

## School of Mathematics

### Course 241 — Mechanics

2004-05

(SF Mathematics, SF Theoretical Physics, optional for JS Mathematics, JS & SS Two-subject Moderatorship )

**Lecturer:** Dr. Sergey Cherkis

**Requirements/prerequisites:** 131, 141

**Duration:** 24 weeks

**Number of lectures per week:** 3

**Assessment:** Regular assignments

**End-of-year Examination:** One 2-hour Midterm and one 3-hour Final examination

**Description:** First part of the course is devoted to classical mechanics

- Newton's laws, Constrained dynamics, Generalized coordinates and forces, D'Alembert'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

Second and third parts of the course continue with classical mechanics of continuous systems and fields and introduce special theory of relativity and conclude with the introduction to quantum mechanics.

See also <http://www.maths.tcd.ie/~cherkis/241/> for further information.

**Objectives:** Introduction to Lagrangian and Hamiltonian mechanics, Introduction to quantum mechanism and to special relativity.

### Textbooks:

H. Goldstein/*Classical Mechanics*, third edition, Addison Wesley

L.D. Landau and E.M. Lifshitz/*Mechanics*, Butterworth-Heinemann

V.I. Arnold,/*Mathematical Methods of Classical Mechanics*, Springer-Verlag Berlin and Heidelberg GmbH & Co. K.

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