University of Vermont
Department of Physics

Physics 5200: Advanced Dynamics

Spring 2026

Instructor:	Dr. Dennis Clougherty	**Time:**	TR 2:50-4:05 PM
Email:	dennis.clougherty+PHYS5200@uvm.edu	**Place:**	TBD

Course Description: Classical mechanics presented as the basis of the concepts and methods of modern physics. Variational, Lagrangian, and Hamiltonian formulations, canonical transformations, continuous systems.

Prerequisites: Graduate student or undergraduate student with Instructor permission; knowledge PHYS 2200 topics strongly recommended.

Objectives: Students will master the Lagrangian and Hamiltonian formulations of classical mechanics and acquire essential elements of classical field theory through problem solving.

Course Personnel:

Mohamed Elsayed, graduate teaching assistant (Mohamed.Elsayed@uvm.edu).

Office Hours: F 2-3 PM & by appointment.

References:

1. A.L. Fetter and J. D. Walecka, *Theoretical Mechanics of Particles and Continua*, (Dover, 2003). (This is the required text for the course.)
2. H. Goldstein, C.P. Poole, and J.L. Safko, *Classical Mechanics*, 3rd edition, (Pearson, 2001). (This was the standard text for many years.)
3. L.D. Landau and E.M. Lifshitz, *Mechanics*, 3rd edition, (Butterworth-Heinemann, 1976).
4. J.V. Jose and E.J. Saletan, *Classical Dynamics: A Contemporary Approach*, (Cambridge, 1998).
5. G. Arfken et al., *Mathematical Methods for Physicists*, 7th edition, (Academic, 2012). (This text is a popular reference for relevant mathematics.)

Course Outline:

1. Review of Newtonian dynamics
2. Lagrangian dynamics
3. Small oscillations
4. Rigid body dynamics
5. Hamiltonian dynamics
6. Classical field theory

Online Resources:

1. Course web site: http://brightspace.uvm.edu
2. UVM Physics help sessions web site: https://www.uvm.edu/cems/physics/help-sessions
3. UVM tutoring center web site: https://www.uvm.edu/academicsuccess/tutoring_center
4. UVM Physics web site: http://www.uvm.edu/physics/
5. UVM student accessibility services (SAS): http://www.uvm.edu/access
6. Prof. Clougherty's web site: http://go.uvm.edu/dpc/

Grading Policy:

Homework (30%), Exams (15% each), Final (25%).

Important Dates:

Exam #1	February 26, 2026
Exam #2	March 5, 2026
Exam #3	April 16, 2026
Final Exam	May 4-8, 2026

Please mark these dates in your calendar now. Exams will take precedence over medical appointments, travel plans, athletic events, and other personal activities. If you miss an exam, you will receive a score of zero unless excused by Professor Clougherty prior to the exam. As a general rule, only a verifiable illness is reason to miss an exam.

Class expectations:

1. *Attendance*: Regular attendance is important in mastering the material.
2. *Preparation*: Students are required to read the assigned text in advance of class. Please come to class with questions stimulated by your readings.
3. *Homework*: Homework assignments will be posted to the course web site on Brightspace. Please write up your complete and detailed solutions neatly. Please upload a scanned pdf of your solution to Brightspace in advance of the posted deadline.
4. *Exams*: Exams will be based on the homework problems. Exams are closed-book, but you can bring a single-page sheet with notes to use during the exam.
5. *Class recordings*: Our class sessions may be recorded for students in the class to refer back to, and for enrolled students who are unable to attend live. Students who participate online with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who unmute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live.

Accommodations: In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact SAS, the office of Disability Services on campus. SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter. All students are strongly encouraged to meet with their faculty to discuss the accommodations they plan to use in each course. See http://www.uvm.edu/access for more information.

Academic Integrity: It is expected that all students will adhere to the University code of academic integrity. Students are prohibited from publicly sharing or selling academic materials that they did not author (for example: class syllabus, outlines or class presentations authored by the professor, practice questions, text from the textbook or other copyrighted class materials, etc.); and students are prohibited from sharing assessments (for example, homework or a take-home examination). Violations will be handled under UVM's Intellectual Property policy and Code of Academic Integrity.
(https://www.uvm.edu/sites/default/files/UVM-Policies/policies/acadintegrity.pdf)