Name of the Teacher: Sushma Gupta

Class: M.Sc. Mathematics (3rd Semester), MM-502 (Analytic Mechanics and Calculus of Variance )

**Lesson Plan**

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| **S No** | **Period** | **Topics to be Covered** | **Academic Activity to be Organized** |
|  | **17-31 July 2017** | 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. | **Oral Presentations** |
|  | **01-31 Aug 2017** | 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. 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 Uniqueness of solution. Theorem on variation of total Energy. Potential, Gyroscopic and dissipative forces, Lagrange’s equations for potential forces equation for conservative fields. | **Oral Presentations** |
|  | **01-30 Sept 2017** | D’Alembert’s principle, HolonomicSystems independent coordinates, generalized forces, Lagrange’s equations of second kind. Hamilton’s variables. Don kin’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. | **Group Discussion** |
|  | **01-31 Oct 2017** | Poincare-Carton integral invariant. Whittaker’s equations. Jacobi’s equations. Principle of least action 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. | **Group Discussion** |
|  | **01-13 Nov 2017** | Simplicial nature of the Jacobian matrix of a canonical transformations. Invariance of Lagrange brackets and Poisson brackets under canonical transformations. | **Surprise Test** |

**Topics of Assignments/ Class Tests to be given to the Students:**

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| **Assignment 1** | Poisson’s Identity. Jacobi-Poisson theorem. |
| **Assignment 2** | Poincare-Carton integral invariant. |
| **Class Test** | Properties of Poisson Bracket |