

Modern Physics (PHYS:2704) Spring 2019

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Office hours: Official: Mo 9 am-12 pm (or by appointment)

Department: Physics and Astronomy

Department Office is in 203 Van Allen

Department Executive Officer is Professor Fred Skiff, available for appointment via Heather Mineart, 203 Van Allen, 335-1688



Course location & times: 70 Van Allen MWF 12:30-1:20 pm

Course website: icon.uiowa.edu

Course description: This course will cover physics formulated primarily in the twentieth century, including special relativity, wave properties of matter and quantum mechanics, the hydrogen atom and atomic physics, and statistical physics.

Prerequisites: MATH:1860 or MATH:1550 (differential and integral calculus), and PHYS:2703 (Physics III)

Required Texts: Modern Physics for Scientists and Engineers, 4th edition, Thornton and Rex, (2006,13) Publisher: Thomson, Brooks/Cole

Course Format: Three lectures by me, and one 3 hour lab by a TA will be given each week. For lectures, I encourage you to read materials in the book before I talk about them in class. Questions are encouraged during class. Weekly homework will be assigned. Two evening exams will be given and a comprehensive final. Students are expected to spend 2 hours preparing outside of class for each hour of class credit per week.

Homework: You will be assigned weekly homework consisting of multiple problems. Homework will be assigned Fridays and due the following Friday. Homework solutions for all assigned

problems will be available on the course webpage via ICON. Your worst homework score will be dropped.

As in most physics courses, problems are important. They will help learn how to apply course concepts, make connections between concepts, and improve your understanding and problem solving ability.

Laying your problem solution out clearly is important to organize your thinking, and to learn how to communicate your solution to others. When writing up your problem sets, you should:

1. Always explain what you are doing, e.g. invoke a conservation law and justify its use.
2. Give the equation # for any equations from the text you use. Cite your source if you use the analytical solution of an integral from a table of integrals or computer software.
3. Present your work in a neat, organized, logical manner that is transparent and understandable by others.
4. Do the problem set on 8.5"x11" pieces of paper.

Try to start a problem set early. If you experience difficulty, talk to your classmates, or come and see me for some help (Not only is it my job to help you, I really do enjoy it!). I encourage you to work with your classmates on problems. Before you work with others, be sure to spend some time wrestling with the problems on your own. You will learn more and improve your problem solving skills more that way. Also, the final write-up should be your own creation. Simply copying from another student's work or an online solution is a violation of college ethical standards and you will receive a zero on that homework (without the option of it being dropped as your worst homework score).

One place you can meet to work on problem sets is the departmental lounge in Van Allen 316.

Tutorial help: TA's are generally available to answer questions and discuss problems in room 310 VAN during the hours posted on the door.

Exams: Two midterm exams will be given, and one final exam. Exam solutions will be available via ICON. Exam dates: I: Feb 27; II: April 10; Final: To be announced.

Make-up exams: A make-up exam may be allowed in exceptional circumstances such as *illness, mandatory religious obligations, or other unavoidable circumstances or University activities.*

Students participating in University activities are expected to provide a statement before the absence signed by a responsible official that specifies the dates and times the student will miss

class. Authorized activities include participation in athletic teams, the marching band and pep band, debate teams, and other recognized University groups, as well as participation in University field trips, service with the National Guard, and jury duty. A UI absence form is available at the Registrar [student forms](#) link.

Laboratory: Labs will provide hands on experience with concepts covered in class. The labs will be held under the supervision of teaching assistants, who will also grade the laboratory reports. Discuss the grading of your labs with your TA. Students are expected to spend 2 hours outside of class for each hour of laboratory credit per week.

Grading: Exam 1: 23% Exam 2: 23% Final: 24%. Homework: 20% Lab:10%. Your worst exam score will be replaced with your class participation score if it helps; otherwise class participation score will be ignored. Your grade will not be penalized for nonparticipation in answering classroom questions. You can check your scores on exams and homework on the course webpage via ICON. Grading for the course will follow [College of Liberal Arts grading guidelines](#).

Class attendance: Class attendance is expected. Poor attendance may affect the quality of students' work, and their success in the course. For the situation where a class must be missed, students can obtain assignments and critical dates on the course webpage via ICON. You will also participate in classes by answering questions. As detailed in Grading, you can use your collective clicker scores to replace your worst exam score.

Class participation: Class participation will involve answering conceptual questions and problems that I pose to the class with you smart phone, tablet, or computer - be sure to bring one to class. You will get one point for each question you answer, and an additional point if you get it right. This means you get at least 50% on class participation simply by answering all the question. There will be no opportunity to make up questions for missed classes, or if you forget your phone/tablet/computer.

