Lesson Plan
Kallol Bhandhu Bagchi
Department of Mathematics
Session: 2022-23

**Weekly Lesson Plan For 1st Sem (2022-2023)**

**Paper :**

| Month/week | Topic to be covered |
|---|---|
| November , Week 1-2 | Calculas, Geometry and ODE Unit-I |
| November, Week 3-4 | Calculas, Geometry and ODE Unit-I |
| December, Week 1 | Calculas, Geometry and ODE Unit-III |
| December, Week 2 | Calculas, Geometry and ODE Unit-IV |
| December, Week 3 | Calculas, Geometry and ODE Unit-IV |
| January , Week 1 | Algebra Unit-I |
| January , Week 2 | Algebra Unit-II |
| January , Week 3 | Algebra Unit-III |
| January , Week 4 | Algebra Unit-IV |
| February, Week 1-2 | Rivision |

**Mode of Internal Assessment:** Class Test in Offline Mode.

**Weekly Lesson Plan For 2nd Sem (2022-2023)**

**Paper : HCC-III, HCC-IV, GE-II**

| Month/Week | Topic to be covered |
|---|---|
| March, Week 4 | Review of Algebric and order properties of R, Vector valued functions |
| April, Week 1 | Classification of sets through cardinality, Limit-continuity-differentiation-integration of vector functions |
| April, Week 2 | Countable and uncountable sets, 2nd and higher order ODE with constant coefficeints |
| April, Week 3 | Important results related to countable and uncountable sets, Wronskian and method of variation of parameter |
| April, Week 4 | Bounded sets and related topics, method of undetermined coefficeints |
| May, Week 1 | Introduction to ponit set topology of R, 2nd order homogeneous ODE |
| May, Week 2 | Results related to open and closed sets, System of linear differential equations |
| May, Week 3 | Results related to limit points, derived sets and closure of a sets, System of linear differential equations |
| May, Week 4 | Sequence of real numbers, System of linear differential equations |
| June, Week 1 | Sequence of real numbers |
| June, Week 2 | Infinite series |

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**Weekly Lesson Plan For 3rd Sem (2022-2023)**
**Paper : HCC(V-VII), SE-I**

| Month/week | Topic to be covered |
|---|---|
| July, Week 3 | Theory of real functions and introduction to metric spaces Unit-I |
| July, Week 4 | Theory of real functions and introduction to metric spaces Unit-II |
| August, Week 1 | Theory of real functions and introduction to metric spaces Unit-III |
| August, Week 2 | Theory of real functions and introduction to metric spaces Unit-IV |
| August, Week 3 | Group Theory1 Unit-I<br>Logic and sets Unit-I |
| August, Week 4 | Group Theory1 Unit-II<br>Logic and sets Unit-II |
| September, Week 1 | Group Theory1 Unit-III<br>Logic and sets Unit-III |
| September, Week 2 | Group Theory1 Unit-IV |
| September, Week 3 | Group Theory1 Unit-V |
| September, Week 4 | Riemann Integration and Series of functions Unit-(I, II) |
| November, Week 1 | Riemann Integration and Series of functions Unit-(III, IV) |
| November, Week 2 | Riemann Integration and Series of functions Unit-V |
| November, Week 3 | Rivision |

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**Weekly Lesson Plan For 4th Sem (2022-2023)**

**Paper : HCC(VIII-X), GE-IV, SE-II**

| Month/Week | Topic to be covered |
|---|---|
| January, Week 2 | Functions of several variables, limit and continuity of functions of two or more variables |
| January, Week 3 | Partial differentiation, total differentiability and differentiability, sufficient condition for differentiability. |
| January, Week 4 | Chain rule for one and two independent parameters, directional derivatives, the gradient |
| February, Week 1 | maximal and normal property of the gradient, tangent planes, extrema of functions of two variables, method of Lagrange multipliers, constrained optimization problems. |
| February, Week 2 | Double integration over rectangular region, double integration over non-rectangular region, double integrals in polar co-ordinates |
| February, Week 3 | triple integrals, triple integral over a parallelepiped and solid regions. Volume by triple integrals, cylindrical and spherical co-ordinates. |
| March, Week 3 | Change of variables in double integrals and triple integrals.<br>Continuous mapping, sequential criterion and other characterizations of continuity. Uniform continuity. Connectedness, connected subsets of $\mathbb{R}$. Compactness: Sequential compactness, Heine-Borel property, totally bounded spaces, finite intersection property and continuous functions on compact sets. |
| March, Week 4 | Definition of vector field, divergence and curl. |
| April, Week 1 | Line integrals, applications of line integrals: mass and work. Fundamental theorem for line integrals, conservative vector fields, independence of path.<br>Homeomorphism. Contraction mappings. Banach fixed point theorem and its application to ordinary differential equation. |
| April, Week 2 | Green's theorem, surface integrals, integrals over parametrically defined surfaces. Stoke's theorem, the Divergence theorem. |
| April, Week 3 | Vector spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces. |

