

Course #14869 (3 credits)

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 Professor, Dept. of Physics office: SE 214B, NDSU

Classes: TTh, 2:00-3:15 pm, SE 208/221 **Office Hours:** MW, 4:15-5:00 pm (Zoom)

Bulletin Description:

Basic concepts, single and coupled oscillators, variational calculus, Lagrangian dynamics, Hamiltonian dynamics, central force motion, and accelerated coordinate systems.

Prerequisites: PHYS 252, MATH 265 (basic knowledge of mechanics and calculus)

Objectives: Students will master the foundations of classical mechanics and learn to apply theoretical and computational methods to model a variety of physical systems, including projectiles, charged particles, oscillators, planetary systems, and rigid bodies.

Format: Students are expected to review assigned resources in advance and attend class prepared to discuss and work through guided exercises. You are not expected to fully understand the material before class, but be familiar with terminology and definitions. In this way, class time can be used more effectively to deepen conceptual understanding, strengthen problem-solving skills, and discuss practical relevance and applications.

Textbook: J. R. Taylor, *Classical Mechanics* (University Science Books, 2005)

Evaluation:	Homework	100 pts	(best 9/11 assignments)
	Exams	150 pts	(best 2/3 midterms and a final exam)
	Quizzes	25 pts	
	Project	25 pts	
	<u>Total</u>	<u>300 pts</u>	

Attendance is expected (NDSU Policy 333, www.ndsu.edu/fileadmin/policy/333.pdf), Class attendance and engagement are strongly correlated with success in this course!

Homework: Assignments will be posted on Blackboard (<https://bb.ndsu.nodak.edu>). While discussion of homework with classmates is encouraged, submitted work must be your own. Close similarity to work of other students or internet solutions yields no points.

Quizzes: Reading quizzes will be posted on Blackboard.

Grading: A: $\geq 85\%$, B: 70 to $< 85\%$, C: 55 to $< 70\%$, D: 40 to $< 55\%$, F: $< 40\%$
 Grades will not be curved and any shift in grade boundaries will be only in your favor.

Health and Safety Expectations

Do not come to class if you are sick or, if infected by COVID-19, during your five-day isolation period. Do not come to class if you have been exposed to individuals who tested positive for COVID-19 and/or you have been notified to self-quarantine due to exposure. See attached COVID-19 Related Information.

Should any circumstances necessitate strictly online instruction, all course resources will remain accessible through Blackboard and communications and interactive discussions will continue via email and Zoom.

Preliminary Schedule

Week	Topic
1-2	Newton's Laws of Motion
2-3	Projectiles and Charged Particles
4	Momentum and Angular Momentum
5-6	Energy
September 27	Midterm Exam 1
6-7	Oscillations
8	Calculus of Variations
9-10	Lagrange's Equations
November 1	Midterm Exam 2
11	Hamiltonian Mechanics
12	Two-Body Central-Force Problems
13-14	Mechanics in Noninertial Frames
November 29	Midterm Exam 3
14-15	Rotational Motion of Rigid Bodies
16	Coupled Oscillators and Normal Modes
December 13, 1:00 PM	Final Exam

Project: Choose a topic from the list below and prepare slides and notes for a one-hour lecture and solutions to three example/homework problems

Nonlinear Mechanics and Chaos (chap. 12); Collision Theory (chap. 14); Special Relativity (chap. 15); Continuum Mechanics (chap. 16)

Computational Examples and Exercises

To deepen conceptual understanding and build computational skills, we will make use of Mathematica, and *Simulations in Physics* in the Open Source Physics Library, free Java software that can be downloaded, compiled, and run on any computer.

The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.

All access to NDSU computers must respect NDSU Senate Policy, section 158:

Acceptable use of Electronic Communication Devices

<https://www.ndsu.edu/fileadmin/policy/158.pdf>

Any students with disabilities or other special needs, who need special accommodations in this course are invited to share concerns or requests with the instructor and to contact the Disability Services Office (www.ndsu.edu/disabilityservices) as soon as possible.

COVID-19 Related Information

Communication

Course-related information will be communicated primarily during our class meetings. Reminders and notifications of any schedule changes will be communicated through NDSU email and posted on the Blackboard announcements page.

Your NDSU email address is the official route for course-related information!

Office hours will be conducted in person and via Zoom (at times to be announced).

If you have any technology concerns, please contact the IT Help Desk:

ndsu.helpdesk@ndsu.edu 701-231-8685 (option 1)

Homework and Posting of Grades

Homework assignments and grades will be posted on our Blackboard course page.

For full credit, your solutions must include clear, written explanations of your reasoning!

Copyright of Course Materials

Recording any class meetings with your own personal devices is strictly prohibited. See NDSU [Policy 190](#) on Intellectual Property.

Health and Safety Expectations

Do not come to class if you are sick or, if infected by COVID-19, during your five-day isolation period. Please protect your health and the health of others by staying home. If you are unable to attend class at the scheduled time due to illness or exposure, email me promptly for alternate arrangements, including accommodations and extensions.

For information on COVID-19, symptoms, testing, and steps to stay healthy see

https://www.ndsu.edu/studenthealthservice/patient_resources/covid_19_information/

Do not come to class if you have been exposed to individuals who tested positive for COVID-19 and/or you have been notified to self-quarantine due to exposure.

If you were exposed to COVID-19, please follow CDC guidance available [here](#).

If you tested positive for COVID-19, please follow CDC guidance available [here](#).

Free testing kits can be picked up at the NDSU Bookstore, Library, or Student Health Service. Rapid and PCR testing is available at Student Health Service by appointment during regular business hours for both symptomatic and asymptomatic students.

Information on COVID-19 preparedness in Residence Life:

https://www.ndsu.edu/reslife/covid_19_response/

If public health conditions and directives from NDSU administration change, I will let you know in writing the expectations for our class moving forward.

Additional Resources for Students

As a valued member of the NDSU community, you have access to resources should you need help in dealing with adverse reactions to things happening in the world today:

Counseling Services: 701-231-7671; <https://www.ndsu.edu/counseling/>

Disability Services: 701-231-8463; <https://www.ndsu.edu/disabilityservices/>

Student Health Service: 701-231-7331; <https://www.ndsu.edu/studenthealthservice/>

Dean of Students Office: 701-231-7701; <https://www.ndsu.edu/deanofstudents/>

In a Crisis or Emergency Situation:

Call University Police: 701-231-8998

Call 9-1-1

For physical health crises: Go to a Hospital Emergency Room

For mental health crises: Go to Prairie St. John's for a Needs Assessment

510 4th St. S, Fargo (701-476-7216)

Call the FirstLink Help Line: 1-800-273-TALK (8255) or 2-1-1

Call the Rape and Abuse Crisis Center: 701-293-7273

Call the Suicide and Crisis Lifeline: 9-8-8