**LESSON PLAN**

**OF**

**MATHEMATICS DEPT.**

**UG/PG Courses**

**Odd Semester**



**2023-24**

**INDIRA GANDHI (PG) MAHILA MAHAVIDYALAYA**

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**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:- MM-401: Advanced Abstract Algebra-I**

**Class:- M.Sc. Mathematics 1st sem. Session:-2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 21August-26August | Automorphisms and Inner automorphisms of a group G. The groups Aut(G) and Inn(G). Automorphism group of a cyclic group. |
| 2 | 28August-2 September | Normalizer and Centralizer of a non-empty subset of a group G. Conjugate elements and conjugacy classes. Class equation of a finite group G and its applications. Derived group (or a commutator subgroup) of a group G. perfect groups. Zassenhau’s Lemma. |
| 3 | 4 September- 9 September | Normal and Composition series of a group G. Scheier’s refinement theorem. Jordan Holder theorem. Composition series of groups of order pn and of Abelian groups. |
| 4 | 11 September – 16September | Caunchy theorem for finite groups. ∏ - groups and pgroups. Sylow ∏-subgroups and Sylow p-subgroups. Sylow’s Ist, IInd and IIIrd theorems. Application of Sylow theory to groups of smaller orders. |
| 5 | 18 September -23September | Characteristic of a ring with unity. Prime fields Z/pZ and Q. Field extensions. Degree of an extension. |
| 6 | 25 September – 30September | Algebraic and transcendental elements. Simple field extensions. Minimal polynomial of an algebraic element..Conjugate elements. Algebraic extensions. Finitely generated algebraic extensions. |
| 7 | 3 October- 7 October | Algebraic closure and algebraically closed fields. Splitting fields., finite fields.. Normal extensions.Separable elements, separable polynomials and separable extensions. |
| 8 | 9 October -14 October | Theorem of primitive element. Perfect fields. Galois extensions. Galois group of an extension. Dedekind lemma |
| 9 | 16 October-21 October | Fundamental theorem of Galois theory. Frobenius automorphism of a finite field. |
| 10 | 23 October-28 October | Klein’s 4-group and Diheadral group. Galois groups of polynomials. Fundamental theorem of Algebra. |
| 11 | 30 October-4 November | Solvable groups Derived series of a group G. Simplicity of the Alternating group An (n>5). Non-solvability of the symmetric group Sn |
| 12 | 6 November - 9 November | Alternating group An (n>5). Roots of unity Cyclotomic polynomials and their irreducibility over Q Radicals extensions. Galois radical extensions. |
| 13 | 17 November-24 November | Cyclic extensions. Solvability of polynomials by radicals over Q. Symmetric functions and elementary symmetric functions. . Construction with ruler and compass only. |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name: MM-402 REAL ANALYSIS-I**

**Class:- MSc –1st Sem. Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 21August-26August | Definition and existence of Riemann Stieltjes integral, properties of the integral. |
| 2 | 28August-2 September | Integration by parts, integration of vector-valued functions, Rectifiable curves. |
| 3 | 4 September- 9 September | Integration by parts, integration of vector-valued functions, Rectifiable curves..Pointwise and uniform convergence, Cauchy criterion for uniform convergence. |
| 4 | 11 September – 16September | Weirstrass M-test, Abel’s test and Dirichlet’s test for uniform convergence.uniform convergence and continuity, uniform convergence and Riemann Stieltjes integration |
| 5 | 18 September -23September | uniform convergence and differentiation, existence of a real continuous nowhere differentiable function |
| 6 | 25 September – 30September | Equicontinous families of functions, Weierstrass approximation theorem |
| 7 | 3 October- 7 October | Functions of several variables : linear transformations, Derivative in an open subset of Rn |
| 8 | 9 October -14 October | Chain rule, Partial derivatives, directional derivatives, the contraction principle .Inverse function theorem, Implicit function theorem, Jacobians, extremum problems with constraints |
| 9 | 16 October-21 October | Lagrange’s multiplier method, Derivatives of higher order, mean value theorem for real functions of two variables |
| 10 | 23 October-28 October | Interchange of the order of differentiation, Differentiation of integrals. |
| 11 | 30 October-4 November | Power Series : Uniqueness theorem for power series, Abel’s and Tauber’s theorem |
| 12 | 6 November - 9 November | Taylor’s theorem, Exponential & Logarithm functions. |
| 13 | 17 November-24 November | Trigonometric functions, Fourier series, Gamma function,Revision. |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-MM-403 Topology**

**Class:-M.Sc 1s tsem Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 21August-26August | Definition and examples of topological spaces, Neighbourhoods, Neighbourhood system of a point and its properties, Interior point and interior of a set, interior as an operator and its properties, definition of a closed set as complement of an open set, limit point (accumulation point) of a set, derived set of a set, definition of closure of a set as union of the set and its derived set. |
| 2 | 28August-2 September | Adherent point (Closure point) of a set , closure of a set as set of adherent (closure) points, properties of closure, closure as an operator and its properties, boundary of a set, Dense sets. A characterization of dense sets.  Base for a topology and its characterization, Base for Neighbourhood system, Sub-base for a topology.  .Relative (induced) Topology and subspace of a topological space. |
| 3 | 4 September- 9 September | Alternate methods of defining a topology using ‘properties’ of ‘Neighbourhood system’, ‘Interior Operator’, ‘Closed sets’, Kuratowski closure operator and ‘base’.  First countable, Second countable and separable spaces, their relationships and hereditary property.About countability of a collection of disjoint open sets in a separable and a second countable space, Lindelof theorem.  . |
| 4 | 11 September – 16September | Comparison of Topologies on a set, about intersection and union of topologies, infimum and supremum of a collection of topologies on a set, the collection of all topologies on a set as a complete lattice.Definition, examples and characterisations of continuous functions, composition of continuous functions, Open and closed functions, Homeomorphism, embedding. |
| 5 | 18 September -23September | Tychonoff product topology in terms of standard (defining) subbase, projection maps, their continuity and openness, Characterisation of product topology as the smallest topology with projections continuous, continuity of a function from a space into a product of spaces. |
| 6 | 25 September – 30September | T0 , T1, T2,Regular and T3 separation axioms, their characterization and basic properties i.e. hereditary property of T0 , T1, T2, Regular and T3 spaces, and productive property of T1 and T2 spaces.Quotient topology w.r.t. a map, Continuity of function with domain a space having quotient topology, About Hausdorffness of quotient space |
| 7 | 3 October- 7 October | Completely regular and Tychonoff (T 3 1/2), spaces, their hereditary and productive properties. Embedding lemma, Embedding theorem..Normal and T4 spaces : Definition and simple examples, Urysohn’s Lemma, complete regularity of a regular normal space, T4 implies Tychonoff, Tietze’s extension theorem (Statement only). |
| 8 | 9 October -14 October | Definition and examples of filters on a set, Collection of all filters on a set as a p.o. set, finer filter, methods of generating filters/finer filters, Ultra filter (u.f.) and its characterizations, Ultra Filter Principle (UFP) i.e. Every filter is contained in an ultra filter. Image of filter under a function. |
| 9 | 16 October-21 October | Convergence of filters: Limit point (Cluster point) and limit of a filter and relationship between them, Continuity in terms of convergence of filters. Hausdorffness and filter convergence. |
| 10 | 23 October-28 October | Compactness: Definition and examples of compact spaces, definition of a compact subset as a compact subspace, relation of open cover of a subset of a topological space in the sub-space with that in the main space, |
| 11 | 30 October-4 November | compactness in terms of finite intersection property (f.i.p.), continuity and compact sets, compactness and separation properties, Closedness of compact subset, closeness of continuous map from a compact space into a Hausdorff space and its consequence, Regularity and normality of a compact Hausdorff space. |
| 12 | 6 November - 9 November | Compactness and filter convergence, Convergence of filters in a product space, compactness and product space. Tychonoff product theorem using filters. |
| 13 | 17 November-24 November | Tychonoff space as a subspace of a compact Hausdorff space and its converse, compactification and Hausdorff compactification, Stone-Cech compactification. |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-MM-404 Complex Analysis-1**

