**GOVT. P.G. COLLEGE FOR WOMEN, SECTOR-14, PANCHKULA**

**LESSON-PLAN (Session 2024-25) ODD SEMESTER**

**Name of Teacher**: Raj Singh

**Designation: ASSISTANT PROFESSOR**

**Class: M.Sc. 2 Sem.3**

**Subject/ Paper: NUMBER THEORY**

**Type of course:(Non-NEP):**

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| **S. No.** | **Month** | **Topics to be covered** | **Teaching Learning Strategy** | **Learning Outcomes of Students** | **Remarks** |
| **1.** | **AUGUST** | reatest integer function, Arithmetic function, multiplicative function, completely multiplicative function, mobius- inversion formula, recurrence function, combinational number theory. | Peer teaching | After completing this course students will be able to understand basic concepts and genesis of mobius- inversion formula | **Assignment** |
| **2.** | **SEPT.** | Solution of the equation ax+by =c, simultaneous linear equations, Unimodular matrices, Pythagorean triangles, some assorted examples, ternary quadratic forms, rational points on curves. |  | To understand the concepts of ax+by =c, simultaneous linear equations | **Presentations** |
| **3.** | **OCT.** | Farey sequences, rational approximations, Hurwitz theorem, irrational numbers, Blichfeldt’s principle, Minkowski’s Convex body theorem, Lagrange’s four square theorem. |  | To help students to understand the aspects of Convex body theorem | **Class Test** |
| **4.** | **NOV.** | Euclidean algorithm, finite and infinite continued fractions, approximations to irrational numbers, Best possible approximations, Hurwitz theorem, Periodic continued fractions, Pell’s equation. |  | To understand the concepts of , Pell’s equation. |  |

**Seminar/Presentation/Assignment/Quiz/Class Test /Mid-Term Exam will be taken as per schedule.**

**GOVT. P.G. COLLEGE FOR WOMEN, SECTOR-14, PANCHKULA**

**LESSON-PLAN (Session 2024-25) ODDSEMESTER**

**Name of Teacher**: Dr. Kiran Bala

**Designation:** Assistant Professor

**Class:** M.Sc II

**Subject/ Paper:** MM-502 : Analytical Mechanics and Calculus of Variations

**Type of course( major/ minor/ VAC/ AEC/SEC/ MDC): Non- NEP**

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| **S. No.** | **Month** | **Topics to be covered** | **Teaching Learning Strategy** | **Learning Outcomes of Students** | **Remarks** |
| **1.** | **August** | Motivating problems of calculus of variations: shortest distance, Minimum surface of revolution, Brachistochrone problem, Isoperimetric problem, Geodesic. Fundamental Lemma of calculus of variation. 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. Variational derivative, invariance of Euler’s equations, natural boundary conditions and transition conditions, Conditional extremum under geometric constraints and under integral constraints . Variable end points. | Learning through Problem Solving | Students will understand the calculus of variations that is a field of mathematical analysis that uses variations and related problems. |  |
| 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. . Lagrange’s equations of first kind, Principle of virtual displacements D’Alembert’s principle, Holonomic Systems independent coordinates, generalized forces, Lagrange’s equations of second kind. Uniqueness of solution. Theorem on variation of total Energy. Potential, Gyroscopic and dissipative forces, Lagrange’s equations for potential forces equation for conservative fields. | Learning through Problem Solving | In our everyday life, we face some situations where we find that an object can not move freely, rather its motion is restricted, By this students will understand constrained systems and their classifications. | Assignment I  Class Test I |
| **3.** | **October** | Hamilton’s variables. Donkin’s theorem. Hamilton canonical equations. Routh’s equations. Cyclic coordinates Poisson’s Bracket. Poisson’s Identity. Jacobi-Poisson theorem. Hamilton’s Principle, second form of Hamilton’s principle. Poincare-Carton integral invariant. Whittaker’s equations. Jacobi’s equations. Principle of least action | Learning through Problem Solving | Students will be able to solve elementary variational problems, de familiar with Hamilton’s etc. | Assignment II |
| **4.** | **November** | Canonical transformations, free canonical transformations, Hamilton-Jacobi equation. Jacobi theorem. Method of separation of variables for solving Hamilton-Jacobi equation. Testing the Canonical character of a transformation. Lagrange brackets. 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. Invariance of Lagrange brackets and Poisson brackets under canonical transformations. | Learning through Problem Solving ,  Group- Learning and Teaching | Students will be able to learn canonical transformations , testing of canonical characters etc. | Presentations |

* **Seminar/Presentation/Assignment/Quiz/Class Test /Mid-Term Exam will be taken as per schedule.**

