School of Mathematics

Course 241 — Mechanics 2006-07
(SF Mathematics, SF Theoretical Physics, optional for JS Mathematics, JS & SS Two-subject Moderatorship)

Lecturer: Dr. Sergey Frolov

Requirements/prerequisites: 131, 141

Duration: 24 weeks

Number of lectures per week: 3

Assessment: Regular assignments

End-of-year Examination: One 2-hour One 3-hour Final examination

Description: First and second parts of the course are devoted to classical mechanics

- Newton's laws, Constrained dynamics, Generalized coordinates and forces, D'Alambert's principle
- Lagrange's equations, Hamilton principle, Calculus of variations, Conservation laws
- Motion in central potential
- Rigid body motion, Euler equations
- Oscillations: Equilibrium and motion near equilibrium
- Hamilton formalism: Legendre transform, Hamilton equations, Liouville theorem
- Canonical transformations
- Hamilton-Jacobi equations, action-angle variables

Third part of the course introduces special theory of relativity and classical mechanics of continuous systems and fields.

See also `http://www.maths.tcd.ie/~frolovs/Mechanics/Mechanics.html` for further information.

Objectives: Introduction to Lagrangian and Hamiltonian mechanics, Introduction to special relativity and field theory.

Textbooks:

L.D. Landau and E.M. Lifshitz/*Mechanics*, Butterworth-Heinemann
H. Goldstein/*Classical Mechanics*, third edition, Addison Wesley
V.I. Arnold,/*Mathematical Methods of Classical Mechanics*, Springer-Verlag Berlin and Heidelberg GmbH & Co. K.

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