THE UNIVERSITY OF MISSISSIPPI

Introduction to Modern Physics II

PHYS 318 – Spring 2022
Department of Physics and Astronomy

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Course Description

Catalog Description

This course includes an introduction to relativity as well as atomic, molecular, and nuclear physics.

[The description above pertains to PHYS 317 and PHYS 318 together. Topics in 317 include relativity, basic quantum, and atomic physics.]

3 credit hours

Prerequisites

PHYS 317: Modern Physics I, MATH 262: Unified Calculus & AQnalytic Geometry II

Learning 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.

Times and Places

Lectures:	T Th 9:30–10:45 AM, 109 Lewis Hall
Office Hours:	M W 3:00-4:00 PM, Virtual at this link.
Final Exam:	Thursday, May 5 at 8:00 AM

Required Materials

Textbook

Modern Physics, 4th Ed., Krane ISBN-13: 9781119495468

Top Hat

We will be using the Top Hat classroom response system. You will be able to submit answers to in-class questions using Apple or Android smartphones and tablets, laptops, or through text message. In addition, most class materials (assignments, lectures, notices, etc.) will be posted in Top Hat course folders. You can visit the Top Hat Overview within the Top Hat Success Center which outlines how you will register for a Top Hat account, as well as providing a brief overview to get you up and running on the system.

An email invitation should have been sent to you by email (to your go.olemiss.edu address), but if you didn't receive this email, you can register by simply visiting our Top Hat PHYS 317 course website. Note: our course "Join Code" is 996083. Top Hat will require a paid subscription for Top Hat Pro plan that we are using, and a full breakdown of all subscription options available can be found here. If you're undecided about this course, you are welcome to hold off on paying and to take advantage of the grace period offered at the beginning of the semester.

If at any time you require assistance with Top Hat, please contact their Support Team directly by way of email (support@tophat.com), the in-app support button, or by calling 1-888-663-5491.

Daily Class Format

Pre-Class Reading

There will be an assigned reading section from the textbook to be read prior to each class period. These daily reading assignments will generally be about 10 pages long. Please note that you are expected to do this reading before every class because there will not be a traditional lecture on the reading each day. In general, I will not recap your textbook reading orally in class. However, if there are questions about things you do not understand in the reading, email me ahead of class and I will address those in class.

Daily Reading Quiz

Each class period will start with a brief, simple extra credit quiz based on that day's reading material. The quizzes will be administered using Top Hat Test.

Summary

After the quiz, I will present a brief summary of the day's reading material. This will include a list of important new terms and key formulas, and presntation of new mathematical or problem-solving techniques. It will NOT be an oral lecture restating what is written (and what you should have already read) in the textbook.

Questions

After the summary, I will address any questions about the reading emailed to me prior to class, or posed at this point in class.

Conceptual Questions and Discussion

Once the material has been summarized and questions asked, I will pose a couple of Conceptual Questions to the class to be answered via Top Hat. You will submit your individual responses to the Question, then we will have a period of time for you to have peer discussion with each other about it, then I will pose the Question a second time for you to give individual answers after your discussions. Finally, I will ask a student to give their answer and explanation orally to the class.

Worked Examples

We will work through a couple of example problems thoroughly each class. Most of these will be examples from the textbook reading. Usually, I will have one student go to the board and work through one of these examples for each class. At the end of each class, I will choose the student to present a worked example for the next class, so you will have a heads-up and time to be prepared for your turn to present examples.

Course Credit and Grading

Grading Scheme

Course credit will be earned based on performance on weekly homework assignments, in-class presentations, three tests, and a final exam according to the following weights:

Homework assignments:	10%
Presentations:	15%
Tests:	50%
Final exam:	25%

In addition, extra credit can be earned on in-class response questions.

Homework

Written homework sets will be assigned roughly every week, and must be turned in at the beginning of class, in class, on the due date.

Homework assignments must be hand-written (no red ink), on neatly stapled 8 ½ × 11 inch clean-edged paper (no ragged spiral-bound paper). Answers alone are not worth anything. You must show all of your work, including diagrams, equations, derivations, calculations and explanations of your thinking and reasoning written in complete English sentences. In other words, your homework solutions should be presented in a format very similar to the worked examples in the text. Circle your final answer/solution in order for it to be graded. Make sure you include correct units on every numerical value at all steps in your solutions, and retain the correct number of significant digits in your final answers.