**Class:- M.Sc. Mathematics 1st sem Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 21August-26August | Power series, its convergence, radius of convergence, examples, sum and product, differentiability of sum function of power series. |
| 2 | 28August-2 September | property of a differentiable function with derivative zero. expz and its properties, logz, power of a complex number (z ), their branches with analyticity. |
| 3 | 4 September- 9 September | Path in a region, smooth path, p.w. smooth path, contour, simply connected region, multiply connected region, bounded variation. |
| 4 | 11 September – 16September | Total variation, complex integration, Cauchy-Goursat theorem, Cauchy theorem for simply and multiply connected domains. |
| 5 | 18 September -23September | Index or winding number of a closed curve with simple properties. Cauchy integral formula. |
| 6 | 25 September – 30September | Extension of Cauchy integral formula for multiple connected domain. Higher order derivative of Cauchy integral formula. |
| 7 | 3 October- 7 October | Gauss mean value theorem Morera’s theorem. |
| 8 | 9 October -14 October | Cauchy’s inequality. Zeros of an analytic function, entire function. |
| 9 | 16 October-21 October | Radius of convergence of an entire function, Liouville’s theorem, Fundamental theorem of algebra, Taylor’s theorem. |
| 10 | 23 October-28 October | Maximum modulus principle, Minimum modulus principle. Schwarz Lemma. Singularity, their classification, pole of a function and its order. Laurent series. |
| 11 | 30 October-4 November | Cassorati – Weiertrass theorem Meromorphic functions, Poles and zeros of Meromorphic functions .Residue : Residue at a singularity, residue at a simple pole, residue at infinity. |
| 12 | 6 November - 9 November | Cauchy residue theorem and its use to calculate certain integrals, definite integral (∫0 2∏ f(cosθ, sinθ) dθ, ∫-∞ ∞ f(x)dx), integral of the type ∫0 ∞ f(x) sinmx dx or ∫0 ∞ f(x) cosmx dx, poles on the real axis, integral of many valued functions. |
| 13 | 17 November-24 November | Bilinear transformation, their properties and classification, cross ration.preservance of cross ration under bilinear transformation, preservance of circle and straight line under bilinear transformation. Definition and examples of conformal mapping, critical points. |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-MM-405 DIFFERENTIAL EQUATION-1**

**Class:-M.Sc 1stsem Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 21August-26August | Preliminaries: Initial value problem and equivalent integral equation, ε-approximate solution, equicontinuous set of functions. |
| 2 | 28August-2 September | Basic theorems: Ascoli- Arzela theorem, Cauchy –Peano existence theorem and its corollary |
| 3 | 4 September- 9 September | Lipschitz condition. Differential inequalities and uniqueness, Gronwall’s inequality. Successive approximations. Picard-Lindelöf theorem. |
| 4 | 11 September – 16September | Continuation of solution, Maximal interval of existence, Extension theorem. Kneser’s theorem. |
| 5 | 18 September -23September | Linear differential systems: Definitions and notations. Linear homogeneous systems; Fundamental matrix . |
| 6 | 25 September – 30September | Adjoint systems, reduction to smaller homogeneous systems. Nonhomogeneous linear systems; variation of constants |
| 7 | 3 October- 7 October | Linear systems with constant coefficients. Linear systems with periodic coefficients; Floquet theory |
| 8 | 9 October -14 October | Higher order equations: Linear differential equation (LDE) of order n; Linear combinations. |
| 9 | 16 October-21 October | Linear dependence and linear independence of solutions. Wronskian theory: Definition, necessary and sufficient condition for linear dependence and linear independence of solutions of homogeneous LDE |
| 10 | 23 October-28 October | Abel’s Identity, Fundamental set, More Wronskian theory. Reduction of order. Non-homogeneous LDE.Variation of parameters. Adjoint equations, Lagrange’s Identity, Green’s formula. Linear equation of order n with constant coefficients. |
| 11 | 30 October-4 November | System of differential equations, the n-th order equation |
| 12 | 6 November - 9 November | Dependence of solutions on initial conditions and parameters: Preliminaries, continuity and differentiability.Maximal and Minimal solutions. Differential inequalities. |
| 13 | 17 November-24 November | A theorem of Wintner. Uniqueness theorems: Kamke’s theorem.Nagumo’s theorem and Osgood theorem |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-( MM-406) PRACTICAL-1**

**Class:-M.Sc 1stsem Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 21August-26August | Introduction of C, constants,variables, conditional statements,loops,switch statement |
| 2 | 28August-2 September | Use of nested if.. .else in finding the smallest of four numbers. |
| 3 | 4 September- 9 September | Use series sum to compute sin(x) and cos(x) for given angle x in degrees. Then, check error in verifying sin2 x+cos2 (x)=1. |
| 4 | 11 September – 16September | Verify ∑n3 ={∑n } 2 , (where n=1,2,..,m) & check that prefix and postfix increment operator gives the same result. |
| 5 | 18 September -23September | Compute simple interest of a given amount for the annual rate = .12 if amount >=10,000/- or time >=5 years; =.15 if amount >=10,000/- and time >=5 years; and = .10 otherwise. |
| 6 | 25 September – 30September | Introduction of array,user defined functions |
| 7 | 3 October- 7 October | Use array of pointers for alphabetic sorting of given list of English words. |
| 8 | 9 October -14 October | Program for interchange of two rows or two columns of a matrix. Read/write input/output matrix from/to a file. |
| 9 | 16 October-21 October | Calculate the eigenvalues and eigenvectors of a given symmetric matrix of order 3. |
| 10 | 23 October-28 October | Calculate standard deviation for a set of values {x(j)j=l,2,...,n} having the corresponding frequencies {f(j)j=l,2,...,n}. |
| 11 | 30 October-4 November | Find GCD of two positive integer values using pointer to a pointer. |
| 12 | 6 November - 9 November | Compute GCD of 2 positive integer values using recursion .Check a given square matrix for its positive definite form. |
| 13 | 17 November-24 November | To find the inverse of a given non-singular square matrix. |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-MM-501 Functional Analysis**

