bivens & Stephan Davis (2016). Calculus (10th edition). Wiley India.

2. Gabriel Klambauer (1986). Aspects of Calculus. Springer-Verlag.

3. Wieslaw Krawcewicz & Bindhyachal Rai (2003). Calculus with Maple Labs. Narosa.

4. Gorakh Prasad (2016). Differential Calculus (19th edition). Pothishala Pvt. Ltd.

5. George B. Thomas Jr., Joel Hass, Christopher Heil & Maurice D. Weir (2018). Thomas' Calculus (14th edition). Pearson Education.

BMC-102: Algebra

Unit-I: Theory of Equations and Complex Numbers Elementary theorems on the roots of an equations including Cardan's method, The remainder and factor theorems, Synthetic division, Factored form of a polynomial, The Fundamental theorem of algebra, Relations between the roots and the coefficients of polynomial equations, Imaginary roots, Integral and rational roots; Polar representation of complex numbers, The nth roots of unity, De Moivre's theorem for integer and rational indices and its applications.

Unit-II: Relations and Basic Number Theory Relations, Equivalence relations, Equivalence classes; Functions, Composition of functions, Inverse of a function; Finite, countable and uncountable sets; The division algorithm, Divisibility and the Euclidean algorithm, The fundamental theorem of arithmetic, Modular arithmetic and basic properties of congruences; Principles of mathematical induction and well ordering.

Unit-III: Row Echelon Form of Matrices and Applications Systems of linear equations, Row reduction and echelon forms, Linear independence, The rank of a matrix and applications.

Unit-IV: Introduction to linear transformations, The matrix of a linear transformation, Matrix operations, Determinants, The inverse of a matrix, Characterizations of invertible matrices; Applications to Computer Graphics; Eigenvalues and eigenvectors, The characteristic equation and the Cayley–Hamilton theorem.

References:

1. Titu Andreescu, & Dorin Andrica (2014). Complex Numbers from A to...Z. (2nd edition). Birkhäuser.

2. Robert J. T. Bell (1994). An Elementary Treatise on Coordinate Geometry of Three Dimensions. Macmillan India Ltd.

3. D. Chatterjee (2009). Analytical Geometry: Two and Three Dimensions. Narosa Publishing House.

Semester-II

BMC-201: Multivariable Calculus

Unit-I: Partial Differentiation Functions of several variables, Level curves and surfaces, Limits and continuity, Partial differentiation, Tangent planes, Chain rule, Directional derivatives, The gradient, Maximal and normal properties of the gradient, Tangent planes and normal lines.

Unit-II: Differentiation Higher order partial derivatives, Total differential and differentiability, Jacobians, Change of variables, Euler's theorem for homogeneous functions, Taylor's theorem for functions of two variables and more variables, Envelopes and evolutes.

Unit-III: Extrema of Functions and Vector Field Extrema of functions of two and more variables, Method of Lagrange multipliers, Constrained optimization problems, Definition of vector field, Divergence, curl, gradient and vector identities.

Unit-IV: Double and Triple Integrals Double integration over rectangular and nonrectangular regions, Double integrals in polar coordinates, Triple integral over a parallelepiped and solid regions, Volume by triple integrals, Triple integration in cylindrical and spherical coordinates, Change of variables in double and triple integrals, Dirichlet integral.

Unit-V: Green's, Stokes' and Gauss Divergence Theorem Line integrals, Applications of line integrals: Mass and Work, Fundamental theorem for line integrals, Conservative vector fields, Green's theorem, Area as a line integral, Surface integrals, Stokes' theorem, The Gauss divergence theorem.

References:

1. Jerrold Marsden, Anthony J. Tromba & Alan Weinstein (2009). Basic Multivariable Calculus, Springer India Pvt. Limited.

2. James Stewart (2012). Multivariable Calculus (7th edition). Brooks/Cole. Cengage.

3. Monty J. Strauss, Gerald L. Bradley & Karl J. Smith (2011). Calculus (3rd edition). Pearson Education. Dorling Kindersley (India) Pvt. Ltd.

4. George B. Thomas Jr., Joel Hass, Christopher Heil & Maurice D. Weir (2018). Thomas' Calculus (14th edition). Pearson Education.

BMC-202: Ordinary Differential Equations

Unit-I: First Order Differential Equations Basic concepts and genesis of ordinary differential equations, Order and degree of a differential equation, Differential equations of first order and first degree, Equations in which variables are separable, Homogeneous equations, Linear differential equations and equations reducible to linear form, Exact differential equations, Integrating factor, First order higher degree equations solvable for x, y and p. Clairaut's form and singular solutions. Picard's method of successive approximations and the statement of Picard's theorem for the existence and uniqueness of the solutions of the first order differential equations.

Unit-II: Second Order Linear Differential Equations Statement of existence and uniqueness theorem for linear differential equations, General theory of linear differential equations of second order with variable coefficients, Solutions of homogeneous linear ordinary differential equations of second order with constant coefficients, Transformations of the equation by changing the dependent/independent variable, Method of variation of parameters and method of undetermined coefficients, Reduction of order, Coupled linear differential equations with constant coefficients.

Unit-III: Higher Order Linear Differential Equations Principle of superposition for a homogeneous linear differential equation, Linearly dependent and linearly independent solutions on an interval, Wronskian and its properties, Concept of a general solution of a linear differential equation, Linear homogeneous and non-homogeneous equations of higher order with constant coefficients, Euler-Cauchy equation, Method of variation of parameters and method of undetermined coefficients, Inverse operator method.

Unit-IV: Series Solutions of Differential Equations Power series method, Legendre's equation, Legendre polynomials, Rodrigue's formula, Orthogonality of Legendre polynomials, Frobenius method, Bessel's equation, Bessel functions and their properties, Recurrence relations.

References:

1. Belinda Barnes & Glenn Robert Fulford (2015). Mathematical Modelling with Case Studies: A Differential Equation Approach Using Maple and MATLAB (2nd edition). Chapman & Hall/CRC Press, Taylor & Francis.