Assignments will consist of several problems each, although only one problem per assignment will be graded (you will not know ahead of time which one). Scores for each graded problem will either be equal to 1 (for a well-worked problem), 0.5 (for a poorly-worked problem), or 0 (for inadequate or no attempt at a solution). Late homework assignments will not be accepted. However, your lowest homework grade will be replced with a score of 1. Solutions to all homework problems will be posted on Top Hat

Daily Reading Quizzes/Response Questions

Daily Reading Quizzes and in-class Response Questions will be posed to the class during most lectures to evaluate completion of assigned textbook readings and understanding of material. Students will use the Top Hat system to take the quizzes and respond to the Response Questions. The Daily Quiz grades will be totaled to earn up to 5 points extra credit added to your overall course grade. There will be no make ups for missed Daily Quiz extra credit due to class absences.

Presentations

You will give two different types of class presentations during the course. The first is at-the-board Worked Examples mentioned above. Each of you will do this twice during the semester wihtout notes, and you will be notified that you will be next up the class before it is your turn. Each worked example presentation will be worth about 2.5 points to your overall course grade. The second type of presentation will be a mini-lecture of about 10-15 minutes to the class on an important experiment in Modern Physics. The assignment of experiment topics and presentations will occur later in the semester. These experiment presentations will be worth 10 points to your course grade.

Tests

There will be four in-class tests. The first will be on Chapters 9 and 10, the second on Chapter 11, the third on Chapters 12 and 13, and the fourth on Chapters 14 and 15. Your first three test scores will count 15% of your course grade each, and your fourth test score will count 5% of your course grade (but you have the option of swapping your fourth test score with the lowest of your first three). Tests will be closed book/closed notes, but I will provide a formula sheet ahead of time that you can use on the tests. Make up tests will only be given for officially documented emergency absences (e.g. medical excuse or death in the family) or university required events.

Final Exam

The final exam will be comprehensive. It will be given on Thursday, May 5 at 8:00 AM. You may not reschedule your final exam time unless you have three final exams scheduled for Dec 9.

Grading Scale

Grades will be assigned according to the UM Plus/Minus Grading System. The conversion from numerical grade (out of 100%) to letter grade will carried out according to the table below.

92% ≤ A ≤ 100%
88% ≤ A- < 92%
84% ≤ B+ < 88%
80% ≤ B < 84%
76% ≤ B- < 80%
72% ≤ C+ < 76%
68% ≤ C < 72%
64% ≤ C- < 68%
50% ≤ D < 64%
0% ≤ F < 50%

Course Schedule (Tentative)

- Chapter 9: Molecular Structure [3 classes]
- Chapter 10: Statistical Physics [3 classes]
- Test 1: February 10
- Chapter 11: Solid-State Physics [5 classes]
- Test 2: March 3 (evening)
- Chapter 12: Nuclear Structure & Radioactivity [3 classes]
- Chapter 13: Nuclear Reactions [3 classes]
- Test 3: March 31
- Chapter 14: Elementary Particles [4 classes]
- Chapter 15: Cosmology [4 classes]
- Test 4: April 28
- Final Exam: May 5

Attendance

There is no explicit attendance policy for the class, however please note that there are no make ups for the in-class response extra credit quizzes. Also, note the university requires that all students have a verified attendance at least once during the first two weeks of the semester for each course. If your attendance is not verified, you will be dropped from the course andany financial aid will be adjusted accordingly. Please see http://olemiss.edu/gotoclass for more information.

Academic Integrity

Students are expected to adhere to the Standards of Honesty as described in Policy Code ACA.AR.600.001 and the M Book. Students are reminded that cheating in any form will not be tolerated. Performance on all tests and assignments must represent the individual work of the student. Those who violate the Standards of Honesty will be reported to the university's Academic Discipline committee, and subject to the appropriate sanction, which may range from receiving a 0 on the assignment in question to expulsion from the University, depending on the severity of the infraction.

Intellectual Property

The faculty senate has adopted this statement concerning unauthorized distribution of course materials.

"All materials distributed electronically and in hard copy in this class are protected under intellectual copyright. Any attempt to upload these documents onto the Internet (or to distribute them by some other means) or to profit from the distribution (by Internet or other means) of these documents constitutes theft and will be in violation of intellectual property law and the UM Academic Conduct Code

unless expressly permitted for by the instructor. Accessing such materials for your own use is also in violation of the UM Academic Conduct Code. Additionally, the distribution of your own class notes via the Internet or other means, or access of such materials, encourages absence from class and is highly discouraged."