**Class:-M.Sc 3rdsem Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 1 August-5August | Normed linear spaces, Banach spaces and examples, subspace of a Banach space, completion of a normed space, quotient space of a normed linear space and its completeness, product of normed spaces |
| 2 | 7 August-12 August | finite dimensional normed spaces and subspaces, equivalent norms, compactness and finite dimension, F.Riesz’s lemma. |
| 3 | 14 August-19 August | Bounded and continuous linear operators, differentiation operator, integral operator, bounded linear extension, linear functionals, bounded linear functionals, continuity and boundedness |
| 4 | 21August-26August | definite integral, canonical mapping, linear operators and functionals on finite dimensional spaces, normed spaces of operators, dual spaces with examples |
| 5 | 28August-2 September | Hahn-Banach theorem for real linear spaces, complex linear spaces and normed linear spaces |
| 6 | 4 September- 9 September | application to bounded linear functionals on C[a,b], Riesz-representation theorem for bounded linear functionals on C[a,b], adjoint operator, norm of the adjoint operator |
| 7 | 11 September – 16September | Reflexive spaces, uniform boundedness theorem and some of its applications to the space of polynomials and fourier series. |
| 8 | 18 September -23September | Strong and weak convergence, weak convergence in l p , convergence of sequences of operators, uniform operator convergence, strong operator convergence, |
| 9 | 25 September – 30September | weal operator convergence, strong and weak\* convergence of a sequence of functionals. Open mapping theorem |
| 10 | 3 October- 7 October | bounded inverse theorem, closed linear operators, closed graph theorem, differential operator, relation between closedness and boundedness of a linear operator |
| 11 | 9 October -14 October | Inner product spaces, Hilbert spaces and their examples, pythagorean theorem, Apolloniu’s identity, Schwarz inequality, continuity of innerproduct, completion of an inner product space |
| 12 | 16 October-21 October | subspace of a Hilbert space, orthogonal complements and direct sums, projection theorem, characterization of sets in Hilbert spaces whose space is dense. |
| 13 | 23 October-28 October | Orthonormal sets and sequences, Bessel’s inequality, series related to orthonormal sequences and sets |
| 14 | 30 October-4 November | total(complete) orthonormal sets and sequences, Parseval’s identity, separable Hilbert spaces.Representation of functionals on Hilbert spaces |
| 15 | 6 November - 9 November | Riesz representation theorem for bounded linear functionals on a Hilbert space, sesquilinear form, Riesz representation theorem for bounded sesquilinear forms on a Hilbert space, Hilbert adjoint operator, its existence and uniqueness, properties of Hilbert adjoint operators |
| 16 | 17 November-24 November | self adjoint, unitary, normal, positive and projection operators |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-MM-502 Analytical Mechanics and Calculus of Variation**

**Class:- M.Sc. Mathematics 3rdsem Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 1 August-5August | Motivating problems of calculus of variations: shortest distance, Minimum surface of revolution, Brachistochrone problem, Isoperimetric problem, Geodesic. Fundamental Lemma of calculus of variation. |
| 2 | 7 August-12 August | Euler’s equation for one dependent function of one and several independent variables, and its generalization to (i) Functional depending on ‘n’ dependent functions, (ii) Functional depending on higher order derivatives. |
| 3 | 14 August-19 August | Variational derivative, invariance of Euler’s equations, natural boundary conditions and transition conditions |
| 4 | 21August-26August | Conditional extremum under geometric constraints and under integral constraints . Variable end points. |
| 5 | 28August-2 September | Free and constrained systems, constraints and their classification. Generalized coordinates. Holonomic and Non-Holonomic systems. Scleronomic and Rheonomic systems. Generalized Potential, Possible and virtual displacements,ideal constraints. |
| 6 | 4 September- 9 September | Lagrange’s equations of first kind, Principle of virtual displacements D’Alembert’s principle, HolonomicSystems independent coordinates, generalized forces, Lagrange’s equations of second kind. |
| 7 | 11 September – 16September | Uniqueness of solution. Theorem on variation of total Energy. Potential, Gyroscopic and dissipative forces, |
| 8 | 18 September -23September | Lagrange’s equations for potential forces equation for conservative fields. |
| 9 | 25 September – 30September | Hamilton’s variables. Don kin’s theorem. Hamilton canonical equations. . Routh’s equations. Cyclic coordinates Poisson’s Bracket. Poisson’s Identity. |
| 10 | 3 October- 7 October | Jacobi-Poisson theorem. Hamilton’s Principle, second form of Hamilton’s principle. Poincare-Carton integral invariant. |
| 11 | 9 October -14 October | Whittaker’s equations. Jacobi’s equations. Principle of least action |
| 12 | 16 October-21 October | Canonical transformations, free canonical transformations, Hamilton-Jacobi equation. Jacobi theorem. Method of separation of variables for solving Hamilton-Jacobi equation. |
| 13 | 23 October-28 October | Testing the Canonical character of a transformation. Lagrange brackets. |
| 14 | 30 October-4 November | . Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets. Simplicial nature of the Jacobian matrix of a canonical transformations |
| 15 | 6 November - 9 November | Invariance of Lagrange brackets and Poisson brackets under canonical transformations |
| 16 | 17 November-24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-MM- 503 ELASTICITY (opt-1)**

**Class:- MSc-3rd Sem Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 1 August-5August | Tensor Algebra: Coordinate-transformation, Cartesian Tensor of different order. |
| 2 | 7 August-12 August | Properties of tensors, Isotropic tensors of different orders and relation between them |
| 3 | 14 August-19 August | Symmetric and skew symmetric tensors. Tensor invariants, Deviatoric tensors. |
| 4 | 21August-26August | Eigenvalues and eigen-vectors of a tensor. |
| 5 | 28August-2 September | Tensor Analysis: Scalar, vector, tensor functions, Comma notation, Gradient, divergence and curl of a vector / tensor field |
| 6 | 4 September- 9 September | Analysis of Strain : Affine transformation, Infinitesimal affine deformation |
| 7 | 11 September – 16September | Geometrical Interpretation of the components of strain. Strain quadric of Cauchy. |
| 8 | 18 September -23September | Principal strains and invariance, General infinitesimal deformation. |
| 9 | 25 September – 30September | Saint-Venant's equations of compatibility. Finite deformations |
| 10 | 3 October- 7 October | Analysis of Stress : Stress Vecotr, Stress tensor, Equations of equilibrium, Transformation of coordinates. |
| 11 | 9 October -14 October | Stress quadric of Cauchy, Principal stress and invariants. Maximum normal and shear stresses. Mohr’s circles, examples of stress |
| 12 | 16 October-21 October | Equations of Elasticity :Generalised Hooks Law, Anisotropic symmetries, Homogeneous isotropic medium. |
| 13 | 23 October-28 October | Elasticity moduli for Isotropic media. Equilibrium and dynamic equations for an isotropic elastic solid. |
| 14 | 30 October-4 November | Strain energy function and its connection with Hooke’s Law. |
| 15 | 6 November - 9 November | Uniqueness of solution. Beltrami-Michell compatibility equations. |
| 16 | 17 November-24 November | Clapeyrom’s theorem. Saint-Venant's principle. |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-MM-504 FLUID MECHANICS-I (opt-1)**

**Class:- MSc-3rd Sem Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 1 August-5August | Kinematics of fluid in motion:Velocity at a point of a fluid. Lagrangian and Eulerian methods |
| 2 | 7 August-12 August | Stream lines, path lines and streak liens, vorticity and circulation, Vortex lines, Acceleration and Material derivative |
| 3 | 14 August-19 August | Equation of continuity (vector or Cartesian form). Reynolds transport Theorem. |
| 4 | 21August-26August | General analysis of fluid motion. Properties of fluids- static and dynamic pressure |
| 5 | 28August-2 September | Boundary surfaces and boundary surface conditions. Inotational and rotational motions. Velocity potential. |
| 6 | 4 September- 9 September | Equation of Motion : Lagrange's and Euler's equations of Motion (vector or in Cartesian form). Bernculli's theorem. |
| 7 | 11 September – 16September | Applications of the Bernoulli Equation in one –dimensional flow problems. Kelvins circulation theorem |
| 8 | 18 September -23September | vorticity equation. Energy equation for incompressible flow. Kinetic energy of irrotational flow. |
| 9 | 25 September – 30September | Kelvins minimum energy theorem ,mean potential over a spherical surface. Kinetic energy of infinite liquid. Uniqueness theorems. |
| 10 | 3 October- 7 October | Stress components in a real fluid. Relations between rectangular components of stress |
| 11 | 9 October -14 October | Connection between stresses and gradients of velocity.Navier- Stoke’s equations of motion. |
| 12 | 16 October-21 October | Steady flows between two parallel plates, Plane Poiseuille and Couette flows. |
| 13 | 23 October-28 October | Reduction of Navier-Stock equations in flows having axis of symmetry, steady flow in circular pipe: the Hagen-Poiseuille flow |
| 14 | 30 October-4 November | steady flow between two coaxial cylinders, flow between two concentric rotating cylinders |
| 15 | 6 November - 9 November | Steady flows through tubes of uniform crosssection in the form (i) Ellipse (ii) equilateral triangle |
| 16 | 17 November-24 November | Steady flows through tubes of uniform crosssection in the form rectangle, under constant pressure gradient, uniqueness theorem. |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-MM-505 Integral Equations (opt-1)**