2. H. I. Freedman (1980). Deterministic Mathematical Models in Population Ecology. Marcel Dekker Inc. 3. Erwin Kreyszig (2011). Advanced Engineering Mathematics (10th edition). Wiley.

Semester-III

BMC-301: Real Analysis

Unit-I: Real Number System Algebraic and order properties of $\mathbb{R}$, Absolute value of a real number; Bounded above and bounded below sets, Supremum and infimum of a nonempty subset of $\mathbb{R}$,The completeness property of $\mathbb{R}$, Archimedean property, Density of rational numbers in $\mathbb{R}$, Definition and types of intervals, Nested intervals property; Neighborhood of a point in $\mathbb{R}$, Open, closed and perfect sets in $\mathbb{R}$, Connected subsets of $\mathbb{R}$, Cantor set and Cantor function.

Unit-II: Sequences of Real Numbers Convergent sequence, Limit of a sequence, Bounded sequence, Limit theorems, Monotone sequences, Monotone convergence theorem, Subsequences, Bolzano–Weierstrass theorem for sequences, Limit superior and limit inferior of a sequence of real numbers, Cauchy sequence, Cauchy's convergence criterion.

Unit-III: Infinite Series Convergence and divergence of infinite series of positive real numbers, Necessary condition for convergence, Cauchy criterion for convergence; Tests for convergence of positive term series; Basic comparison test, Limit comparison test, D'Alembert's ratio test, Cauchy's nth root test, Integral test; Alternating series, Leibniz test, Absolute and conditional convergence, Rearrangement of series and Riemann's theorem.

Unit-IV: Riemann Integration Riemann integral, Integrability of continuous and monotonic functions, Fundamental theorem of integral calculus, First mean value theorem, Bonnet and Weierstrass forms of second mean value theorems.

References:

1. N.L Carothers, Real Analysis, McGraw Hill, NY

2. R. R. Goldberg, Methods of Real Analysis, John Wiley & Sons

3. W. Rudin, Principles of Mathematical Analysis McGraw-Hill Education

BMC-302: Group Theory

Unit-I: Groups and its Elementary Properties Symmetries of a square, Definition and examples of groups including dihedral, permutation and quaternion groups, Elementary properties of groups.

Unit-II: Subgroups and Cyclic Groups Subgroups and examples of subgroups, Cyclic groups, Properties of cyclic groups, Lagrange's theorem, Euler phi function, Euler's theorem, Fermat's little theorem.

Unit-III: Normal Subgroups Properties of cosets, Normal subgroups, Simple groups, Factor groups, Cauchy's theorem for finite abelian groups; Centralizer, Normalizer, Center of a group, Product of two subgroups; Classification of subgroups of cyclic groups.

Unit-IV: Permutation Groups Cycle notation for permutations, Properties of permutations, Even and odd permutations, alternating groups, Cayley's theorem and its applications.

References:

1. Michael Artin (2014). Algebra (2nd edition). Pearson.

2. John B. Fraleigh (2007). A First Course in Abstract Algebra (7th edition). Pearson.

3. Joseph A. Gallian (2017). Contemporary Abstract Algebra (9th edition). Cengage.

4. I. N. Herstein (2006). Topics in Algebra (2nd edition). Wiley India.

5. Nathan Jacobson (2009). Basic Algebra I (2nd edition). Dover Publications.

6. Ramji Lal (2017). Algebra 1: Groups, Rings, Fields and Arithmetic. Springer.

7. I.S. Luthar & I.B.S. Passi (2013). Algebra: Volume 1: Groups. Narosa.

BMC-303: Probability and Statistics

Unit-I: Probability Functions and Moment Generating Function Basic notions of probability, Conditional probability and independence, Baye's theorem.

Unit II: Random variables - Discrete and continuous, Cumulative distribution function, Probability mass/density functions; Transformations, Mathematical expectation, Moments, Moment generating function, Characteristic function.

Unit-III: Univariate Discrete and Continuous Distributions Discrete distributions: Uniform, Bernoulli, Binomial, Negative binomial, Geometric and Poisson; Continuous distributions: Uniform, Gamma, Exponential, Chi-square, Beta and normal; Normal approximation to the binomial distribution.

Unit-IV: Correlation, Regression and Central Limit Theorem The Correlation coefficient, Covariance, Calculation of covariance from joint moment generating function, Independent random variables, Linear regression for two variables, The method of least squares, Bivariate normal distribution, Chebyshev's theorem, Strong law of large numbers, Central limit theorem and weak law of large numbers.

. References:

1. Robert V. Hogg, Joseph W. McKean & Allen T. Craig (2013). Introduction to Mathematical Statistics (7th edition), Pearson Education.

2. Irwin Miller &Marylees Miller (2014). John E. Freund's Mathematical Statistics with Applications (8thedition). Pearson. Dorling Kindersley Pvt. Ltd. India.

3. Jim Pitman (1993). Probability, Springer-Verlag.

4. Sheldon M. Ross (2014). Introduction to Probability Models (11th edition). Elsevier.

5. A. M. Yaglom and I. M. Yaglom (1983). Probability and Information. D. Reidel Publishing Company. Distributed by Hindustan Publishing Corporation (India) Delhi.

Semester-IV

BMC-401: Mechanics

Unit-I: Statics Equilibrium of a particle, Equilibrium of a system of particles, Necessary conditions of equilibrium, Moment of a force about a point, Moment of a force about a line, Couples, Moment of a couple, Equipollent system of forces, Work and potential energy, Principle of virtual work for a system of coplanar forces acting on a particle or at different points of a rigid body, Forces which can be omitted in forming the equations of virtual work.

Unit-II: Centres of Gravity and Common Catenary Centres of gravity of plane area including a uniform thin straight rod, triangle, circular arc, semicircular area and quadrant of a circle, Centre of gravity of a plane area bounded by a curve, Centre of gravity of a volume of revolution; Flexible strings, Common catenary, Intrinsic and Cartesian equations of the common catenary, Approximations of the catenary.

Unit-III: Rectilinear Motion Simple harmonic motion (SHM) and its geometrical representation, SHM under elastic forces, Motion under inverse square law, Motion in resisting media, Concept of terminal velocity, Motion of varying mass.