Honors Designation: If you are an honors student and wish to take this course as an Honors Contract Course, you may. You can receive Honors for the course by satisfying one of the below:

1. Attend at least four physics (or other science) colloquia during the semester, and write a 2-4 page (single spaced) summary of each colloquia, including what you thought of it.
2. Read an approved popular science book, and write a 2-4 (single spaced) page summary and reaction paper.

From the Iowa Honors page:

1. Approach your instructor to ask if they'd be willing to do an honors contract with you.
2. Discuss and agree on your project proposal and timeline for completion. Be sure your instructor approves this before you submit!
3. Fill out the Honors Contract Form on [MyUI](#) (you can find the form under Student Information > Courses & Grades)

Administrative Home

The College of Liberal Arts and Sciences (CLAS) is the administrative home of this course and governs its add/drop deadlines, the second-grade-only option, and other policies. These policies vary by college (<https://clas.uiowa.edu/students/handbook>).

Electronic Communication

Students are responsible for official correspondences sent to their UI email address (uiowa.edu) and must use this address for all communication within UI ([Operations Manual, III.15.2](#)).

Accommodations for Disabilities

UI is committed to an educational experience that is accessible to all students. A student may request academic accommodations for a disability (such as mental health, attention, learning, vision, and physical or health-related condition) by registering with Student Disability Services (SDS). The student should then discuss accommodations with the course instructor (<https://sds.studentlife.uiowa.edu/>).

Nondiscrimination in the Classroom

UI is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious or other identities. Toward this goal, students are invited to optionally share their preferred names and pronouns with their instructors and classmates. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national

origin, and other identity categories set forth in the University's Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity (diversity.uiowa.edu).

Academic Integrity

All undergraduates enrolled in courses offered by CLAS have, in essence, agreed to the College's [Code of Academic Honesty](#). Misconduct is reported to the College, resulting in suspension or other sanctions, with sanctions communicated with the student through the UI email address (<https://clas.uiowa.edu/students/handbook/academic-fraud-honor-code>).

CLAS Final Examination Policies

The final exam schedule for each semester is announced around the fifth week of classes; students are responsible for knowing the date, time, and place of a final exam. Students should not make travel plans until knowing this final exam information. No exams of any kind are allowed the week before finals (<https://clas.uiowa.edu/faculty/teaching-policies-resources-examination-policies>).

Making a Complaint

Students with a complaint should first visit with the instructor or course supervisor and then with the departmental executive officer (DEO), also known as the Chair. Students may then bring the concern to CLAS (<https://clas.uiowa.edu/students/handbook/student-rights-responsibilities>).

Understanding Sexual Harassment

Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community must uphold the UI mission and contribute to a safe environment that enhances learning. Incidents of sexual harassment must be reported immediately. For assistance, definitions, and the full University policy, see <https://osmrc.uiowa.edu/>.

Tentative class schedule:

Jan. 14	MW: Syllabus and Chapt. 1 Birth of Modern Physics F: Chapt. 2 Special Relativity
Jan. 21	M: no class (MLK day) WF: Chapt. 2 continued
Jan. 28	Chapt. 2 continued
Feb. 4	M: Chapt. 2 continued, WF: Chapt. 3 Experimental Basis of Quantum Theory
Feb. 11	Chapt. 3 continued
Feb. 18	Chapt. 4 Structure of the Atom
Feb. 25	M: Chapt. 5 Quantum Mechanics I W: Exam I, F: Chapt. 5 cont

March 4	Chapt. 5 continued
March 11	Chapt 6 Quantum Mechanics II
March 18	Spring Break
March 25	MW Chapt. 6 continued F Chapt 7 The Hydrogen Atom
April 1	Chapt 7 The Hydrogen Atom
April 8	M: Chapt. 8 Atomic Physics, W: Exam II, F: Chapt. 8 continued
April 15	MW: Chapt. 8, F: Chapt. 9 Statistical Physics
April 22	Chapt. 9 continued
April 29	M: Chapt. 9 continued, W: Make up day F: Review for Final Exam

Tentative Lab schedule:

Jan. 14	No Lab
Jan. 21	No Lab
Jan. 28	Speed of Light, S1
Feb. 4	Planck's Constant, Q2
Feb. 11	Photoelectric Effect, Q1
Feb. 18	Hydrogen Spectral Lines, Q3
Feb. 25	No lab
March 4	Frank-Hertz, Q9
March 11	Electron Diffraction, Q4
March 18	Spring Break
March 25	No Lab
April 1	Electron Spin Resonance, Q7
April 8	No lab
April 15	No lab
April 22	No lab
April 29	No lab