**Signature of Teacher Principal**

**GOVT. P.G. COLLEGE FOR WOMEN, SECTOR-14, PANCHKULA**

**LESSON-PLAN (Session 2024-25) ODD SEMESTER**

**Name of Teacher**: Kanchan Bala

**Designation: Associate Professor**

**Class: MSC Mathematics 3rd sem**

**Subject/ Paper: Functional analysis**

**Type of course( major/ minor/ VAC/ AEC/SEC/ MDC):**

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| **S. No.** | **Month** | **Topics to be covered** | **Teaching Learning Strategy** | **Learning Outcomes of Students** | **Remarks** |
| **1.** | **August** | 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, finite dimensional normed spaces and subspaces, equivalent norms, compactness and finite dimension, F.Riesz’s lemma.  Bounded and continuous linear operators, differentiation operator, integral operator, bounded linear extension, linear functionals, bounded linear functionals, continuity and boundedness, definite integral, canonical mapping, linear operators and functionals on finite dimensional spaces, normed spaces of operators, dual spaces with examples. | Group learning and teaching, learning through problem solving. | Have deep understanding and knowledge in the core areas of Mathematics and demonstrate understanding and application of the concepts/theories/principles/ methods/ techniques in different areas of pure Mathematics. |  |
| **2.** | **September** | Hahn-Banach theorem for real linear spaces, complex linear spaces and normed linear spaces, 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.  Reflexive spaces, uniform boundedness theorem and some of its applications to the space of polynomials and fourier series. |  |  |  |
| **3.** | **October** | Strong and weak convergence, weak convergence in *l p* , convergence of sequences of operators, uniform operator convergence, strong operator convergence, weal operator convergence, strong and weak\* convergence of a sequence of functionals. Open mapping theorem, bounded inverse theorem, closed linear operators, closed graph theorem, differential operator, relation between closedness and boundedness of a linear operator.  Inner product spaces, Hilbert spaces and their examples, pythagorean theorem, Apolloniu’s identity,  Schwarz inequality, continuity of innerproduct, completion of an inner product space, subspace of a  Hilbert space, orthogonal complements and direct sums, projection theorem, characterization of sets in Hilbert spaces whose space is dense. |  |  |  |
| **4.** | **November**  **December** | Orthonormal sets and sequences, Bessel’s inequality, series related to orthonormal sequences and sets, total(complete) orthonormal sets and sequences, Parseval’s identity, separable Hilbert spaces.Representation of functionals on Hilbert spaces, 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, self adjoint, unitary, normal, positive and projection operators. |  |  |  |

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**Signature of Teacher Principal**

**GOVT. P.G. COLLEGE FOR WOMEN, SECTOR-14, PANCHKULA**

**LESSON-PLAN (Session 2024-25) ODD SEMESTER**

**Name of Teacher**: Ms. Bindu

**Designation: Assistant Professor of Mathematics**

**Class: M. Sc.II**

**Subject/ Paper: Integral Equations**

**Type of course( major/ minor/ VAC/ AEC/SEC/ MDC): Major**

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| **S. No.** | **Month** | **Topics to be covered** | **Teaching Learning Strategy** | **Learning Outcomes of Students** | **Remarks** |
| **1.** | **August** | Definition of Integral Equations and their classifications. Eigen values and Eigen functions. Special kinds of Kernel Convolution Integral. The inner or scalar product of two functions. Reduction to a system of algebraic equations. Fredholm alternative, Fredholm theorem, Fredholm alternative theorem, An approximate method. | **Incorporate questions and discussions into lectures to engage students and encourage active participation.**  **Encourage students to work in groups to solve problems which promotes peer learning and communication skills** | **Gain thorough understanding of the basic type of integral equations And to understand eigen values and Eigen functions specially kernel convolution integral** |  |
| **2.** | **September** | Method of successive approximations, Iterative scheme for Fredholm and Volterrra Integral equations of the second kind. Conditions of uniform convergence and uniqueness of series solution. Some results about the resolvent Kernel. Application of iterative scheme to Volterra integral equations of the second kind. Classical Fredholm’s theory, the method of solution of Fredholm equation, Fredholm’s First theorem, Fredholm’s second theorem, Fredhom’s third theorem. |  | **Gain a thorough understanding of basic type of integral equation, including Freedom and Voltaire equations and their classifications into first kind and 2nd kind equations** |  |
| **3.** | **October** | Symmetric Kernels, Introduction, Complex Hilbert space. An orthonormal system of functions, Riesz Fisher theorem, A complete two-Dimensional orthonormal set over the rectangle a ≤ s ≤ b , c ≤ t ≤ d . Fundamental properties of Eigenvalues and Eigenfunctions for symmetric Kernels. Expansion in eigen functions and Bilinear form. Hilbert-Schmidt theorem and some immediate consequences. Definite Kernels and Mercer’s theorem. Solution of a symmetric Integral Equation. Approximation of a general 2 ℓ-Kernel(Not necessarily symmetric) by a separable Kernel. The operator method in the theory of integral equations. Rayleigh-Ritz method for finding the first eigenvalue. |  | **Learn to apply symmetry kernels complex Hilbert space and other Fundamental properties of eigen values and eigen functions** |  |
| **4.** | **November** | **The Abel Integral Equation. Inversion formula for singular integral equation with Kernel of the type h(s)-h(t), 0<α** |  | **Learn to apply the able integral equation and inversion formula for singular equations.** |  |

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