Physics 321b: Classical Mechanics II

Instructor: Stefan Janiszewski
Office: Elliot 203
Office Hours: Monday 12-1 and Friday 1-2
Email: stefan.janiszewski@gmail.com

Recommended Texts:
-I will follow Classical Dynamics by Thorton and Marion (5th Ed.) which can be found cheaply online (although slow shipping) and a couple are available in the bookstore.
-The dense but thorough classic Mechanics Vol 1 by Landau and Lifshitz can be found for free online.

Lecture: Lectures are Tuesday and Friday 2:30-3:50 in Elliot 160. Every other week may involve a problem session instead of traditional lecture.

Homework: Homework assignments will be a LARGE part of the total grade. They will be due weekly at the beginning of class on **Tuesday**. Late assignments will be penalized at my discretion. Computer tools (Mathematica etc) can be used, but are NOT a substitute for explanation. Homeworks will be graded by TA Marla Cervantes and score specific questions should be directed to her, marla@uvic.ca.

Labs: Labs are a required component of this course.

Midterm: The midterm exam is tentatively scheduled for Tuesday **February 16th**. A practice session will be held the lecture before.

Final: The final exam is scheduled to for **TBD**. Note that on all exams only the Sharp EL-510R calculator, available from the bookstore, can be used.

Grades: The course grade will be determined from the following components, following option 1 **or** 2, which ever gives the higher score.

- 1: a) The Labs will count **15%**.
  b) The Midterm will count **15%**.
  c) The Homeworks will count **30%**.
  d) The Final will count **40%.**

Or - 2: a) The Labs will count **15%**.
b) The Midterm will count **15%**.
c) The Final will count **30%**.
d) The homework will count **40%.**

Tentative schedule. Details will be added as time goes on, but the following topics will likely be covered.

1. **Intro: Functionals and extremization (~1 week).** An intro to the machinery of advanced mechanics, along with motivation for departure from Newton's Laws formalism.
2. **Lagrange mechanics (~2 weeks).** Generalized coordinates and configuration space. The Lagrangian and action. Hamilton's principle. Euler-Lagrange equations. Conservation laws. Application.
3. **Hamilton dynamics (~2 weeks).** Legendre transformations, Hamilton function, and Hamilton's equations of motion. Canonical transformations. Poisson brackets. Maupertuis principle. Hamilton-Jacoby equation.
4. **Rigid body motion (~1 week).** Main concepts of solid bodies. Euler's angles and Euler's equations.
5. **Particles in electromagnetic and gravitational fields (~2 weeks).** Action for a relativistic particle. The vector potential of electromagnetism. Equations of motions and simple solutions. Backreaction of radiation. Small perturbations of Keplerian orbits.
6. **Adiabatic processes (~1 week).** Adiabatic invariants. Action-angle variables. Liouville's theorem. Boltzmann equation.
7. **Fields (~1 week).** Lagrangian of scalar and vector fields. Derivation of Maxwell's equations. Least action for light.