

Lesson Plans 2024-25 odd semester

Name of the Assistant professor-DrMeenu Gupta
Subject-Analytical Mechanics and Calculus of Variations

Class- M.Sc. Mathematics 3rdsem
Paper code- MM-502

Date	Topics
August	Unit-1
1 st week	Motivating problems of calculus of variations: of shortest distance,
2 nd week	Brachistochrone problem
3 rd week	Minimum surface revolution,
	Geodesic
4 th week	Isoperimetric problem
	Fundamental Lemma of calculus of variation.
5 th week	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.
September	Variational derivative
1 st week	Invariance of Euler's equations
	Natural boundary conditions and transition conditions.
	Conditional extremum under geometric constraints and under integral constraints.
2 nd week	Unit 2
	Free and constrained systems.
	constraints and their classification
3 rd week	Generalised coordinates.
	Scleronomic and Rheonomic systems
	Generalized Potential, Possible and virtual displacements, ideal constraints.

4 th week	Holonomic and non Holonomic system
	Lagrange's equations of first kind
	Principle of virtual displacements D'Alembert's principle
	Holonomic Systems independent coordinates

October	generalized forces
1 st week	Lagrange's equations of second kind.
	Uniqueness of solutions.
	Unit-3
2 nd week	Theorem on variation of total Energy
	Potential, Gyroscopic and dissipative forces.
3 rd week	Lagrange's equations for potential forces equation for conservative fields.
	Hamilton's variables.
	Donkin's theorem.
4 th week	Hamilton canonical equations
	Routh's equations.
	Cyclic coordinates Poisson's Bracket
November	Poisson's Identity, Jacobi-Poisson theorem
1 st week	Hamilton's Principle, second form of Hamilton's principle.
	Poincare-Carton integral invariant, Whittaker's equations, Jacobi's equations.
	Principle of least action,
2 nd week	UNIT -4
	Hamilton Jacobi's equations, Canonical transformations, free canonical transformations
	Jacobi theorem, Method for solving Hamilton-Jacobi equation.
3 rd week	Testing the Canonical character of a transformation, Lagrange brackets.
	Simplicial nature of the Jacobian matrix of a canonical-transformations
	Invariance of Lagrange's brackets.
	Poisson brackets under canonical transformations