**Class:-M.Sc 3rdsem Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 1 August-5August | Definition of Integral Equations and their classifications.Eigen values and Eigen functions. |
| 2 | 7 August-12 August | Special kinds of Kernel Convolution Integral. The inner or scalar product of two functions. |
| 3 | 14 August-19 August | Reduction to a system of algebraic equations. Fredholm Alternative. |
| 4 | 21August-26August | Fredholm Theorem, Fredholm Alternative Theorem,An approximate method. |
| 5 | 28August-2 September | Methods of successive approximations, Iterative scheme for Fredholm and Volterra Integral equations of the second kind. |
| 6 | 4 September- 9 September | Conditions of uniform convergence and uniqueness of series solution. Some results about the resolvent kernel. |
| 7 | 11 September – 16September | Application of iterative scheme to Volterra Integral equations of the second kind. Classical Fredholm Theory, The method of solution of Fredholm equation |
| 8 | 18 September -23September | Fredholm First theorem, Fredholm Second theorem, Fredholm Third theorem |
| 9 | 25 September – 30September | Symmetric kernels, Introduction, Complex Hilbert space. An orthonormal system of functions, Riesz- Fisher theorem, A complete two - Dimensional orthonormal set over the rectangle. |
| 10 | 3 October- 7 October | Fundamental properties of Eigenvalues and Eigenfunctions for symmetric kernels. Expansion in eigen functions and Bilinear form. Hilbert - Schmidt theorem and some immediate consequences. |
| 11 | 9 October -14 October | Definite Kernels and Mercer theorem. Solution of a symmetric integral Equation. Approximation of a general (Not necessarily symmetric ) by a separable kernel. |
| 12 | 16 October-21 October | The operator method in the theory of integral equations. Rayleigh -Ritz methodfor finding the first eigen value. |
| 13 | 23 October-28 October | The Abel Integral Equation.Inversion formula for singular integral equation with kernel of the type h(s) - h(t). |
| 14 | 30 October-4 November | Cauchy's principal value for integrals solutionof the Cauchy - type singular integral equation. |
| 15 | 6 November - 9 November | Closed contour, unclosed contours and the Riemann-Hilbert problem. The Hilbert -kernel |
| 16 | 17 November-24 November | Solution of the Hilbert - Type singular Integral equation. |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:- (MM-506) Practical-III**

**Class:- M.Sc. Mathematics 3rdsem Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 1 August-5August | Simple program of Fortran 90 |
| 2 | 7 August-12 August | Program to find the area of Triangle. |
| 3 | 14 August-19 August | Use a function program for simple interest to display year-wise compound interest and amount, for given deposit, rate and time. |
| 4 | 21August-26August | Use logical operators in computing the compound interest on a given amount for rate of interest varying with amount as well as time of deposit. |
| 5 | 28August-2 September | Write a subroutine program to check (logical output) whether the three given points in a plane are collinear. |
| 6 | 4 September- 9 September | Use subroutine program to multiply two given matrices and use resource files in main program to read input and write output. |
| 7 | 11 September – 16September | Use ALLOCATABLE size declaration for given set of points in a plane and fit a straight line through these points. |
| 8 | 18 September -23September | Write a program to display the use of whole-array operations on non-conformable arrays. |
| 9 | 25 September – 30September | Write a program to display the procedure of format-rescan-rule and the action of tab-edit descriptors. |
| 10 | 3 October- 7 October | Revision |
| 11 | 9 October -14 October | Compute a given definite integral (as summation) in a subroutine using integrand as a dummy argument. |
| 12 | 16 October-21 October | Explain the use of MODULE in defining an abstract (derived) data type for complex arithmetic. |
| 13 | 23 October-28 October | Use of pointers in manipulating a linked-list. |
| 14 | 30 October-4 November | To solve a quadratic equation with given (complex-valued) coefficients, using COMPLEX data type |
| 15 | 6 November - 9 November | Use string operations to find if a given string is a palindrome or not. |
| 16 | 17 November-24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**SUBJECT NAME:- B23-MAT-101 CALCULUS**

**CLASS:- B.SC. 1stsem SESSION:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | definition of the limit of a function. Basic properties of limits. Learn to use basic operators and functions in Maxima  software. |
| 2 | 31 July-5 August | Continuous functions and classification of discontinuities. Simplify algebraic expressions and expressions containing  radicals, logarithms, exponentials and trigonometric functions. |
| 3 | 7 August-12August | Differentiability. Application of L’Hospital rule to  indeterminate forms. Successive differentiation. Expand algebraic, rational, trigonometric and logarithmic  expressions. |
| 4 | 14 August-19 August | Leibnitz theorem. Maclaurin and Taylor series expansions. Find derivatives of algebraic, trigonometric, exponential and  logarithmic functions. |
| 5 | 21 August-26 August | Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes. Find derivatives of functions involving above mentioned  functions. |
| 6 | 28August-2 September | asymptotes in polar coordinates. Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves. Problems of successive differentiation. |
| 7 | 4 September- 9 September | Problem of determination of radius of curvature expressed in Cartesian coordinates, in Parametric coordinates and in polar coordinates. Newton’s method. Radius of curvature for pedal curves. Tangential polar equations. |
| 8 | 11 September – 16September | Centre of curvature. Circle of curvature. Chord of curvature, evolutes. Find indefinite integrals of different functions. |
| 9 | 18 September -23 September | Tests for concavity and convexity. Points of inflexion. Multiple points. Find definite integrals of different functions. |
| 10 | 25 September –30 September | Cusps, nodes & conjugate points. Type of cusps. |
| 11 | 3 October-7 October | To plot curves involving Cartesian, parametric and polar forms. |
| 12 | 9 October -14 October | Tracing of curves in Cartesian co-ordinates and Problems of curve tracing when equation is given in Cartesian coordinates. To demonstrate singular points. |
| 13 | 16 October-21 October | Tracing of curves in parametric and polar co-ordinates. |
| 14 | 23 October-28 October | Problems of curve tracing when equation is given in Parametric form and in Polar coordinates.. |
| 15 | 30 October- 4 November | Reduction formulae. Rectification. |
| 16 | 6 November- 9 November | Intrinsic equations of curve. |
| 17 | 17 November-18 November | Problem of determination of length of a curve expressed in  Cartesian coordinates and in  Polar coordinates. |
| 18 | 20 November-25 November | Quardrature (area)Sectorial area. Area bounded by closed curves. |
| 19 | 27 November- 2 December | Volumes and surfaces of solids of revolution. Theorems of Pappu’s and Guilden. |
| 20 | 4 December- 9 December | Problem of determination of volumes and surfaces of solids of revolution for Cartesian curve, for Parametric curve and for Polar curve. |
| 21 | 11 December- 16 December | Revision. |
| 22 | 18 December- 23 December | Revision. |
| 23 | 25 December- 30 December | Revision . |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:- BM-23-MAT-103**

