PHYSICS III: Theory and Simulation, Fall 2026

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- Only use emails to contact me.
- I only respond to emails sent via your uni.edu account.
- Emails are responded to within one business day.
- I will send course-related updates and notifications via the class Google group.
- I will use eLearning to post exam grades, links, and upload materials.

Class Times: Monday & Wednesday, 2:00PM - 2:50PM, & Friday 2:00PM - 3:50PM
Location: Lectures will be held at Begeman 114, and the computer lab will be held at Begeman 102. Fridays will be a combination of lectures and computer lab activities. The details will be discussed later. Every student in the class will have remote access to MATLAB and other UNI licensed software by connecting to the UNI server via Citrix. Further information about Citrix can be found below. In case of emergency, the class will be delivered by Zoom.

Office Hours: Monday 12:30-1:30 pm. You can Email me or drop by. You can also send me an Email if you want to see me at a time outside of office hours. We can also meet online via Zoom. The Zoom link for office hours differs from the Zoom link for the lectures. If you prefer to meet me online, let me know in advance.

Recommended textbook: University Physics with Modern Physics, Author: Young, Publisher: Pearson, Edition: 13.
Recommended supplementary textbook: An Introduction to Mechanics, Author: Kleppner and Kolenkow, second edition.

Citrix: Citrix Virtual Desktop and Applications is a service provided by Information Technology at UNI that allows access to licensed applications from their personal devices. More information about how to install Citrix, including a short video, can be found here.

Course Description: This course is a calculus-based course building on your knowledge gained in introductory physics. Therefore, proficiency in calculus is essential for succeeding in this course. We will tackle the more advanced topics in introductory physics. The Emphasis is on developing analytical and computational skills needed to study physics at a more advanced level. Topics include but are not limited to Newtonian mechanics and applications, Maxwell's equations, and applications. Note, however, that this is not a course in computer programming! Instead, this course is designed to use computer programming to solve physics problems. The course will combine lectures, hands-on activities, student projects, and presentations. MATLAB programming is the adopted language for this course. MATLAB is installed on the computer lab workstations. While most of the analytical material will be adopted from your textbook, your assignments and class examples exams are not limited and can come from different sources.

Course Learning Outcomes:

Course Learning Outcome	*Corresponding UNI Learning Outcomes*
Introduction to non-Cartesian coordinates and incorporating geometrical constraints for solving multi-body Newtonian dynamics.	Critical thinking; Program content knowledge and skills
Use calculus to solve introductory physics problems in mechanics and electro-magnetism.	Critical thinking; Program content knowledge and skills
Understand basic programing functions and algorithms and implement them to solve physics.	Critical thinking; Program content knowledge and skills
Understand how to use basic calculus-based numerical techniques to solve physics problems computationally.	Critical thinking; Program content knowledge and skills;
Work collaboratively, write a comprehensive report describing a physical system and a computational investigation of it and presenting the results.	Critical thinking; Program content knowledge and skills; Communication

Attendance and group activities: Active participation and a team spirit are required at all class meetings, and it is your responsibility to yourself and your team. Each team member is assigned by the instructor and will be reassigned every few sessions. Also, within a group, the role of the group members will rotate each session. It is expected that group members evaluate their teammates and team critically.

Course load: In this course, you are expected to employ your math/calculus skills and numerical programming to analytically and numerically solve physics problems. In this course, it is expected that you can use your calculus knowledge and efficiently perform analytical integration and derivation. In many problems, it is expected that you perform 2-d and 3-d integrations. For some of you, this is the first time you encounter programming for doing your coursework and doing a course project. Therefore, you must expect a time devotion higher than your typical courses. You are responsible for managing your time through the term to have enough time dedicated to your assignments and projects. Especially as you get close to your project deadline, you might experience a high volume of work if you do not plan your project in a timely fashion.

Course and group activity etiquette:
Positive Interdependence exists when each student in a group believes they are linked such that they cannot succeed unless everyone contributes. You need to know that you are ultimately responsible for your own learning. No one can "hitch-hike" on the work of others. You should believe that you "sink or swim together."
Since the class is held in the computer lab, during the classroom hour, it is unacceptable to use the machines for connecting to irrelevant websites or social media.

UNI eLearning: The UNI *eLearning System* is a web-based course delivery system. You will occasionally use the *eLearning* system for the administration of some course related materials and

grades. To access the *eLearning* system, navigate to the main UNI web site, click on the "eLearning" link and log in to the *eLearning* environment after reading the instructions. Extensive help is available within the environment. Do a browser check to ensure that your browser has the required functionality and make sure that pop-ups are allowed for the *eLearning* site.

Homework and Class Activities: There will be weekly problem sets. You will be assigned both analytical and numerical problems. We will have in class quizzes from the assigned HWs with a chance of slight modification. It is your responsibility to complete each assignment before the deadline. This will allow you to consult the instructor and the TA for assistance before you submit your work. If things are not working out, then at least turn in what you have done to receive some of the credit. Submission after deadline will result in a 25% deduction per day. The instructor is not responsible for debugging the codes. Therefore, it is important that the final output result of the code is clear.

Plagiarism and cheating are serious offenses and will incur severe penalties. Work that is missed or late due to absence may be made up or turned in late if the absence is for good cause, *e.g.*, illness and emergency. However, the student must explain the cause, show evidence to the instructor, and make necessary arrangements. This should be done ahead of time if possible and certainly as soon as possible.

Examinations: There will be three examinations during the semester. Examinations will consist of *questions* and problems that are like the assignments and class activities.

