Physics 317: Introduction to Modern Physics 1, Fall 2025

Instructor: Dr. Jake Bennett
(jvbennet@olemiss.edu)
Web: **https://physics.olemiss.edu/bennett/**

Office: Lewis 105
Office Hours: TTh @ 10-11 am, W @ 9 am
and by appointment

Class Location: Lewis 109

Class Time: MWF 8:00-8:50 am

Course Description

This course includes an introduction to relativity as well as atomic, molecular, and nuclear physics. For this semester, we will focus on topics in relativity, basic quantum mechanics, and atomic physics.

Course Prerequisite and Corequisites

- Prerequisite: Physics 212 or 214

Course Objectives

Students will learn the key physics concepts of Modern Physics (i.e. post-Classical physics of the 20th and 21st centuries) including their historical theoretical and experimental development. They will develop the intuition and reasoning skills to apply those concepts to the analysis of a broad range of physical applications and situations. Students will also learn and practice problem-solving skills and techniques in order to move from conceptual understanding to finding solutions to real-world physics problems.

After completing the course, students will know:

- The historical development of Modern Physics concepts and principles to address deficiencies in Classical Physics.
- The key ideas and results of Modern Physics (i.e. postulates, formulas, etc.).
- The particular cases, situations, and/or circumstances in which these ideas apply.

Students will be able to:

- Employ and articulate sound, intuitive reasoning when applying Modern Physics concepts to analyze physical problems.
- Identify the correct ideas and formulas, and use them with proper mathematical tools and problem-solving techniques to determine solutions to those problems.
- Practice a range of interactive self-directed and group learning methods.
- Make effective scientific presentations to a group.

Teaching Philosophy and Approach

Qualitative reasoning and quantitative evaluation are emphasized in this course. This is done through an active learning approach; problem-solving in physics using interactive instruction, collaborative learning and computer applications. Students will perform hands-on tasks and solve practice problems in class. Students are expected to prepare for class by completing the assigned reading in order to introduce themselves to the basic material and start working with it before class. Otherwise it will be very difficult to contribute to the collaborative in-class activities and problems, which are graded.

As class meetings will often include activities and experiments, students should be aware that note taking may be different than in other lecture classes. Students are encouraged to bring a notebook to each class and record observations and inferences during activities and demonstrations, not just the details the instructor writes on the board. It is also highly recommended to take notes while reading the textbook and otherwise preparing for class.

Required Text

Modern Physics, Felder ISBN-13: 9781108842891

Other Required Items

- *Scientific calculator*: Any calculator with trigonometric functions, exponential functions and scientific notation is acceptable. Online calculators are allowed, but may not be used for quizzes and exams.

Expectations

Pre-class assignments: **Students should expect to spend about 8 hours per week reading, doing homework, and otherwise preparing for class**. Studying the textbook regularly and not waiting until just before homework is due or a test is imminent will be of great benefit. When reading the assigned textbook sections, take note of any material that is not clear to you so you can ask questions during class.

Attendance and in class participation Students are expected to attend all classes and participate in all in-class activities. Students who miss class are still expected to understand the material that is covered and complete the in-class assignments, which will be available on BlackBoard. Class attendance will be verified for university purposes during the first two weeks of class.

Assessments

- Tests (25%) In-class tests will be given approximately every four weeks to gauge students' level of understanding of the material. All tests are closed book (no books, notes or "cheat-sheets"), individual assignments. Calculators are allowed and a formula sheet will be provided.
- Homework (25%) Written homework sets will be assigned approximately weekly. It is very important to start early and finish homework on time.
  - As scientists and engineers normally work in groups, students are encouraged to work together on homework to teach and learn from each other. However, each student is responsible for understanding all details of a problem solution.
  - AI and homework help sites such as ChatGPT and Chegg are a liability, not a resource. Depending on sites like these is a sure way to do poorly on a test or exam. More importantly, using these sites will be considered cheating and will be result in a zero. Instead, work with classmates. Teaching peers is a great way to solidify your understanding!
  - There is no penalty for extensions past the due date during the first two weeks of class. **After the first two weeks, there will be a 20% penalty per homework extension. Extensions will be for two days past the original due date.**
- Pre-class assignments (10%) Pre-class assignments include textbook readings and short example problems. A 50% penalty will be assessed for late submissions.
- Participation (10%) Students are expected to attend all classes. The participation grade will be derived from in-class activities, exit tickets, and worked examples. **Every three unexcused absences will result in a drop of one letter grade for the course, according to the grading scale below.**
- Presentations (10%) Students will prepare and present a mini-lecture covering an important experiment in modern physics. The topic will be assigned later in the semester. Presentations will be made in-class toward the end of the semester.
- Final exam (20%) The final exam is comprehensive and will be similar in format to the tests. **The final exam date is Tuesday, December 10, at 8:00 am.**

Important Dates

Tentative test/exam dates (subject to change)

- Test 1: Monday, September 22
- Test 2: Monday, October 20
- Test 3: Friday, November 21
- **Final Exam: Monday, December 8, at 8:00 am.**

See the academic calendar (**https://olemiss.edu/registrar/calendars**)

Grading Scale

- $92\% \leq$ A $\leq 100\%$
- $88\% \leq$ A- $< 92\%$
- $84\% \leq$ B+ $< 88\%$
- $80\% \leq$ B $< 84\%$
- $76\% \leq$ B- $< 80\%$
- $72\% \leq$ C+ $< 76\%$
- $68\% \leq$ C $< 72\%$
- $64\% \leq$ C- $< 68\%$
- $60\% \leq$ D $< 64\%$
- F $< 60\%$

Policies

Academic Integrity

Every student of the University of Mississippi, by virtue of choosing to be part of the university community agrees to abide by the University of Mississippi Creed and the UM Academic Integrity Policy which covers academic integrity. Please consult the M-Book, Academic Integrity document for details on university policy and the academic creed.

Cheating is forbidden and will result in a zero grade on the assignment. A second case of cheating will result in an F for the entire course.

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Disability Access and Inclusion:

The University of Mississippi is committed to the creation of inclusive learning environments for all students. If there are aspects of the instruction or design of this course that result in barriers to your full inclusion and participation, or to accurate assessment of your achievement, please contact the course instructor as soon as possible. Barriers may include, but are not necessarily limited to, timed exams and in-class assignments, difficulty with the acquisition of lecture content, inaccessible web content, and the use of non-captioned or non-transcribed video and audio files. If you are registered with Student Disability Services (SDS), you must log in to your Rebel Access portal at https://sds.olemiss.edu/rebel-access-portal to request approved accommodations. If you are NOT registered with SDS, you must complete the process to become registered. To begin that process, please visit the SDS website.

Audio and video recording

Audio and/or video recording of class lectures is not allowed unless explicit permission is given by the instructor. Permission will only be given if the student has a Student Disability Services request. In such cases, recordings may only be used by the student to whom permission is given and all recordings must be deleted at the end of the semester. Recordings may not be distributed online or elsewhere.