Unit-IV: Motion in a Plane Kinematics and kinetics of the motion, Expressions for velocity and acceleration in Cartesian, polar and intrinsic coordinates; Motion in a vertical circle, projectiles in a vertical plane and cycloidal motion.

References:

1. S. L. Loney (2006). An Elementary Treatise on the Dynamics of a Particle and of Rigid Bodies. Read Books.

2. P. L. Srivatava (1964). Elementary Dynamics. Ram Narin Lal, Beni Prasad Publishers Allahabad.

3. J. L. Synge & B. A. Griffith (1949). Principles of Mechanics. McGraw-Hill.

4. A. S. Ramsey (2009). Statics. Cambridge University Press.

5. A. S. Ramsey (2009). Dynamics. Cambridge University Press.

6. R. S. Varma (1962). A Text Book of Statics. Pothishala Pvt. Ltd.

BMC-402: Linear Algebra

Unit-I: Vector Spaces Definition and examples, Subspace, Linear span, Quotient space and direct sum of subspaces, Linearly independent and dependent sets, Bases and dimension.

Unit-II: Linear Transformations Definition and examples, Algebra of linear transformations, Matrix of a linear transformation, Change of coordinates, Rank and nullity of a linear transformation and rank-nullity theorem.

Unit-III: Further Properties of Linear Transformations Isomorphism of vector spaces, Isomorphism theorems, Dual and second dual of a vector space, Transpose of a linear transformation, Eigen vectors and eigen values of a linear transformation, Characteristic polynomial and Cayley–Hamilton theorem, Minimal polynomial.

Unit-IV: Inner Product, orthogonality, Cauchy–Schwarz inequality, Gram–Schmidt orthogonalisation, Diagonalisation of symmetric matrices.

References:

1. Stephen H. Friedberg, Arnold J. Insel & Lawrence E. Spence (2003). Linear Algebra (4thedition). Prentice-Hall of India Pvt. Ltd.

2. Kenneth Hoffman & Ray Kunze (2015). Linear Algebra (2nd edition). Prentice-Hall.

3. I. M. Gel'fand (1989). Lectures on Linear Algebra. Dover Publications.

4. Nathan Jacobson (2009). Basic Algebra I & II (2nd edition). Dover Publications.

5. Serge Lang (2005). Introduction to Linear Algebra (2nd edition). Springer India.

6. Vivek Sahai & Vikas Bist (2013). Linear Algebra (2nd Edition). Narosa Publishing House.

7. Gilbert Strang (2014). Linear Algebra and its Applications (2nd edition). Elsevier.

BMC-403: Partial Differential Equations

Unit-I: First Order Partial Differential Equations Order and degree of Partial differential equations (PDE), Concept of linear and non-linear partial differential equations, Partial differential equations of the first order, Lagrange's method, Some special type of equation which can be solved easily by methods other than the general method, Charpit's general method.

Unit-II: Second Order Partial Differential Equations with Constant Coefficients Classification of linear partial differential equations of second order, Homogeneous and nonhomogeneous equations with constant coefficients.

Unit-III: Second Order Partial Differential Equations with Variable Coefficients Partial differential equations reducible to equations with constant coefficient, Second order PDE with variable coefficients, Classification of second order PDE, Reduction to canonical or normal form; Monge's method

Unit IV: Solution of heat and wave equations in one and two dimensions by method of separation of variables.

References:

1. A. S. Gupta (2004). Calculus of Variations with Applications. PHI Learning.

2. Erwin Kreyszig (2011). Advanced Engineering Mathematics (10th edition). Wiley.

3. TynMyint-U & Lokenath Debnath (2013). Linear Partial Differential Equation for Scientists and Engineers (4th edition). Springer India.

4. H. T. H. Piaggio (2004). An Elementary Treatise on Differential Equations and Their Applications. CBS Publishers. 5. S. B. Rao & H. R. Anuradha (1996). Differential Equations with Applications. University Press.

6. Ian N. Sneddon (2006). Elements of Partial Differential Equations. Dover Publications.

Semester-V

BMC-501: Set Theory and Metric Spaces

Unit-I: Theory of Sets Finite and infinite sets, Countable and uncountable sets, Cardinality of sets, Schröder–Bernstein theorem, Cantor's theorem, Order relation in cardinal numbers, Arithmetic of cardinal numbers, Partially ordered set.

Unit-II: Concepts in Metric Spaces Definition and examples of metric spaces, Open spheres and closed spheres, Neighbourhoods, Open sets, Interior, exterior and boundary points, Closed sets, Limit points and isolated points, Interior and closure of a set, Boundary of a set, Bounded sets, Distance between two sets, Diameter of a set, Subspace of a metric space.

Unit-III: Complete Metric Spaces and Continuous Functions Cauchy and Convergent sequences, Completeness of metric spaces, Cantor's intersection theorem, Dense sets and separable spaces, Nowhere dense sets and Baire's category theorem, Continuous and uniformly continuous functions, Homeomorphism, Banach contraction principle.

Unit-IV: Compactness Compact spaces, Sequential compactness, Bolzano–Weierstrass property, Compactness and finite intersection property, Heine–Borel theorem, totally bounded sets, Equivalence of compactness and sequential compactness, Continuous functions on compact spaces.

References:

1. N.L Carothers, Real Analysis, McGraw Hill, NY

2. G. F. Simmons (2004). Introduction to Topology and Modern Analysis. McGraw-Hill

3. E. T. Copson (1988). Metric Spaces. Cambridge University Press.

4. P. K. Jain & Khalil Ahmad (2019). Metric Spaces. Narosa.

BMC-502: Advanced Algebra

Unit-I: Group Actions Group actions, Orbits and stabilizers, Conjugacy classes, Orbit-stabilizer theorem, Normalizer of an element of a group, Center of a group, Class equation of a group, Inner and outer automorphisms of a group.

Unit-II: Sylow Theorems Cauchy's theorem for finite abelian groups, Finite simple groups, Sylow theorems and applications including nonsimplicity tests.