Projects: You should do one team project that will require you to solve a numerical problem with more depth and over a longer time than those you encounter in lab and homework assignments. The project will be your choice, with the instructor's approval. This typically requires several weeks to complete. The topic should be both challenging and doable. For your project, you are required to perform a short presentation, which will be assessed by your peers and the instructor, plus a short written report (not more than 4 pages), which will be assessed by the instructor. Within the term, I will also assign several small projects, which I will ask you to read, investigate, and research interesting topics related to physics or interdisciplinary science.

Make-Up Work, Late Work:
Your work is due on time, except for reasonable *documented* excuses. Late work will be docked 10% per day. There will be *no make-ups for missed activities* since the lowest score will be dropped. Make-ups for exams are granted in the case of *documented* illness, family emergencies, or to permit participation in a school-sponsored activity (a signed document is required as proof). If you are going to miss an exam, you must notify the instructor in advance (preferably one week) so alternative arrangements can be made. (Please specify the nature of illness/family emergencies in the notifications: any notification without details will be disregarded.)

Grade Basis and Calculation: Performance in the various categories of work will count toward your final grade as follows:

Homework	24%	None dropped
Lab Activity and Group-Functioning Evaluation	10%	Instructor observation, evaluation and student participation
Exams	54%	(18% each, none dropped)
Numerical project reports (paper and presentation)	10%	(5% peer reviewed)
Small non-numerical projects	2 %	

Opportunities to Change your Destiny!
If you get an A in **all** your midterm and final exams, you can drop any of the low-score homework.
The letter grade corresponding to a given numerical (percentage) score may be found from the following standard scale of percentage *cutoffs* for the grades:

94.0% for A	73.0% for C
90.0% for A-	70.0% for C-
87.0% for B+	67.0% for D+
83.0% for B	63.0% for D
80.0% for B-	60.0% for D-
77.0% for C+	Below 60.0% for F

Grading philosophy: The purpose of grading is to guide students in their learning process. The reading material, homework exercises, activities, and classroom discussions are aimed so that the student completing the course will have as good of understanding as possible of the most important concepts in physics as can be reasonably expected for a four-credit one-semester course. The exams are chosen so students and the instructor can evaluate their progress towards achieving this goal. I hope that each student completes the course with a grade that meets their expectations, has enjoyed the time in the classroom, and has a greater understanding of how nature works. If you feel uncertain about progress in meeting any of these expectations, please be sure to visit me immediately so we can develop a strategy for completing the course successfully.

Chapter Coverage: Below is a list of chapters to be covered. The topical coverage may change as the course progresses. We will only focus on more challenging topics in each chapter. Some topics will not be explicitly discussed in class

University Physics (Sears & Zemansky)	An Intro to Mechanics Kleppner
Ch. 1.7-1.10	1.2-1.7
Ch. 2, Ch. 3	1.8-1.11
Ch. 4	2.9
Ch. 5	3
Ch. 8.6	4.3, 4.7-4.10
	5
Ch. 9	

Ch. 10	7
Ch. 14	6.1-6.4
Ch. 22	
Ch. 23	

Important Dates
1st exam: Friday, October 9th
2nd exam: Friday, November 20th
3rd exam, the last Friday of classes
Monday, December 14th, Final week exam day, 3:00 - 4:50 p.m. (project presentations)

The Learning Center
The Learning Center @ Rod Library provides free tutoring for a variety of different areas (i.e., writing, math, science, business, Spanish, college reading, and learning strategies). The Learning Center @ Rod Library is open for walk-in assistance Monday-Thursday 10 am-10 pm and is free of charge for all UNI students. If you are unavailable during regular tutoring hours, online tutoring is also available through Smarthinking. You will need your CATID and passphrase to gain access. To access the Smarthinking platform go to https://tlc.uni.edu/online. For more information, go to https://tlc.uni.edu, email TheLearningCenter@uni.edu , call 319-273-6023, or visit the TLC desk located on the main floor of Rod Library.

Office of Compliance and Equity Management
"The University of Northern Iowa does not discriminate in employment or education. Visit 13.03 Equal Opportunity & Non-Discrimination Statement (https://policies.uni.edu/1303) for additional information."

Student Accessibility Services
"The University of Northern Iowa (UNI) complies with the Americans with Disabilities Act Amendments Act of 2008 (ADAAA), Section 504 of the Rehabilitation Act of 1973, the Fair Housing Act, and other applicable federal and state laws and regulations that prohibit discrimination based on disability. Students with disabilities experiencing a barrier to access should connect with Student Accessibility Services (SAS) to request accommodations. For more information about the accommodation process, please contact SAS at (319) 273-2677 Relay 711, accessibilityservices@uni.edu, or GIL 118. Additional information is also available at sas.uni.edu."

Emergency Procedures – Report all Emergencies
You may have noticed the emergency "tip sheet" posted in classrooms and laboratories around UNI buildings. I would encourage you to read the sheet and learn its contents. Here is a link to it: http://www.uni.edu/resources/sites/default/files/UNI_Emergency_Tip_Sheet.pdf. In the event of an emergency, there are designated shelters in each campus building. The designated shelters in Begeman Hall are on the ground and first floors in or near the restrooms. The shelter locations can be found at: http://www.vpaf.uni.edu/ehso/evac-diagrams.shtml. These diagrams also contain the building evacuation routes, which should be used in the event that an evacuation order is given. You'll notice that the shelter areas are small. If there are too many people to fit into the shelters, the hallways on the ground and first floors should be used.

Free Speech
The University of Northern Iowa supports and upholds the First Amendment protection of freedom of speech and the principles of academic and artistic freedom. We encourage the free and responsible exchange of diverse ideas on our campus. The University is committed to open inquiry and the spirited and thoughtful debate of such ideas.

Note: The instructor reserves the right to modify this syllabus in a reasonable fashion and the best interest of the class. Students will be notified by email if there is any syllabus change during the semester.