Hamiltonian Mechanics – MAT467HS

Spring 2023

Time/location: TU 10-12/OI8180, TH 11-12/BA1240

Instructor: Boris Khesin

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Course description:

The course focuses on the key notions of classical mechanics: Newton equations, variational principles, Lagrangian formulation and Euler-Lagrange equations, the motion in a central force, the motion of a rigid body, small oscillations, Hamiltonian formulation, canonical transformations, Hamilton-Jacobi theory, action-angle variables, and integrable systems.

Textbooks:

1. Goldstein, Poole, and Safko: “Classical Mechanics”
   (can be downloaded from https://3lib.net/book/3355492/bc94a3)
   (can be downloaded from https://3lib.net/book/2297866/63d501)
   (can be downloaded from https://3lib.net/book/1272223/c80d94)

Course Website:

The website for the course is http://www.math.toronto.edu/khesin/teaching/mechanics/mechanics23.html
Homework Assignments:

There will be 3 assignments and a final individual project, all weighted equally at 25%, which together constitute the full course mark. No late assignments will be accepted.

Note: You must write your solutions yourself, in your own words. If your solution is aided by information from textbooks or online sources, you must properly quote these references.

Code of Behaviour / Plagiarism:

Students should become familiar with and are expected to adhere to the Code of Behaviour on Academic Matters which can be found at:

http://www.governingcouncil.utoronto.ca/policies/behaveac.htm

Course Syllabus:

5. The two-body problem. Motion in a central field. The Kepler problem.
6. Rigid Bodies. Euler’s equations.
9. Liouville’s theorem, Poincaré recurrence.
11. Introduction to Lagrangian and Hamiltonian setting of continuous systems. Hydrodynamical Euler equation.

Prerequisites:

MAT235Y1/MAT237Y1/MAT257Y1 (multivariable calculus),
MAT244H1/MAT267H1 (differential equations),
MAT223 (linear algebra)

Program Area Section: Mathematics