Unit-III: Rings and Fields Definition, examples and elementary properties of rings, Commutative rings, Integral domain, Division rings and fields, Characteristic of a ring, Ring homomorphism and isomorphism, Ideals and quotient rings. Prime, principal and maximal ideals, Relation between integral domain and field, Euclidean rings and their properties, Wilson and Fermat's theorems.

Unit-IV: Polynomial Rings Polynomial rings over commutative ring and their basic properties, The division algorithm; Polynomial rings over rational field, Gauss lemma and Eisenstein's criterion, Euclidean domain, principal ideal domain, and unique factorization domain.

Unit-V: Field Extensions and Finite Fields Extension of a field, Algebraic element of a field, Algebraic and transcendental numbers, Perfect field, Classification of finite fields.

References:

1. I.N Herstein, Topics in Algebra, John Wiley & Sons. New York

2. Michael Artin (2014). Algebra (2nd edition). Pearson.

3. P. B. Bhattacharya, S. K. Jain & S. R. Nagpaul (2003). Basic Abstract Algebra (2nd edition). Cambridge University Press.

4. David S. Dummit & Richard M. Foote (2008). Abstract Algebra (2nd edition). Wiley.

5. John B. Fraleigh (2007). A First Course in Abstract Algebra (7th edition). Pearson.

6. Joseph A. Gallian (2017). Contemporary Abstract Algebra (9th edition). Cengage.

Elective Courses (Any Two)

(BMC-503 & 504 (i)-(vi))

BMC-(i): Mathematical Logic

Unit-I: Syntax of First-order Logic First-order languages, Terms of language, Formulas of language, First order theory.

Unit-II: Semantics of First-order Languages Structures of first order languages, Truth in a structure, Model of a theory, Embeddings and isomorphism.

Unit-III: Propositional Logics Syntax of propositional logic, Semantics of propositional logic, Compactness theorem for propositional logic, Proof in propositional logic, Meta theorem in propositional logic, Post tautology theorem.

Unit-IV: Proof and Meta Theorems in First-order Logic Proof in first-order logic, Meta theorems in first-order logic, Some meta theorem in arithmetic, Consistency and completeness.

Unit-V: Completeness Theorem and Model Theory Completeness theorem, Interpretation in a theory, Extension by definitions, Compactness theorem and applications, Complete theories, Applications in algebra.

References:

1. Richard E. Hodel (2013). An Introduction to Mathematical Logic. Dover Publications.

2. Yu I. Manin (2010). A Course in Mathematical Logic for Mathematicians (2nd edition). Springer.

3. Elliott Mendelson (2015). Introduction to Mathematical Logic (6th edition). Chapman & Hall/CRC.

4. Shashi Mohan Srivastava (2013). A Course on Mathematical Logic (2nd edition). Springer.

BMC-(ii): Integral Transforms and Fourier Analysis

Unit-I: Laplace Transforms Laplace transform, Linearity, Existence theorem, Laplace transforms of derivatives and integrals, Shifting theorems, Change of scale property, Laplace transforms of periodic functions, Dirac's delta function.

Unit-II: Further Properties of Laplace Transforms and Applications Differentiation and integration of transforms, Convolution theorem, Integral equations, Inverse Laplace transform, Lerch's theorem, Linearity property of inverse Laplace transform, Translations theorems of inverse Laplace transform, Inverse transform of derivatives, Applications of Laplace transform in obtaining solutions of ordinary differential equations and integral equations.

Unit-III: Fourier Transforms Fourier and inverse Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier sine and cosine transforms, Linearity property, Change of scale property, Shifting property, Modulation theorem, Relation between Fourier and Laplace transforms.

Unit-IV: Solution of Equations by Fourier Transforms Solution of integral equation by Fourier sine and cosine transforms, Convolution theorem for Fourier transform, Parseval's identity for Fourier transform, Plancherel's theorem, Fourier transform of derivatives, Applications of infinite Fourier transforms to boundary value problems, Finite Fourier transform, Inversion formula for finite Fourier transforms.

Unit-V: Fourier series Fourier cosine and sine series, Fourier series, Differentiation and integration of Fourier series, Absolute and uniform convergence of Fourier series, Bessel's inequality, The complex form of Fourier series.

References: You may see Fourier Series and Integral Transforms by A. Pinkus and S Zafrany.

1. James Ward Brown & Ruel V. Churchill (2011). Fourier series and Boundary Value Problems. McGraw-Hill Education.

2. Charles K. Chui (1992). An Introduction to Wavelets. Academic Press.

3. Erwin Kreyszig (2011). Advanced Engineering Mathematics (10th edition). Wiley.

4. Walter Rudin (2017). Fourier Analysis on Groups. Dover Publications.

5. A. Zygmund (2002).Trigonometric Series (3rd edition). Cambridge University Press.

BMC-(iii): Linear Programming

Unit-I: Linear Programming Problem, Convexity and Basic Feasible Solutions Formulation, Canonical and standard forms, Graphical method; Convex and polyhedral sets, Hyperplanes, Extreme points; Basic solutions, Basic Feasible Solutions, Reduction of feasible solution to basic feasible solution, Correspondence between basic feasible solutions and extreme points.

Unit-II: Simplex Method Optimality criterion, Improving a basic feasible solution, Unboundedness, Unique and alternate optimal solutions; Simplex algorithm and its tableau format; Artificial variables, Two-phase method, Big-M method.

Unit-III: Duality Formulation of the dual problem, Duality theorems, Complimentary slackness theorem, Economic interpretation of the dual, Dual-simplex method.

Unit-IV: Sensitivity Analysis Changes in the cost vector, right-hand side vector and the constraint matrix of the linear programming problem.

Unit-V: Applications Transportation Problem: Definition and formulation, Methods of finding initial basic feasible solutions: Northwest-corner rule, Least- cost method, Vogel approximation method; Algorithm for obtaining optimal solution. Assignment Problem: Mathematical formulation and Hungarian method.

References:

1. Mokhtar S. Bazaraa, John J. Jarvis & Hanif D. Sherali (2010). Linear Programming and Network Flows (4th edition). John Wiley & Sons.

