Modern Physics (PHYS:2704)
Spring 2016

Instructor: John Prineas, Professor
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Office hours: Official: Mo 1:30-3:00 pm, Th 1:30-3:00 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)


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. Three in-class 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: Three midterm exams will be given, and one final exam. Exam solutions will be available via ICON. Exam dates: I: Feb 24; II: March 30; III: April 27; 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: 17.5% Exam 2: 17.5% Exam 3 Final: 17.5%. 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 clicker questions. As detailed in Grading, you can use your collective clicker scores to replace your worst exam score.

**Clickers:** Class participation will involve answering conceptual questions and problems that I pose to the class with your clickers. Clickers can be purchased in the book store, and may be used again in any Univ of Iowa course requiring them. In order to get credit for using the clickers, you must register your clickers: http://its.uiowa.edu/support/article/1009 . You will get one point for each clicker 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 questions.

Some common issues with clickers:
1. Students forget their clickers and want to make up points
2. Students don’t come to class and want to make up points
3. Students lose their clickers
4. Students don’t register their clickers or register the clicker incorrectly
5. Clicker battery goes dead

Regarding #1 and 2: No option exists to make up points. However, your worst week will be dropped. Regarding #3: you will have to buy a new clicker, and re-register it. Regarding #4&5: You can check on the course ICON site to make sure you are receiving clicker scores. If you are, you registered correctly; if not, you haven’t, or your clicker battery is dead. If you register incorrectly, it is your responsibility to get this corrected, and there will be no option for make up for the week(s) it was incorrectly registered.

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 colloquium, 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.
3. Propose a research direction that you would like to one day pursue in an ideal world. Describe why you think this would be an interesting and important topic, what particular questions/problems you would like to attack, and how you would go about addressing them. Outline current research on these questions. Cite your sources. Your write-up should be 3-4 pages (single spaced).

Administrative Home: The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall, or see the CLAS Academic Policies Handbook at http://clas.uiowa.edu/students/handbook.
Electronic Communication: University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences (Operations Manual, III.15.2, k.11).

Accommodations for Disabilities: A student seeking academic accommodations should first register with Student Disability Services and then meet with the course instructor privately in the instructor’s office to make particular arrangements. See http://sds.studentlife.uiowa.edu/ for more information.

Academic Honesty: All CLAS students or students taking classes offered by CLAS have, in essence, agreed to the College’s Code of Academic Honesty: ”I pledge to do my own academic work and to excel to the best of my abilities, upholding the IOWA Challenge. I promise not to lie about my academic work, to cheat, or to steal the words or ideas of others; nor will I help fellow students to violate the Code of Academic Honesty.” Any student committing academic misconduct is reported to the College and placed on disciplinary probation or may be suspended or expelled (CLAS Academic Policies Handbook).

CLAS Final Examination Policies: The final examination schedule for each class is announced by the Registrar generally by the fifth week of classes. Final exams are offered only during the official final examination period. No exams of any kind are allowed during the last week of classes. All students should plan on being at the UI through the final examination period. Once the Registrar has announced the date, time, and location of each final exam, the complete schedule will be published on the Registrar’s web site and will be shared with instructors and students. It is the student’s responsibility to know the date, time, and place of a final exam.

Making a Suggestion or a Complaint: Students with a suggestion or complaint should first visit with the instructor (and the course supervisor), and then with the departmental DEO. Complaints must be made within six months of the incident (CLAS Academic Policies Handbook).

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 have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the
UI Office of the Sexual Misconduct Response Coordinator for assistance, definitions, and the full University policy.

Reacting Safely to Severe Weather: In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Department of Public Safety website.

*These CLAS policy and procedural statements have been summarized from the web pages of the College of Liberal Arts and Sciences and The University of Iowa Operations Manual.
Tentative class schedule:

Jan. 18  W: Chapt. 1 Birth of Modern Physics  F: Chapt. 2 Special Relativity
Jan. 25  Chapt. 2 continued
Feb. 1   Chapt. 2 continued
Feb. 8   M: Chapt. 2 continued, WF: Chapt. 3 Experimental Basis of Quantum Theory
Feb. 15  Chapt. 3 continued
Feb. 22  M: Chapt. 4 Structure of the Atom, W: Exam I, F: Chapt. 4 continued
Feb. 29  MW: Chapt. 4 continued, F: Chapt. 5 Quantum Mechanics I
March 7  Chapt. 5 continued
March 14 Spring Break
March 21 M: Chapt. 5 continued, WF: Chapt 6 Quantum Mechanics II
March 28 M: Chapt. 6 continued, W: Exam II, F: Chapt. 6 continued
April 4  M: Chapt. 6 continued WF: Chapt 7 The Hydrogen Atom
April 11 MW: Chapt. 7 continued, F: Chapt. 8 Atomic Physics
April 18 MW: Chapt. 8, F: Chapt. 9 Statistical Physics
April 25 M: Chapt. 9 continued, W: Exam II, F: Chapt. 9 continued
May 2   MW: Chapt. 9 continued, F: Review for Final Exam

Tentative Lab schedule:

Jan. 20  No Lab
Jan. 25  No Lab
Feb. 1   Speed of Light, S1
Feb. 8   Planck's Constant, Q2
Feb. 15  Photoelectric Effect, Q1
Feb. 22  Hydrogen Spectral Lines, Q3
Feb. 29  Frank-Hertz, Q9
March 7  Electron Diffraction, Q4
March 14 Spring Break
March 21 Quantum Interference / Electron Spin Resonance, Q10/Q7
March 28 Electron Spin Resonance / Quantum Interference, Q7/Q10
April 4  No lab
April 11 No lab
April 18 No lab
<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
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<tbody>
<tr>
<td>April 25</td>
<td>No lab</td>
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<td>May 2</td>
<td>No lab</td>
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