**Class:-B.Sc1st sem Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **DATE** | **CONTENT** |
| 1 | 24 July-29 July | Limit and continuity of a real valued function. .Practical problems to check the limit and continuity of a function. |
| 2 | 31 July-5 August | Basic properties of limits. Introduce basic operators and functions in Maxima software. |
| 3 | 7 August-12August | Types of discontinuities, Differentiability of functions.Practical problems to check the differentiability of a function.Practical problems of finding derivatives of algebraic, trigonometric, exponential and logarithmic functions. |
| 4 | 14 August-19 August | Application of L’Hospital rule to Indeterminate forms.Practical application of L’Hospital rule to evaluate indeterminate forms. |
| 5 | 21 August-26 August | Successive differentiation, Leibnitz theorem (statement only). |
| 6 | 28August-2 September | Practical problems of finding nth derivatives using Leibnitz theorem. |
| 7 | 4 September- 9 September | Taylor’s and Maclaurin’s series expansions with different forms of remainder. |
| 8 | 11 September – 16September | Simplify algebraic expressions and expressions containing radicals, logarithms, exponentials and trigonometric functions. |
| 9 | 18 September -23 September | Practical problems to find Maclaurin’s series expansion of various functions. |
| 10 | 25 September –30 September | Expand algebraic, rational, trigonometric and logarithmic expressions. |
| 11 | 3 October-7 October | Practical problems related to application of Taylor's theorem. |
| 12 | 9 October -14 October | Find derivatives of algebraic, trigonometric, exponential and logarithmic functions. |
| 13 | 16 October-21 October | Asymptotes: Horizontal, vertical and oblique asymptotes for algebraic curves. |
| 14 | 23 October-28 October | Practical problems to find the asymptotes of a given algebraic curve. |
| 15 | 30 October- 4 November | Asymptotes for polar curves. |
| 16 | 6 November- 9 November | Find derivatives of functions involving above mentioned functions. |
| 17 | 17 November-18 November | Practical problems to find the asymptotes of a polar curve. |
| 18 | 20 November-25 November | Intersection of a curve and its asymptotes. Find indefinite integrals of different functions. |
| 19 | 27 November- 2 December | Reduction formulae. Practical problems based on reduction formulae. |
| 20 | 4 December- 9 December | Find definite integrals of different functions. |
| 21 | 11 December- 16 December | Revision. |
| 22 | 18 December- 23 December | Revision. |
| 23 | 25 December- 30 December | Revision. |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:- BM-231 Advanced Calculus**

**Class:-B.Sc3rd sem Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Continuity, Sequential Continuity, properties of continuous functions. |
| 2 | 31 July-5 August | Uniform continuity, chain rule of differentiability. Mean value theorems; Rolle’s Theorem. |
| 3 | 7 August-12August | Lagrange’s mean value theorem and their geometrical interpretations. Taylor’s Theorem with various forms of remainders |
| 4 | 14 August-19 August | Darboux intermediate value theorem for derivatives, Indeterminate forms. |
| 5 | 21 August-26 August | Limit and continuity of real valued functions of two variables. Partial differentiation. Total Differentials |
| 6 | 28August-2 September | Composite functions & implicit functions. Change of variables. |
| 7 | 4 September- 9 September | Homogenous functions & Euler’s theorem on homogeneous functions. |
| 8 | 11 September – 16September | Taylor’s theorem for functions of two variables. |
| 9 | 18 September -23 September | Differentiability of real valued functions of two variables. |
| 10 | 25 September –30 September | Schwarz and Young’s theorem. Implicit function theorem. |
| 11 | 3 October-7 October | Maxima, Minima and saddle points of two variables. Lagrange’s method of multipliers. |
| 12 | 9 October -14 October | Curves: Tangents, Principal normals, Binormals, Serret-Frenet formulae. |
| 13 | 16 October-21 October | Locus of the centre of curvature, Spherical curvature, |
| 14 | 23 October-28 October | Locus of centre of Spherical curvature, Involutes, evolutes, Bertrand Curves. |
| 15 | 30 October- 4 November | Evolutes, Bertrand Curves. |
| 16 | 6 November- 9 November | Surfaces: Tangent planes, one parameter family of surfaces, Envelopes. |
| 17 | 17 November-24November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:- BM-232 Partial Differential Equations**

**Class:-B.Sc.(3rd sem.) Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: |
| 2 | 31 July-5 August | Complete solution, singular solution, Generalsolution, Solution of Lagrange’s linear equations |
| 3 | 7 August-12August | Charpit’s general method of solution |
| 4 | 14 August-19 August | Compatible systems of first order equations, Jacobi’s method. |
| 5 | 21 August-26 August | Linear partial differential equations of second and higher orders, Linear and non-linearhomogenious and non-homogenious equations with constant co-efficients, |
| 6 | 28August-2 September | Partialdifferentialeqution with variable co-efficients reducible to equations with constantcoefficients, |
| 7 | 4 September- 9 September | their complimentary functions and particular Integrals, Equations reducibleto linear equations with constant co-efficients. |
| 8 | 11 September – 16September | Classification of linear partial differential equations of second order, Hyperbolic,parabolic and elliptic types |
| 9 | 18 September -23 September | Reduction of second order linear partial differential equationsto Canonical (Normal) forms and their solutions |
| 10 | 25 September –30 September | Solution of linear hyperbolic equations,Monge’s method for partial differential equations of second order. |
| 11 | 3 October-7 October | Cauchy’ s problem for second order partial differential equations, Characteristicequations |
| 12 | 9 October -14 October | characteristic curves of second order partial differential equation. |
| 13 | 16 October-21 October | Method of separation of variables. |
| 14 | 23 October-28 October | Solution of Laplace’s equation. |
| 15 | 30 October- 4November | Solutions of Wave equation (one and twodimensions) |
| 16 | 6 November- 9November | Solutions of Diffusion(Heat)equation(oneandtwodimension)inCartesianco-ordinate system |
| 17 | 17 November- 24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-BM-233 Statics**

**Class:- B.Sc.3rd sem Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Basic difference between statics and dynamics |
| 2 | 31 July-5 August | Composition and resolution of forces. |
| 3 | 7 August-12August | Parallel forces |
| 4 | 14 August-19 August | Moments and Couples. |
| 5 | 21 August-26 August | Analytical conditions of equilibrium of coplanar forces. |
| 6 | 28August-2 September | Friction. |
| 7 | 4 September- 9 September | Centre of Gravity. |
| 8 | 11 September – 16 September | Virtual work. |
| 9 | 18 September -23 September | Revision |
| 10 | 25 September –30 September | Forces in three dimensions. |
| 11 | 3 October-7 October | Poinsots central axis |
| 12 | 9 October -14 October | Wrenches |
| 13 | 16 October-21 October | Null lines |
| 14 | 23 October-28 October | Null planes. |
| 15 | 30 October- 4 November | Stable and unstable equilibrium. |
| 16 | 6 November- 9 November | Revision |
| 17 | 17 November- 24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-BM-351 REAL ANALYSIS**

**Class:- B.Sc. 5thsem Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Riemann Integral |
| 2 | 31 July-5 August | Integrabililty of continuous and monotonic functions |
| 3 | 7 August-12August | The Fundamental theorem of integral calculus |
| 4 | 14 August-19 August | Mean value theorems of integral calculus |
| 5 | 21 August-26 August | Improper integrals and their convergence, Comparison tests |
| 6 | 28August-2 September | Abel’s and Dirichlet’s tests, Frullani’s integral |
| 7 | 4 September- 9 September | Integral as a function of a parameter. Continuity |
| 8 | 11 September – 16September | Differentiability and integrability of an integral of a function of a parameter |
| 9 | 18 September -23 September | Definition and examples of metric spaces, neighborhoods, limit points, interior points |
| 10 | 25 September –30 September | open and closed sets |
| 11 | 3 October-7 October | closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness |
| 12 | 9 October -14 October | Cantor’s intersection theorem, Baire’s category theorem, contraction Principle |
| 13 | 16 October-21 October | Continuous functions, uniform continuity, compactness for metric spaces |
| 14 | 23 October-28 October | sequential compactness, Bolzano-Weierstrass property, total boundedness |
| 15 | 30 October- 4 November | finite intersection property, continuity in relation with compactness, connectedness , components. |
| 16 | 6 November- 9 November | continuity in relation with connectedness. |
| 17 | 17 November- 24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-GROUP AND RING**