2. G. Hadley (2002). Linear Programming. Narosa Publishing House.

3. Frederick S. Hillier & Gerald J. Lieberman (2015). Introduction to Operations Research (10th edition). McGraw-Hill Education.

4. Hamdy A. Taha (2017). Operations Research: An Introduction (10th edition). Pearson.

5. Paul R. Thie & Gerard E. Keough (2014). An Introduction to Linear Programming and Game Theory (3rd edition). Wiley India Pvt. Ltd.

BMC-(IV): Information Theory and Coding

Unit-I: Concepts of Information Theory Communication processes, A model of communication system, A quantitative measure of information, Binary unit of information, A measure of uncertainty, H function as a measure of uncertainty, Sources and binary sources, Measure of information for two-dimensional discrete finite probability schemes.

Unit-II: Entropy Function A sketch of communication network, Entropy, Basic relationship among different entropies, A measure of mutual information, Interpretation of Shannon's fundamental inequalities; Redundancy, efficiency, and channel capacity; Binary symmetric channel, Binary erasure channel, Uniqueness of the entropy function, Joint entropy and conditional entropy, Relative entropy and mutual information, Chain rules for entropy, Conditional relative entropy and conditional mutual information, Jensen's inequality and its characterizations, The log sum inequality and its applications.

Unit-III: Concepts of Coding Block codes, Hamming distance, Maximum likelihood decoding, Levels of error handling, Error correction, Error detection, Erasure correction, Construction of finite fields, Linear codes, Matrix representation of linear codes, Hamming codes.

Unit-IV: Bounds of Codes Orthogonality relation, Encoding and decoding of linear codes, The singleton bound and maximum distance separable codes, The sphere-packing bound and perfect codes, The Gilbert–Varshamov bound, MacWilliams' identities.

Unit-V: Cyclic Codes Definition and examples of cyclic codes, Generator polynomial and check polynomial, Generator matrix and check matrix, Bose–Chaudhuri–Hocquenghem (BCH) code as a cyclic code.

References:

1. Robert B. Ash, (2014). Information Theory. Dover Publications.

2. Thomas M. Cover & Joy A. Thomas (2013). Elements of Information Theory (2nd edition). Wiley India Pvt. Ltd.

3. Joseph A. Gallian (2017). Contemporary Abstract Algebra (9th edition), Cengage.

4. Fazlollah M. Reza, (2003). An Introduction to Information Theory. Dover Publications.

5. Ron M. Roth (2007). Introduction to Coding Theory. Cambridge University Press.

6. Claude E. Shannon & Warren Weaver (1969). The Mathematical Theory of Communication. The University of Illinios Press.

BMC-(V): Graph Theory

Unit-I: Paths, Circuits and Graph Isomorphisms Definition and examples of a graph, Subgraph, Walks, Paths and circuits; Connected graphs, disconnected graphs and components of a graph; Euler and Hamiltonian graphs, Graph isomorphisms, Adjacency matrix and incidence matrix of a graph, Directed graphs and their elementary properties.

Unit-II: Trees and Fundamental Circuits Definition and properties of trees, Rooted and binary trees, Cayley's theorem on a counting tree, Spanning tree, Fundamental circuits, Minimal spanning trees in a connected graph.

Unit-III: Cut-Sets and Cut-Vertices Cut-set of a graph and its properties, Fundamental circuits and cut-sets, Cut-vertices, Connectivity and separability, Network flows, 1- isomorphism and 2-isomorphism.

Unit-IV: Planar Graphs Planar graph, Euler theorem for a planar graph, Various representations of a planar graph, Dual of a planar graph, Detection of planarity, Kuratowski's theorem.

References:

1. R. Balakrishnan & K. Ranganathan (2012). A Textbook of Graph Theory. Springer.

2. Narsingh Deo (2016). Graph Theory with Applications to Engineering and Computer Science. Dover Publications.

3. Reinhard Diestel (2017). Graph Theory (5th edition). Springer.

4. Edgar G. Goodaire & Michael M. Parmenter (2018). Discrete Mathematics with Graph Theory (3rd edition). Pearson.

5. Douglas West (2017). Introduction to Graph Theory (2nd edition). Pearson.

BMC-(VI): Special Theory of Relativity

Unit-I: Newtonian Mechanics Inertial frames, Speed of light and Gallilean relativity, Michelson–Morley experiment, Lorentz–Fitzgerold contraction hypothesis, Relative character of space and time, Postulates of special theory of relativity, Lorentz transformation equations and its geometrical interpretation, Group properties of Lorentz transformations.

Unit-II: Relativistic Kinematics Composition of parallel velocities, Length contraction, Time dilation, Transformation equations for components of velocity and acceleration of a particle and Lorentz contraction factor.

Unit-III: Geometrical representation of space-time Four dimensional Minkowskian space-time of special relativity, Time-like, light-like and space-like intervals, Null cone, Proper time, World line of a particle, Four vectors and tensors in Minkowiskian space-time.

Unit-IV: Relativistic Mechanics Variation of mass with velocity. Equivalence of mass and energy. Transformation equations for mass momentum and energy. Energy-momentum four vector. Relativistic force and Transformation equations for its components. Relativistic equations of motion of a particle.

References:

1. James L. Anderson (1973). Principles of Relativity Physics. Academic Press.

2. Peter Gabriel Bergmann (1976). Introduction to the Theory of Relativity. Dover Publications.

3. C. Moller (1972). The Theory of Relativity (2nd edition). Oxford University Press.

4. Robert Resnick (2007). Introduction to Special Relativity. Wiley.

5. Wolfgang Rindler (1977). Essential Relativity: Special, General, and Cosmological. Springer-Verlag.

6. V. A. Ugarov (1979). Special Theory of Relativity. Mir Publishers, Moscow.

Semester-VI

BMC-601: Complex Analysis

Unit-I: Complex Plane and functions. Complex numbers and their representation, algebra of complex numbers; Complex plane, Open set, Domain and region in complex plane; Stereographic projection and Riemann sphere; Complex functions and their limits including limit at infinity; Continuity, Linear fractional transformations and their geometrical properties.

