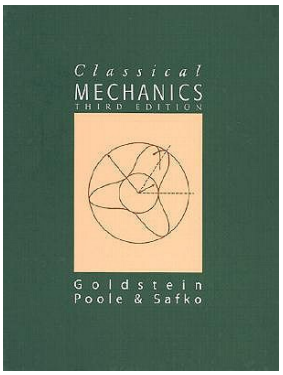
PHYS 601: Classical Mechanics, Fall 2021



Instructor: Josh Erlich
Office: Small 332B
Phone: 757-221-3763
E-mail: jxerli@wm.edu

Lectures: MW 11am-12:20pm, Small 122

Course website: http://physics.wm.edu/~erlich/601F21

Office hours: Thursdays 11am-12pm, and by appointment, and whenever Josh is in his office. Feel free to stop by.

Textbook: *Classical Mechanics* (third edition) by H. Goldstein, C. Poole, and J. Safko

Errata: http://astro.physics.sc.edu/goldstein/

Other references:
A.L. Fetter and J.D. Walecka, *Theoretical Mechanics of Particles and Continua* - an excellent textbook, the one that was used when I was taught the subject. Does not cover special relativity.

D. Tong, *Lectures on Classical Dynamics*, http://www.damtp.cam.ac.uk/user/tong/dynamics.html - David Tong is the new Landau. He has lecture notes on everything, freely available online. The classical mechanics notes are great, but organized a little differently than this course.

L. Landau & E. Lifshitz, *Mechanics* - a classic, like all of the Landau & Lifshitz texts

V.I. Arnold, *Mathematical Methods of Classical Mechanics* - dives deep into the mathematical aspects of the subject

Chegg, and other homework solutions offered online - These are *NOT* acceptable references for the homeworks, but you may use them for studying.

Grading and exams:
Homework (50%): Roughly weekly, due Mondays
In-class exam 1 (10%): Wednesday, October 6
In-class exam 2 (10%): Wednesday, November 10
Final Exam (30%): December 15, 9am-12pm

Grading: A 90-100, A- 85-90, B+ 80-85, B 75-80, B- 70-75, C+ 65-70, C 60-65, C- 55-60, D+ 50-55, D 45-50, D- 40-45, F <40

Course objectives:
Classical mechanics is a broad subject, and we will select topics that develop techniques for analyzing nontrivial classical systems, and topics that are essential for understanding other branches of physics. You are expected to master the major topics covered in the course and be able to solve relevant problems.

From the course catalog:
The mechanics of particles and rigid bodies, methods of Lagrangian and Hamiltonian mechanics, relativistic mechanics, approximation techniques.

Topics will include:

- Basic principles: the subtleties in Newton's laws
- D'Alembert principle, Lagrangians, and Lagrange's equations of motion
- Variational methods and Hamilton's principle
- Systems with constraints
- Symmetries and conservation laws: Noether's theorem
- Hamiltonians and Hamilton's equations of motion
- Central forces
- Small oscillations and normal modes
- Rigid body motion and non-inertial reference frames
- Canonical transformations; Hamilton-Jacobi theory; action-angle variables
- Special relativity