**Class:- B.SC 5thsem Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Definition of a group with example and simple properties of groups, Subgroups |
| 2 | 31 July-5 August | Subgroup criteria, Generation of groups, cyclic groups, Cosets, Left and right cosets, |
| 3 | 7 August-12August | Index of a sub-group Coset decomposition, Largrage’s theorem and its consequences |
| 4 | 14 August-19 August | Normal subgroups, Quotient groups, |
| 5 | 21 August-26 August | Homoomorphisms, isomophisms, automorphisms and inner automorphisms of a group. Automorphisms of cyclic groups, |
| 6 | 28August-2 September | Permutations groups. Even and odd permutations. Alternating groups |
| 7 | 4 September- 9 September | Cayley’s theorem, Center of a group and derived group of a group |
| 8 | 11 September – 16September | Introduction to rings, subrings, integral domains and fields |
| 9 | 18 September -23 September | Characteristics of a ring. Ring homomorphisms |
| 10 | 25 September –30 September | ideals (principle, prime and Maximal) and Quotient rings |
| 11 | 3 October-7 October | Field of quotients of an integral domain |
| 12 | 9 October -14 October | Euclidean rings, Polynomial rings, Polynomials over the rational field |
| 13 | 16 October-21 October | The Eisenstein’s criterion, |
| 14 | 23 October-28 October | Polynomial rings over commutative rings, Unique factorization domain |
| 15 | 30 October- 4 November | R unique factorization domain implies so is R[X1 , X2……Xn] |
| 16 | 6 November- 9 November | Revision |
| 17 | 17 November- 24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject name:-BM-353 Numerical analysis**

**Class:- B.Sc. 5th sem Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Finite Differences operators and their relations. Finding the missing terms and effect oferror in a difference tabular values, Interpolation with equal intervals: Newton’s forward interpolation formulae |
| 2 | 31 July-5 August | Interpolation with equal intervals: Newton’s backward interpolation formulae.Interpolation with unequal intervals:Newton’s divided difference |
| 3 | 7 August-12August | Lagrange’s Interpolation formulae, Hermite Formula |
| 4 | 14 August-19 August | Central Differences: Gauss forward and Gauss’s backward interpolation formulae, |
| 5 | 21 August-26 August | Central Differences:Sterling, Bessel Formula |
| 6 | 28August-2 September | Probability distribution of random variables, Binomial distribution, |
| 7 | 4 September- 9 September | Poisson’sdistribution, Normal distribution: Mean, Variance and Fitting. |
| 8 | 11 September – 16September | Numerical Differentiation: Derivative of a function using interpolation formulae |
| 9 | 18 September -23 September | Eigen Value Problems: Power method, Jacobi’s method, |
| 10 | 25 September –30 September | Eigen Value Problems: Given’s method, HouseHolder’s method, QR method, Lanczos method |
| 11 | 3 October-7 October | Numerical Integration: Newton-Cote’s Quadrature formula, Trapezoidal rule, Simpson’s one- third |
| 12 | 9 October -14 October | Simpson’s three-eighth rule, Chebychev formula, Gauss Quadrature formula. |
| 13 | 16 October-21 October | Numerical solution of ordinary differential equations: Picard’s method. Taylor’s series method, |
| 14 | 23 October-28 October | Euler’s method, Runge-Kutta Methods |
| 15 | 30 October- 4 November | Multiple step methods; Predictor-corrector method |
| 16 | 6 November- 9 November | Modified Euler’s method,Milne-Simpson’s method. |
| 17 | 17 November- 24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:- B23-MAT-101 CALCULUS**

**Class:- B.A.1stsem Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | definition of the limit of a function. Basic properties of limits. Learn to use basic operators and functions in Maxima  software. |
| 2 | 31 July-5 August | Continuous functions and classification of discontinuities. Simplify algebraic expressions and expressions containing  radicals, logarithms, exponentials and trigonometric functions. |
| 3 | 7 August-12August | Differentiability. Application of L’Hospital rule to  indeterminate forms. Successive differentiation. Expand algebraic, rational, trigonometric and logarithmic  expressions. |
| 4 | 14 August-19 August | Leibnitz theorem. Maclaurin and Taylor series expansions. Find derivatives of algebraic, trigonometric, exponential and  logarithmic functions. |
| 5 | 21 August-26 August | Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes. Find derivatives of functions involving above mentioned  functions. |
| 6 | 28August-2 September | asymptotes in polar coordinates. Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves. Problems of successive differentiation. |
| 7 | 4 September- 9 September | Problem of determination of radius of curvature expressed in Cartesian coordinates, in Parametric coordinates and in polar coordinates. Newton’s method. Radius of curvature for pedal curves. Tangential polar equations. |
| 8 | 11 September – 16September | Centre of curvature. Circle of curvature. Chord of curvature, evolutes. Find indefinite integrals of different functions. |
| 9 | 18 September -23 September | Tests for concavity and convexity. Points of inflexion. Multiple points. Find definite integrals of different functions. |
| 10 | 25 September –30 September | Cusps, nodes & conjugate points. Type of cusps. |
| 11 | 3 October-7 October | To plot curves involving Cartesian, parametric and polar forms. |
| 12 | 9 October -14 October | Tracing of curves in Cartesian co-ordinates and Problems of curve tracing when equation is given in Cartesian coordinates. To demonstrate singular points. |
| 13 | 16 October-21 October | Tracing of curves in parametric and polar co-ordinates. |
| 14 | 23 October-28 October | Problems of curve tracing when equation is given in Parametric form and in Polar coordinates.. |
| 15 | 30 October- 4 November | Reduction formulae. Rectification. |
| 16 | 6 November- 9 November | Intrinsic equations of curve. |
| 17 | 17 November-18 November | Problem of determination of length of a curve expressed in  Cartesian coordinates and in  Polar coordinates. |
| 18 | 20 November-25 November | Quardrature (area)Sectorial area. Area bounded by closed curves. |
| 19 | 27 November- 2 December | Volumes and surfaces of solids of revolution. Theorems of Pappu’s and Guilden. |
| 20 | 4 December- 9 December | Problem of determination of volumes and surfaces of solids of revolution for Cartesian curve, for Parametric curve and for Polar curve. |
| 21 | 11 December- 16 December | Revision. |
| 22 | 18 December- 23 December | Revision. |
| 23 | 25 December- 30 December | Revision . |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**SUBJECT NAME:- BM-23-MAT-103**

