

B.SC. HONOURS (MATHS)

II SEMESTER

PAPER-I (MH-201) GRAPH THEORY

UNIT I: Graph Theory- Basic Terminology, Multi graphs, Weighted Graphs, Shortest paths.

UNIT II: Union, Join, Product, and composition of graphs,. Digraphs- Simple Digraph, Symmetric & Asymmetric Digraph and Complete Digraph.

PAPER-II (MH-202) CALCULUS-II

UNIT I: Asymptotes, Multiple points, Curve tracing of standard curves (Cartesian and polar curves).

PAPER-III (MH-203) OPTIMIZATION THEORY

UNIT I: The linear programming problem formulation. L.P.P. matrix notation. Graphical solution of linear programming problems. Basic solution. Some basic properties of convex sets, Theorems based on convex sets.

PAPER-IV (MH-204) NUMBERS THEORY-II

UNIT I: Number theoretic functions, the multiplicative function. The function, The Mobius function, Greatest integer function, Euler's function, properties of function. Application to the Calendar.

IV SEMESTER

PAPER-I (MH-401) ADVANCED ANALYSIS AND METRIC SPACE

UNIT I: Sequence and series of functions- Point wise and Uniform Convergence, Cauchy's Criterion, Weierstrass M- Test, Abel's Test, Dirichlet's test for Uniform Convergence of series of function. Uniform convergence and continuity of series of functions, Term by Term Differentiation and Integration.

PAPER-II (MH-402) DIFFERENTIAL EQUATION – II

UNIT I: Linear Differential Equation of second order, Linear Independence of solutions, Solution by transformation of the equations by changing the dependent variable/ independent variables, Factorization of Operators, Method of Variation of parameters, Method of undetermined coefficients.

PAPER-III (MH-403) ADVANCED NUMERICAL ANALYSIS

UNIT I: Numerical solution of algebraic and transcendental equations. Bisection method, Regula-Falsi method, Method of iteration, Newton-Raphson method.

UNIT III: Solutions of ordinary differential equations of first order with initial and boundary conditions using Picard's, Euler's methods and Taylor's Series method.

PAPER-IV (MH-404) OPERATIONS RESEARCH-II

Unit IV: Sequencing Models: Sequencing Problems, Processing n jobs through two machines. Processing n jobs through three machines. Processing two through m machines, processing n jobs through shortest cyclic Route models. Minimal path problem (shortest Acyclic Route Models).

VI SEMESTER

PAPER-I (MH-601) ABSTRACT ALGEBRA-II

UNIT I: Ideals and Quotient Ring, Maximal ideal and Prime ideal, Principal Ideal domain.

UNIT II: Field of quotients of an integral domain, Prime fields.

PAPER-II (MH-602) COMPLEX ANALYSIS – II

UNIT II: Taylor's theorem. Laurent's theorem, Maximal modulus theorem, Singularities of an analytic function.

PAPER-III (MH-603) MECHANICS

UNIT I: Catenary, Virtual Work, Friction.

UNIT II: General conditions of equilibrium of rigid body under several coplanar forces, Envelope of the paths of a projectile.

PAPER-IV (MH-604) STATISTICS-II

UNIT I: Probability - Introduction, definitions, events, algebra of events, Bernoulli's trials, Probability, conditional probability, Theorem of Total Probability, Baye's theorem.

UNIT II: Random variable & their event space, probability distribution, probability generating function, expectations, moments

B.Sc. pass course

Semester – II

PAPER- I GRAPH THEORY

UNIT I: Graph Theory- Basic Terminology, Multi graphs, Weighted Graphs, Shortest paths

UNIT II: Union, Join, Product, and composition of graphs,. Digraphs- Simple Digraph, Symmetric & Asymmetric Digraph and Complete Digraph

PAPER – II CALCULUS-II

UNIT I: Asymptotes, Multiple points, Curve tracing of standard curves (Cartesian and polar curves).

Semester – IV

Paper –I ADVANCED ANALYSIS AND METRIC SPACE

UNIT I: Sequence and series of functions- Point wise and Uniform Convergence, Cauchy's Criterion, Weierstrass M- Test, Abel's Test, Dirichlet's test for Uniform Convergence of series of function. Uniform convergence and continuity of series of functions, Term by Term Differentiation and Integration.