Unit-II: Analytic Functions and Cauchy–Riemann Equations Differentiability of a complex valued function, Cauchy–Riemann equations, Harmonic functions, necessary and sufficient conditions for differentiability, Analytic functions; Analyticity and zeros of exponential, trigonometric and logarithmic functions; Branch cut and branch of multi-valued functions.

Unit-III: Cauchy's Theorems and Fundamental Theorem of Algebra Line integral, Path independence, Complex integration, Green's theorem, Anti-derivative theorem, Cauchy–Goursat theorem, Cauchy integral formula, Cauchy's inequality, Derivative of analytic function, Liouville's theorem, Fundamental theorem of algebra, Maximum modulus theorem and its consequences.

Unit-IV: Power Series Sequences, series and their convergence, Singularities, Taylor series and Laurent series of analytic functions, Power series, Radius of convergence, Integration and differentiation of power series, Absolute and uniform convergence of power series.

References:

1. Lars V. Ahlfors (2017). Complex Analysis (3rd edition). McGraw-Hill Education.

2. Joseph Bak & Donald J. Newman (2010). Complex Analysis (3rd edition). Springer.

3. James Ward Brown & Ruel V. Churchill (2009). Complex Variables and Applications (9th edition). McGraw-Hill Education.

4. John B. Conway (1973). Functions of One Complex Variable. Springer-Verlag.

5. E.T. Copson (1970). Introduction to Theory of Functions of Complex Variable. Oxford University Press. 6. Theodore W. Gamelin (2001). Complex Analysis. Springer-Verlag.

7. George Polya & Gordon Latta (1974). Complex Variables. Wiley.

BMC-602: Numerical Analysis

Unit-I: Numerical Methods for Solving Algebraic and Transcendental Equations Round-off error and computer arithmetic, Local and global truncation errors, Algorithms and convergence; Bisection method, False position method, Fixed point iteration method, Newton's method and secant method for solving equations.

Unit-II: Numerical Methods for Solving Linear Systems Partial and scaled partial pivoting, Lower and upper triangular (LU) decomposition of a matrix and its applications, Thomas method for tri-diagonal systems; Gauss–Jacobi, Gauss–Seidel and successive over-relaxation (SOR) methods.

Unit-III: Interpolation Lagrange and Newton interpolations, Piecewise linear interpolation, Cubic spline interpolation, Finite difference operators, Gregory–Newton forward and backward difference interpolations.

Unit-IV: Numerical Differentiation and Integration First order and higher order approximation for first derivative, Approximation for second derivative; Numerical integration: Trapezoidal rule, Simpson's rules and error analysis, Richardson extrapolation.

Unit-V: Initial and Boundary Value Problems of Differential Equations Euler's method, Runge–Kutta methods.

References:

1. Brian Bradie (2006), A Friendly Introduction to Numerical Analysis. Pearson.

2. C. F. Gerald & P. O. Wheatley (2008). Applied Numerical Analysis (7th edition), Pearson Education, India.

3. F. B. Hildebrand (2013). Introduction to Numerical Analysis: (2nd edition). Dover Publications.

4. M. K. Jain, S. R. K. Iyengar & R. K. Jain (2012). Numerical Methods for Scientific and Engineering Computation (6th edition). New Age International Publishers.

5. Robert J. Schilling & Sandra L. Harris (1999). Applied Numerical Methods for Engineers Using MATLAB and C. Thomson-Brooks/Cole.

Elective Courses (Any two)

BMC-603 &604 (i)-(vi)

BMC-(i): Discrete Mathematics

Unit-I: Partially Ordered Sets Definitions, examples and basic properties of partially ordered sets (poset), Order isomorphism, Hasse diagrams, Dual of a poset, Duality principle, Maximal and minimal elements, Least upper bound and greatest upper bound, Building new poset, Maps between posets.

Unit-II: Boolean Algebras and Switching Circuits Boolean algebras, De Morgan's laws, Boolean homomorphism, Representation theorem; Boolean polynomials, Boolean polynomial functions, Disjunctive and conjunctive normal forms, Minimal forms of Boolean polynomials, Karnaugh diagrams, Switching circuits and applications.

Unit-III: Finite-State and Turing Machines Finite-state machines with outputs, and with no output; Deterministic and nodeterministic finite-state automaton; Turing machines: Definition, examples, and computations.

Unit-IV: Graphs Definition, examples and basic properties of graphs, Königsberg bridge problem; Subgraphs, Pseudographs, Complete graphs, Bipartite graphs, Isomorphism of graphs, Paths and circuits, Eulerian circuits, Hamiltonian cycles, Adjacency matrix, Weighted graph, Travellingsalesman problem, Shortest path and Dijkstra's algorithm..

References:

1. B. A. Davey & H. A. Priestley (2002). Introduction to Lattices and Order (2nd edition). Cambridge University Press.

2. Edgar G. Goodaire & Michael M. Parmenter (2018). Discrete Mathematics with Graph Theory (3rd edition). Pearson Education.

3. Rudolf Lidl & Günter Pilz (1998). Applied Abstract Algebra (2nd edition). Springer.

4. Kenneth H. Rosen (2012). Discrete Mathematics and its Applications: With Combinatorics and Graph Theory (7th edition). McGraw-Hill.

5. C. L. Liu (1985). Elements of Discrete Mathematics (2nd edition). McGraw-Hill.

BMC-(ii): Number Theory

Unit-I: Distribution of Primes and Theory of Congruencies Linear Diophantine equation, Prime counting function, Prime number theorem, Goldbach conjecture, Twin-prime conjecture, Odd perfect numbers conjecture, Fermat and Mersenne primes, Congruence relation and its properties, Linear congruence and Chinese remainder theorem, Fermat's little theorem, Wilson's theorem.

Unit-II: Number Theoretic Functions Number theoretic functions for sum and number of divisors, Multiplicative function, The Möbius inversion formula, Greatest integer function, Euler's phi-function and properties, Euler's theorem.

Unit-III: Primitive Roots Order of an integer modulo n, Primitive roots for primes, Composite numbers having primitive roots; Definition of quadratic residue of an odd prime, Euler's criterion.