**CLASS:- B.A. 1stsem SESSION:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **DATE** | **CONTENT** |
| 1 | 24 July-29 July | Limit and continuity of a real valued function. .Practical problems to check the limit and continuity of a function. |
| 2 | 31 July-5 August | Basic properties of limits. Introduce basic operators and functions in Maxima software. |
| 3 | 7 August-12August | Types of discontinuities, Differentiability of functions.Practical problems to check the differentiability of a function.Practical problems of finding derivatives of algebraic, trigonometric, exponential and logarithmic functions. |
| 4 | 14 August-19 August | Application of L’Hospital rule to Indeterminate forms.Practical application of L’Hospital rule to evaluate indeterminate forms. |
| 5 | 21 August-26 August | Successive differentiation, Leibnitz theorem (statement only). |
| 6 | 28August-2 September | Practical problems of finding nth derivatives using Leibnitz theorem. |
| 7 | 4 September- 9 September | Taylor’s and Maclaurin’s series expansions with different forms of remainder. |
| 8 | 11 September – 16September | Simplify algebraic expressions and expressions containing radicals, logarithms, exponentials and trigonometric functions. |
| 9 | 18 September -23 September | Practical problems to find Maclaurin’s series expansion of various functions. |
| 10 | 25 September –30 September | Expand algebraic, rational, trigonometric and logarithmic expressions. |
| 11 | 3 October-7 October | Practical problems related to application of Taylor's theorem. |
| 12 | 9 October -14 October | Find derivatives of algebraic, trigonometric, exponential and logarithmic functions. |
| 13 | 16 October-21 October | Asymptotes: Horizontal, vertical and oblique asymptotes for algebraic curves. |
| 14 | 23 October-28 October | Practical problems to find the asymptotes of a given algebraic curve. |
| 15 | 30 October- 4 November | Asymptotes for polar curves. |
| 16 | 6 November- 9 November | Find derivatives of functions involving above mentioned functions. |
| 17 | 17 November-18 November | Practical problems to find the asymptotes of a polar curve. |
| 18 | 20 November-25 November | Intersection of a curve and its asymptotes. Find indefinite integrals of different functions. |
| 19 | 27 November- 2 December | Reduction formulae. Practical problems based on reduction formulae. |
| 20 | 4 December- 9 December | Find definite integrals of different functions. |
| 21 | 11 December- 16 December | Revision. |
| 22 | 18 December- 23 December | Revision. |
| 23 | 25 December- 30 December | Revision. |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:- BM-231 Advanced Calculus**

**Class:- B.A. 3rd sem Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Continuity, Sequential Continuity, properties of continuous functions. |
| 2 | 31 July-5 August | Uniform continuity, chain rule of differentiability. Mean value theorems; Rolle’s Theorem. |
| 3 | 7 August-12August | Lagrange’s mean value theorem and their geometrical interpretations. Taylor’s Theorem with various forms of remainders |
| 4 | 14 August-19 August | Darboux intermediate value theorem for derivatives, Indeterminate forms. |
| 5 | 21 August-26 August | Limit and continuity of real valued functions of two variables. Partial differentiation. Total Differentials |
| 6 | 28August-2 September | Composite functions & implicit functions. Change of variables. |
| 7 | 4 September- 9 September | Homogenous functions & Euler’s theorem on homogeneous functions. |
| 8 | 11 September – 16September | Taylor’s theorem for functions of two variables. |
| 9 | 18 September -23 September | Differentiability of real valued functions of two variables. |
| 10 | 25 September –30 September | Schwarz and Young’s theorem. Implicit function theorem. |
| 11 | 3 October-7 October | Maxima, Minima and saddle points of two variables. Lagrange’s method of multipliers. |
| 12 | 9 October -14 October | Curves: Tangents, Principal normals, Binormals, Serret-Frenet formulae. |
| 13 | 16 October-21 October | Locus of the centre of curvature, Spherical curvature, |
| 14 | 23 October-28 October | Locus of centre of Spherical curvature, Involutes, evolutes, Bertrand Curves. |
| 15 | 30 October- 4 November | Surfaces: Tangent planes, one parameter family of surfaces, Envelopes. |
| 16 | 6 November- 9 November | Revision |
| 17 | 17 November- 24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:- BM-232 Partial Differential Equations**

**Class:-B.A.(3rd sem.) Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: |
| 2 | 31 July-5 August | Complete solution, singular solution, Generalsolution, Solution of Lagrange’s linear equations |
| 3 | 7 August-12 August | Charpit’s general method of solution |
| 4 | 14 August-19 August | Compatible systems of first order equations, Jacobi’s method. |
| 5 | 21 August-26 August | Linear partial differential equations of second and higher orders, Linear and non-linearhomogenious and non-homogenious equations with constant co-efficients, |
| 6 | 28August-2 September | Partialdifferentialeqution with variable co-efficients reducible to equations with constantcoefficients, |
| 7 | 4 September- 9 September | their complimentary functions and particular Integrals, Equations reducibleto linear equations with constant co-efficients. |
| 8 | 11 September – 16September | Classification of linear partial differential equations of second order, Hyperbolic,parabolic and elliptic types |
| 9 | 18 September -23 September | Reduction of second order linear partial differential equationsto Canonical (Normal) forms and their solutions |
| 10 | 25 September –30 September | Solution of linear hyperbolic equations,Monge’s method for partial differential equations of second order. |
| 11 | 3 October-7 October | Cauchy’ s problem for second order partial differential equations, Characteristicequations |
| 12 | 9 October -14 October | characteristic curves of second order partial differential equation, Methodof separation of variables: |
| 13 | 16 October-21 October | Solution of Laplace’s equation |
| 14 | 23 October-28 October | Solutions of Wave equation (one and twodimensions) |
| 15 | 30 October- 4 November | Solutions of Diffusion(Heat)equation(oneandtwodimension)inCartesianco-ordinate system |
| 16 | 6 November- 9 November | Revision |
| 17 | 17 November- 24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-BM-233 Statics**

**Class:- B.A (3rd) sem Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Basic difference between statics and dynamics |
| 2 | 31 July-5 August | Composition and resolution of forces. |
| 3 | 7 August-12August | Parallel forces |
| 4 | 14 August-19 August | Moments and Couples. |
| 5 | 21 August-26 August | Analytical conditions of equilibrium of coplanar forces. |
| 6 | 28August-2 September | Friction. |
| 7 | 4 September- 9 September | Centre of Gravity. |
| 8 | 11 September – 16September | Virtual work. |
| 9 | 18 September -23 September | Revision |
| 10 | 25 September –30 September | Forces in three dimensions. |
| 11 | 3 October-7 October | Poinsots central axis |
| 12 | 9 October -14 October | Wrenches |
| 13 | 16 October-21 October | Null lines |
| 14 | 23 October-28 October | Null planes. |
| 15 | 30 October- 4 November | Stable and unstable equilibrium. |
| 16 | 6 November- 9 November | Revision |
| 17 | 17 November- 24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-BM-351 REAL ANALYSIS**

**Class:- B.A. 5thsem Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Riemann Integral |
| 2 | 31 July-5 August | Integrabililty of continuous and monotonic functions |
| 3 | 7 August-12August | The Fundamental theorem of integral calculus |
| 4 | 14 August-19 August | Mean value theorems of integral calculus |
| 5 | 21 August-26 August | Improper integrals and their convergence, Comparison tests |
| 6 | 28August-2 September | Abel’s and Dirichlet’s tests, Frullani’s integral |
| 7 | 4 September- 9 September | Integral as a function of a parameter. Continuity |
| 8 | 11 September – 16September | Differentiability and integrability of an integral of a function of a parameter |
| 9 | 18 September -23 September | Definition and examples of metric spaces, neighborhoods, limit points, interior points |
| 10 | 25 September –30 September | open and closed sets |
| 11 | 3 October-7 October | closure and interior, boundary points, subspace of a metric space, equivalent metrics, Cauchy sequences, completeness |
| 12 | 9 October -14 October | Cantor’s intersection theorem, Baire’s category theorem, contraction Principle |
| 13 | 16 October-21 October | Continuous functions, uniform continuity, compactness for metric spaces |
| 14 | 23 October-28 October | sequential compactness, Bolzano-Weierstrass property, total boundedness |
| 15 | 30 October- 4 November | finite intersection property, continuity in relation with compactness, connectedness , components, continuity in relation with connectedness |
| 16 | 6 November- 9 November | Revision |
| 17 | 17 November- 24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-GROUP AND RING**