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| April, Week 4 | Linear transformations, null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation, algebra of linear transformations. Isomorphisms. Isomorphism theorems, invertibility and isomorphisms, change of coordinate matrix. |
| May, Week 1 | Definition, examples and basic properties of graphs, pseudo graphs, complete graphs, bipartite graphs, isomorphism of graphs. Trees and forests, paths and cycles. |
| May, Week 2 and 3 | Eulerian circuits, Eulerian graph, semi-Eulerian graph, theorems, Hamiltonian cycles,theorems Representation of a graph by matrix, the adjacency matrix, incidence matrix, weighted graph. |

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**Weekly Lesson Plan 5th Sem (2022-2023)**
**Paper : HCC(XI, XII), DSE(I, II)**

| Month/Week | Topic to be covered |
|---|---|
| July, Week 3 | Group Theory II Unit-I |
| July, Week 4 | Group Theory II Unit-II |
| August, Week 1 | Group Theory II Unit-III |
| August, Week 2 | Group Theory II Unit-IV |
| August, Week 3 | Numerical Methods Unit-I, II |
| August, Week 4 | Numerical Methods Unit-III, IV |
| September, Week 1 | Numerical Methods Unit-V, VI |
| September, Week 2 | Linear Programming Unit-I |
| September, Week 3 | Linear Programming Unit-II<br>Linear Programming Unit-III |
| September, Week 4 | Linear Programming Unit-III |
| November, Week 1 | Numerical Methods Lab |
| November, Week 2 | Numerical Methods Lab |
| November, Week 3 | Numerical Methods Lab |

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**Weekly Lesson Plan For 6th Sem (2022-2023)**
**Paper : HCC(XIII-XIV), DSE(III-IV)**

| Month/Week | Topic to be covered |
|---|---|
| January, Week 3 | Polynomial rings over commutative rings, division algorithm and consequences, principal ideal domains, factorization of polynomials, reducibility tests, irreducibility tests, Eisenstein criterion, and unique factorization in Z [x]. Divisibility in integral domains, irreducible, primes, unique factorization domains, Euclidean domains.<br>Theory of equations unit-i |
| January, Week 4 | Dual spaces, dual basis, double dual, transpose of a linear transformation and its matrix in the dual basis, annihilators. Eigen spaces of a linear operator, diagonalizability |
| February, Week 1 | Invariant subspaces and Cayley-Hamilton theorem, the minimal polynomial for a linear operator, canonical forms.<br>Theory of equations unit-ii |
| February, Week 2 | Inner product spaces and norms, Gram-Schmidt orthogonalisation process, orthogonal complements, Bessel's inequality, the adjoint of a |

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|---|---|
| | linear operator. Least squares approximation, minimal solutions to systems of linear equations. |
| February, Week 3 | Normal and self-adjoint operators. Orthogonal projections and Spectral theorem.<br>Theory of equations unit-iii |
| March, Week 3 | Partial differential equations – Basic concepts and definitions. Mathematical problems. First-order equations: classification, construction and geometrical interpretation. Method of characteristics for obtaining general solution of quasi linear equations. |
| March, Week 4 | Canonical forms of firstorder linear equations. Method of separation of variables for solving first order partial differential equations.<br>Theory of equations unit-iv |
| April, Week 1 | Derivation of heat equation, wave equation and Laplace equation. Classification of second order linear equations as hyperbolic, parabolic or elliptic. |
| April, Week 2 | Reduction of second order linear equations to canonical forms. |
| April, Week 3 | Countable and Uncountable Sets, Schroeder-Bernstein Theorem, Cantor's Theorem. |
| April, Week 4 | Cardinal numbers and cardinal arithmetic. |
| May, Week 1 | Continuum Hypothesis, Zorns Lemma, Axiom of Choice. Wellordered sets, Hausdorff's maximalprinciple. Ordinal numbers. |
| May, Week 2 | Topological spaces, basis and Sub basis for a topology, subspace topology, interior points, limit points, derived set, boundary of a set, closed sets, closure and interior of a set. |
| May, Week 3 | Continuous functions, open maps, closed maps and homeomorphisms. |
| May, Week 4 | Product topology, quotient topology, metric topology, Baire category theorem. |

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