PAPER – II DIFFERENTIAL EQUATION-II

UNIT I: Linear Differential Equation of second order, Linear Independence of solutions, Solution by transformation of the equations by changing the dependent variable/ independent variables, Factorization of Operators, Method of Variation of parameters, Method of undetermined coefficients.

Semester –VI

PAPER – I ABSTRACT ALGEBRA-II

UNIT I: Ideals and Quotient Ring, Maximal ideal and Prime ideal, Principal Ideal domain.

UNIT II: Field of quotients of an integral domain, Prime fields.

Paper – II: COMPLEX ANALYSIS-II

UNIT II: Taylor's theorem. Laurent's theorem, Maximal modulus theorem, Singularities of an analytic function.

SEMESTER - II

MAT 201: Algebra II

Unit - 1

Linear transformation of vector spaces, Dual spaces, Dual basis and their properties, Dual maps, Annihilator.

MAT 202: Topology

Unit - 1

Topological spaces, Open sets, Closed sets, Neighbourhood system.

Unit – 2

Continuous mapping and Homeomorphism.

MAT 203: Differential Equation-II

Unit - 1

Classification of linear partial differential equation of second order, Canonical forms,

Unit - 2

Linear homogeneous boundary value problem, Eigen values and eigen functions, Sturm-Liouville boundary value problems, orthogonality of eigen functions,

Unit - 3

Method of separation of variables, Laplace, wave and diffusion equations.

MAT 204: Riemannian Geometry and Tensor Analysis

Unit - 2

Tensor Analysis– Kronecker delta. Contravariant and Covariant tensors, Symmetric tensors, Quotient law of tensors, Relative tensor. Riemannian space. Metric tensor, Indicator, Permutation symbols and Permutation tensors.

MAT 205: Hydrodynamics

Unit - 1

Kinematics of ideal fluid. Lagrange's and Euler's methods. Equation of continuity in Cartesian, cylindrical and spherical polar coordinates. Boundary surface.

Unit - 2

Stream-lines, path-lines and streak lines, velocity potential, irrotational motion.

MAT 206 : Special Functions- II

Unit - 1

Bessel functions $J_n(x)$.

SEMESTER – IV

MAT 401: Functional Analysis II and Advanced Calculus

Unit – 1

Adjoint of an operator on a Hilbert space. Self-adjoint, Positive, Normal and Unitary and their properties. Projection on a Hilbert space. Invariance. Reducibility. Orthogonal projections.

MAT 402: Viscous Fluid Dynamics – II

Unit – 1

Concept of unsteady flow, Flow due to plane wall suddenly set in the motion (Stokes' first problem), Flow due to an oscillating plane wall (Stokes' second problem), Starting flow in plane Couette motion, Suction/injection through porous wall.

Unit - 2

Equation of energy, Temperature distribution: Between parallel plates, in a pipe, between two concentric rotating cylinders.

MAT C02: Mathematical Programming – II

Unit – 1

Convex function, Quadratic forms, constrained problem of maxima and minima, Lagrangian method, Non-linear programming: Formulation and Graphical method.

MAT E02: Integral Equations

Unit – 1

Linear integral equations– Definition and classification. Conversion of initial and boundary value problems to an integral equation. Eigen values and Eigen functions. Solution of homogeneous and general Fredholm integral equations of second kind with separable kernels.

MAT F02: General Relativity & Cosmology

Unit - 1

Mach's principle, Newtonian approximation of equation of motion, Einstein's field equation for matter and empty space, Reduction of Einstein's field equation to Poisson's equation, Removal of clock paradox in General Relativity.

Unit - 2

Schwarzschild exterior metric, its isotropic form, Singularity and singularities in Schwarzschild exterior metric, Derivation of the formula $GM = c^2m$, Mass of sun in gravitational unit, Relativistic differential equation for the orbit of the planet.

MAT G02: Numerical Analysis – II

Unit – 1

Curve Fitting and Function Approximations – Least square error criterion. Linear regression. Polynomial fitting and other curve fittings, Approximation of functions by Taylor series and Chebyshev polynomials.

Unit – 2

Numerical solution of Ordinary differential Equations – Taylor series Method, Picard method, Runge- Kutta methods upto fourth order.