Unit-IV: Quadratic Reciprocity Law The Legendre symbol and its properties, Quadratic reciprocity, Quadratic congruencies with composite moduli.

References:

1. David M. Burton (2007). Elementary Number Theory (7th edition). McGraw-Hill. UGC DOCUMENT ON LOCF MATHEMATICS 58

2. Gareth A. Jones & J. Mary Jones (2005). Elementary Number Theory. Springer.

3. Neville Robbins (2007). Beginning Number Theory (2nd edition). Narosa.

4. I.Niven (2012). An Introduction to the Theory of Numbers (5th edition). John Wiley & Sons.

5. Neal Koblitz (1994). A Course in Number Theory and Cryptography (2nd edition). Springer-Verlag.

BMC-(iii): Mathematical Finance

Unit-I: Basic Theory of Interest and Fixed-Income Securities Principal and interest: simple, compound and continuous; Present and future value of cash flow streams; Net present value, Internal rates of return and their comparison; Inflation, Annuities; Bonds, Bond prices and yields, Macaulay duration and modified duration.

Unit-II: Term Structure of Interest Rates, Bonds and Derivatives Spot rates, forward rates and explanations of term structure; Running present value, Floatingrate bonds, Immunization, Convexity; Putable and callable bonds; Exchange-traded markets and over-the-counter markets; Derivatives: Forward contracts, Future contracts, Options, Types of traders, Hedging, Speculation, Arbitrage.

Unit-III: Mechanics of Options Markets No-arbitrage principle, Short selling, Forward price for an investment asset; Types of options: Call and put options, Option positions, Underlying assets, Factors affecting option prices, Upper and lower bounds for option prices, Put-call parity, Effect of dividends.

Unit-IV: Stochastic Analysis of Stock Prices and Black–Scholes Model Binomial option pricing model, Risk neutral valuation: European and American options on assets following binomial tree model; Lognormal property of stock prices, Distribution of rate of return, Expected return, Volatility, Estimating volatility from historical data, Extension of risk-neutral valuation to assets following geometric Brownian motion, Black–Scholes formula for European options.

Unit-V: Hedging Parameters, Trading Strategies and Swaps Hedging parameters: Delta, gamma, theta, rho and vega; Trading strategies involving options, Swaps, Mechanics of interest rate swaps, Comparative advantage argument, Valuation of interest rate swaps, Currency swaps, Valuation of currency swaps.

References:

1. John C. Hull & Sankarshan Basu (2018). Options, Futures and Other Derivatives (10th edition). Pearson Education.

2. David G. Luenberger (2013). Investment Science (2nd edition). Oxford University Press.

3. Sheldon M. Ross (2011). An Elementary Introduction to Mathematical Finance (3rd edition). Cambridge University Press.

BMC-(IV): C++Programming for Mathematics

Unit-I: C++ Essentials Fundamentals of programming, Organization of logic flow in stored program model of computation, C++ as a general purpose programming language, Structure of a C++ program, Common compilers and IDE's, Basic data-types, Variables and literals in C++, Operators, Expressions, Evaluation precedence and type compatibility; Outline of program development in C++, Debugging and testing; Applications: Greatest common divisor and random number generation.

Unit-II: Structured Data Structured data-types in C++, Arrays and manipulating data in arrays; Objects and classes: Information hiding, modularity, constructors and destructors, methods and polymorphism; Applications: Factorization of an integer, Euler's totient, Images in Cartesian geometry using points in two & three dimensions, Pythagorean triples.

Unit-III: Containers and Templates Containers and Template Libraries: Sets, iterators, multisets, vectors, maps, lists, stacks and queues; Applications: Basic set algebra, modulo arithmetic and congruence's, projective plane, permutations, monotone sequences and polynomials.

References:

1. Nell Dale & Chip Weems (2013).Programming and Problem Solving with C++ (6th edition). Jones & Bartlett Learning.

2. Peter Gottschling (2016). Discovering Modern C++: An Intensive Course for Scientists, Engineers, and Programmers. Pearson.

3. Nicolai M. Josuttis (2012). The C++ Standard Library: A Tutorial and Reference (2nd edition). Addison-Wesley, Pearson.

4. Donald E. Knuth (1968). The Art of Computer Programming. Addison-Wesley.

BMC-(v): Cryptography

Unit I: Introduction to Cryptography and Classical Cryptography Cryptosystems and basic cryptographic tools: Secret-key cryptosystems, Public-key cryptosystems, Block and stream ciphers, Hybrid cryptography, Message integrity: Message authentication codes, Signature schemes, Nonrepudiation, Certificates, Hash functions, Cryptographic protocols, Security; Hybrid cryptography: Message integrity, Cryptographic protocols, Security, Some simple cryptosystems, Shift cipher, Substitution cipher, Affine cipher, Vigenère cipher, Hill cipher, Permutation cipher, Stream ciphers, Cryptanalysis of affine, substitution, Vigenère, Hill and LFSR stream ciphers.

Unit-II: Cryptographic Security, Pseudo Randomness and Symmetric Key Ciphers Shannon's theory, Perfect secrecy, Entropy, Spurious keys and unicity distance; Bit generators, Security of pseudorandom bit generators. Substitution-permutation networks, Data encryption standard (DES), Description and analysis of DES; Advanced encryption standard (AES), Description and analysis of AES; Stream ciphers, Trivium.

Unit-III: Basics of Number Theory and Public-Key Cryptography Basics of number theory; Introduction to public-key cryptography, RSA cryptosystem, Implementing RSA; Primality testing, Legendre and Jacobi symbols, Solovay–Strassen algorithm, Miller–Rabin algorithm; Square roots modulo n, Factoring algorithms, Pollard p – 1 algorithm, Pollard rho algorithm, Dixon's random squares algorithm, Factoring algorithms in practice; Rabin cryptosystem and its security.

Unit-IV: More on Public-Key Cryptography Basics of finite fields; ElGamal cryptosystem, Algorithms for the discrete logarithm problem, Shanks' algorithm, Pollard rho discrete logarithm algorithm, Pohlig–Hellman UGC DOCUMENT ON LOCF MATHEMATICS 64 algorithm; Discrete logarithm algorithms in practice, Security of ElGamal systems, Bit security of discrete logarithms.