**Class:- B.A. 5thsem Session:- 2023-2024**

|  |  |  |
| --- | --- | --- |
| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Definition of a group with example and simple properties of groups, Subgroups |
| 2 | 31 July-5 August | Subgroup criteria, Generation of groups, cyclic groups, Cosets, Left and right cosets, |
| 3 | 7 August-12August | Index of a sub-group Coset decomposition, Largrage’s theorem and its consequences |
| 4 | 14 August-19 August | Normal subgroups, Quotient groups, |
| 5 | 21 August-26 August | Homoomorphisms, isomophisms, automorphisms and inner automorphisms of a group. Automorphisms of cyclic groups, |
| 6 | 28August-2 September | Permutations groups. Even and odd permutations. Alternating groups |
| 7 | 4 September- 9 September | Cayley’s theorem, Center of a group and derived group of a group |
| 8 | 11 September – 16September | Introduction to rings, subrings, integral domains and fields |
| 9 | 18 September -23 September | Characteristics of a ring. Ring homomorphisms |
| 10 | 25 September –30 September | ideals (principle, prime and Maximal) and Quotient rings |
| 11 | 3 October-7 October | Field of quotients of an integral domain |
| 12 | 9 October -14 October | Euclidean rings, Polynomial rings, Polynomials over the rational field |
| 13 | 16 October-21 October | The Eisenstein’s criterion, |
| 14 | 23 October-28 October | Polynomial rings over commutative rings, Unique factorization domain |
| 15 | 30 October- 4 November | R unique factorization domain implies so is R[X1 , X2……Xn] |
| 16 | 6 November- 9 November | Revision |
| 17 | 17 November- 24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject name:-BM-353 Numerical analysis**

**Class:- B.A. 5th sem Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Finite Differences operators and their relations. Finding the missing terms and effect oferror in a difference tabular values, Interpolation with equal intervals: Newton’s forward interpolation formulae |
| 2 | 31 July-5 August | Interpolation with equal intervals: Newton’s backward interpolation formulae.Interpolation with unequal intervals:Newton’s divided difference |
| 3 | 7 August-12August | Lagrange’s Interpolation formulae, Hermite Formula |
| 4 | 14 August-19 August | Central Differences: Gauss forward and Gauss’s backward interpolation formulae, |
| 5 | 21 August-26 August | Central Differences:Sterling, Bessel Formula |
| 6 | 28August-2 September | Probability distribution of random variables, Binomial distribution, |
| 7 | 4 September- 9 September | Poisson’sdistribution, Normal distribution: Mean, Variance and Fitting. |
| 8 | 11 September – 16September | Numerical Differentiation: Derivative of a function using interpolation formulae |
| 9 | 18 September -23 September | Eigen Value Problems: Power method, Jacobi’s method, |
| 10 | 25 September –30 September | Eigen Value Problems: Given’s method, HouseHolder’s method, QR method, Lanczos method |
| 11 | 3 October-7 October | Numerical Integration: Newton-Cote’s Quadrature formula, Trapezoidal rule, Simpson’s one- third |
| 12 | 9 October -14 October | Simpson’s three-eighth rule, Chebychev formula, Gauss Quadrature formula. |
| 13 | 16 October-21 October | Numerical solution of ordinary differential equations: Picard’s method. Taylor’s series method, |
| 14 | 23 October-28 October | Euler’s method, Runge-Kutta Methods |
| 15 | 30 October- 4 November | Multiple step methods; Predictor-corrector method |
| 16 | 6 November- 9 November | Modified Euler’s method,Milne-Simpson’s method. |
| 17 | 17 November- 24 November | Revision |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name: Mathematical Foundations for Computer Science-I**

**Class:- BCA Ist sem Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | Sets and their representations, Empty set, Finite and infinite sets |
| 2 | 31 July-5 August | Subsets, Equal sets, Power sets, Universal set, Union and intersection of sets. |
| 3 | 7 August-12August | Difference of two sets, Complement of a set, Venn diagram, De-Morgan’s laws and their applications. Problems related to union, intersection, difference and complement of sets. Problems based on De Morgan’s Laws. |
| 4 | 14 August-19 August | An introduction to matrices and their types,Operations on matrices. Problems related to Venn diagrams. |
| 5 | 21 August-26 August | Symmetric and skew-symmetric matrices, Minors ,Co-factors. Problems to find inverse of a matrix. |
| 6 | 28August-2 September | Determinant of a square matrix, Adjoint and inverse of a square matrix. Problems to find determinant of a square matrix of order 3 |
| 7 | 4 September- 9 September | Solutions of a system of linear equations up to order 3. |
| 8 | 11 September – 16September | Quadratic equations, Solution of quadratic equations. |
| 9 | 18 September -23 September | Arithmetic progression |
| 10 | 25 September –30 September | Geometric progression, Harmonic progression. |
| 11 | 3 October-7 October | Problems to find nth term of A.P., G.P. and H.P. |
| 12 | 9 October -14 October | Arithmetic mean (A.M.), Geometric mean (G.M.), Harmonic mean (H.M.). |
| 13 | 16 October-21 October | Problems to find sum of n terms of A.P., G.P. and H.P. |
| 14 | 23 October-28 October | Relation between A.M., G.M. and H.M. |
| 15 | 30 October- 4 November | Problems to find A.M., G.M. and H.M. of given numbers. |
| 16 | 6 November- 9 November | The concept of differentiation, differentiation of simple functions. |
| 17 | 17 November-18 November | Use of differentiation for solving problems related to real-life situations. |
| 18 | 20 November-25 November | Problems involving formulation and solution of equations in one variable. |
| 19 | 27 November- 2 December | Differentiation of simple algebraic, trigonometric and exponential functions. |
| 20 | 4 December- 9 December | Problems to find first derivatives of functions. |
| 21 | 11 December- 16 December | Revision. |
| 22 | 18 December- 23 December | Revision. |
| 23 | 25 December- 30 December | Revision. |

**INDIRA GANDHI MAHILA MAHAVIDYALAYA**

**Subject Name:-Computer-Oriented Numerical Methods**

**Class:- BCA 3rdsem. Session:- 2023-2024**

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| **Sr.No** | **Date** | **Content** |
| 1 | 24 July-29 July | ComputerArithmetic:Floating point represetation of numbers, arithmetic operations with normalized floating-point numbers and their consequences, significant figures. |
| 2 | 31 July-5 August | Error in number representation-inherent error, truncation, absolute, relative, percentage. |
| 3 | 7 August-12August | Iterative Methods: Bisection, False position, Newton-Raphson method.. |
| 4 | 14 August-19 August | Iteration method, discussion of convergence, Bairstow's method. |
| 5 | 21 August-26 August | Solution of simultaneous linear equations and ordinary differential equations: Gauss-Elimination methods,. |
| 6 | 28August-2 September | pivoting, Ill-conditioned equations, refinement of solution. Gauss-Seidal iterative method. |
| 7 | 4 September- 9 September | Euler method, Euler modified method, Taylor-series method |
| 8 | 11 September – 16September | Runge-Kutta methods, Predictor-Corrector methods. |
| 9 | 18 September -23 September | Polynomial interpolation:Newton,Lagranges,Differencetables, |
| 10 | 25 September –30 September | Approximation of functions byTaylor Series. |
| 11 | 3 October-7 October | Chebyshev polynomial: First kind, Second kind. and their relations |
| 12 | 9 October -14 October | Orthogonal properties. |
| 13 | 16 October-21 October | Numerical Differentiation: Differentiation formulae based on polynomial fit |
| 14 | 23 October-28 October | pitfalls in differentiation |
| 15 | 30 October- 4 November | Trapezoidal & Simpson Rules |
| 16 | 6 November- 9 November | Gaussian Quadrature.  . |
| 17 | 17 November- 24 November | Revision |