Unit-V: Hash Functions and Signature Schemes Hash functions and data integrity, SHA-3; RSA signature scheme, Security requirements for signature schemes, Signatures and Hash functions, ElGamal signature scheme, Security of ElGamal signature scheme, Certificates.

References:

1. Jeffrey Hoffstein, Jill Pipher & Joseph H. Silverman (2014). An Introduction to Mathematical Cryptography (2nd edition). Springer.

2. Neal Koblitz (1994). A Course in Number Theory and Cryptography (2nd edition). Springer-Verlag.

3. Christof Paar & Jan Pelzl (2014). Understanding Cryptography. Springer.

GM101: Differential & Integral Calculus

Unit I: Differential Calculus: Differentiability and differentials. Successive differentiation and Leibnitz Theorem. Statement of Rolle's Theorem. Mean Value Theorem, Taylor and Maclaurin's Theorems, indeterminate forms. Limits and continuity of functions of two variables.

Unit-II Partial Differentiation: Definition of Partial derivatives. Euler's Theorem on homogeneous functions, total derivative of composite & implicit functions, Errors and approximations.

Unit-III Applications: Asymptotes. Curvature, Concavity, convexity and points of inflection. Extreme Points. Envelopes. Curve tracing, Tracing of Cartesian, Polar Curves,

Unit-IV Integral Calculus: Integration, Beta and Gamma Functions ,Application of Integral Calculus: Quadrature, Area, length of arc, Arc length as a parameter. Multiple Integrals: Definitions, Double integrals, Triple Integral.

References:

1. Shanti Nayaran, Differential Calculus, ShyamLal Charitable Trust, Delhi, 2002. 2. Shanti Nayaran, Integral Calculus, ShyamLal Charitable Trust, Delhi, 2002.

3. N. Piskunov, Differential Calculus & Integral Calculus, Vol. 1 and II, Mir Pub., 1981.

4. C.B. Thomas, Calculus and Analytical Geometry, Narosa Pub., Delhi, 1996.

5. N. Piskunov, Differential Calculus & Integral Calculus, Vol. 1 and II, Mir Pub., 1981.

6.R.Courant, and JohnF., Introduction to Calculus and Analysis, Volume I, Spring.

GM102: Linear Algebra & Differential Equations:

Unit-I Matrix Algebra**:** Types of matrices-Orthogonal Symmetric, Skew-Symmetric, Hermitian, Skew-Hermitian, Unitary matrices and their elementary properties, Elementary row operations and their use in finding rank, Inverse of a matrix, Solution of system of linear equations (using Rank). eigen values and eigen vectors, Cayley – Hamilton theorem, Diagonalization of a matrix.

Unit-II Vector Space: Vector Space, linear span, basis, Linear dependence and independence of vectors, linear transformation.

Unit-III ODE of first order: Formation of ODE, Variable separable, Homogenous differential equation, Exact, integrating factors for converting to exact differential equation, Linear differential equation and Bernoulli's differential equation,

Unit-IV ODE of second order: Solution of linear differential equations with constant coefficients, Euler Cauchy equation, Solution by changing dependent & independent variable, Method of variation of parameters.

Unit – V ODE of higher order: Matrix method

References:

1. E. Krezig, Advance Engineering Mathematics, John Wiley & Sons, 2005

2. B.S Grewal, Higher Engineering Mathematics, Khanna Publishers , 2005

3. G.F Simmons, Differential Equations,Tata McGraw-Hill, PublishingCompany Ltd, 1981

GM103: Integral Transforms

Unit-I Laplace Transform: Existence of Laplace Transform, Function of exponential order, a function of Class A, Laplace Transform of some elementary function, First and Second translation, change of scale property, Laplace transform of the derivative, Laplace transform of Integral, Multiplication, Division, Periodic function.

Unit-II Inverse Laplace Transform: Null Function, Lerch's Theorem, first and second Translation, Change of scale, Derivatives, Integrals, Multiplication, Division, Convolution Theorem, Heaviside's expansion, The complex inversion formula.

Unit-III Applications: Solution of Ordinary Differential equations. Solution of Simultaneous Ordinary differential equation.

Unit-IV Fourier Transform: Fourier Transform, Convolution, Relation between Fourier and Laplace Transform, Parseval's Identity for Fourier Transform, Fourier Transform of derivative of function, Finite Fourier Transform

Unit-V Application of Fourier transform: Solution of Initial and Boundary value problems using fourier transform and finite fourier Transform

Book Recommended:

1. Ian N Senddon: The Use of Integral Transform, McGraw Hill, 1972.

2.L. Dobanth and D. Bhatta: Integral Transforms and Their Applications, 2nd edition, Taylor and Francis Group.

3. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons 2011.

GM104: Statistics

Unit-I Descriptive Statistics: Measurement scales, primary and secondary data, Methods of Collection of primary data, methods of data representation, text, tabular, diagrammatic and graphical representation. Frequency distribution and principles governing their representation, graphical representation of frequency distributions.

Unit-II Measures of central tendency and their properties, uses and limitations, partition values: quartiles, deciles and percentiles. Dispersion and its various measures with their properties and uses, coefficient of variation. Central and raw moments up to fourth order, skewness, kurtosis and their measures.

Unit-III Bivariate Data: Scatter diagram, correlation, product moment correlation coefficient, regression lines and their uses, rank correlation, concept of multiple correlation and partial correlation in case of three variables.

Unit- IV Concept of probability, classical and statistical definition of probability, additive and multiplicative theorems of probability, conditional probability and Baye's theorem. Random variable: Elementary idea of probability mass function, probability density function and distribution function. Binomial, Poisson and normal distributions with their properties and applications.

References:

1.Robert.S Witte & John S. Witte, Statistics, John Wiley

2. P.C Tulsian , Business Statistics, S.Chand & company 2000

3. M.Spigel, L.Stephens, Schaum's Outline Statistics, McGraw-Hill,2018