You do not have my permission to post online or otherwise distribute in any manner, any class materials whatsoever.

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 approved through SDS, you must log in to your Rebel Access portal at https://sds.olemiss.edu to request approved accommodations. If you are NOT approved through SDS, you must contact Student Disability Services at 662-915-7128 so the office can: 1. determine your eligibility for accommodations, 2. disseminate to your instructors a Faculty Notification Letter, 3. facilitate the removal of barriers, and 4. ensure you have equal access to the same opportunities for success that are available to all students.

COVID-19 EMERGENCY SYLLABUS POLICIES AND PROTOCOLS

The following classroom policies have been prescribed by the University of Mississippi during Fall 2021 in response to the COVID-19 Pandemic.

Classroom Health Requirements
(Language in this section can be inserted into syllabus.)

- Students are expected to comply with the University's protocols when they are in effect. Currently, a mask requirement is in place for vaccinated and unvaccinated people. As a result, proper mask wearing is required indoors and in the classroom. Current protocols can be found at https://coronavirus.olemiss.edu/.
- Students who have a diagnosed health concern that interferes with the wearing of face masks may contact the Student Disabilities Services (SDS) Office to seek a University-approved accommodation. Please contact SDS at https://sds.olemiss.edu/ for more information.
- If students test positive for COVID-19 at any health care facility, they must contact the Student Health Center at 662-915-7274. (Faculty and staff should contact the Employee Health Service at 662-915-6550.) University Health Services will coordinate contact tracing to lessen the likelihood of spread.
- Students with COVID-19 should seek medical attention at the Student Health Center and contact their instructor to let them know that they will be missing class due to a health-related issue.
- If you are exposed to someone with COVID-19, you should contact the Student Health Center to get tested three to five days following exposure and follow the guidance recommended by the Health Center. If you are not fully vaccinated, you should follow quarantine protocols found at https://coronavirus.olemiss.edu/students/.

Non-adherence with Health Requirements
(Language in this section can be inserted into syllabus.)

- Currently, COVID-19 guidelines for the Fall 2021 semester include face masks for vaccinated and unvaccinated people inside University buildings; therefore, students should not be in classroom spaces when they are out of compliance with these guidelines unless they have an accommodation approved by Student Disability Services.
- The University's Academic Conduct and Discipline Policy states that "disorderly behavior that disrupts the academic environment violates the standard of fair access to the academic experience." Failure to adhere to health requirements during the COVID-19 emergency will be deemed as disruptive to the classroom and will be enforced following the Academic Conduct and Discipline procedures.
- The University of Mississippi has adopted a tiered disciplinary protocol for non-adherence to COVID-19 health requirements. This disciplinary protocol is maintained by the Office of Conflict Resolution and Student Conduct: https://conflictresolution.olemiss.edu/covidupdates.

Attendance Policies
(Information for faculty)

- A task force of faculty, students, and staff met to review best practices for attendance policies during the pandemic. Their full report, with suggested syllabus language, can be found at https://olemiss.app.box.com/s/dt0e8dq4yw0pgf9vw7yu7u0ahz5td58z.
- The University's Class Attendance Policy enables the instructor to determine the attendance guidelines that best promote learning in the delivery mode of the course. The instructor articulates and informs students of that policy in writing, via a course syllabus, on or before the first meeting of each course.
- Students attending the virtual component of hybrid or online courses are subject to the same attendance policy and procedures as traditional students. However, participation is defined in a different manner. The University's "Attendance Policy for Online Education" states: "Student attendance in online courses is defined

as active participation in the course as described in the individual course syllabus." If students fail to meet online attendance requirements as stated in the syllabus, they will be given an absence.

- COVID-19 safety protocols hold the highest priority, and faculty should design attendance guidelines for students which do not penalize students for adhering to COVID-19 safety protocols. Course attendance policies must allow for absences necessary for isolation, quarantine, or other COVID-19 related absences.
- Students should NOT attend a face-to-face class when they are feeling ill, experiencing COVID-19 symptoms, or believe they may have been exposed to the virus. Instructors of courses with a face-to-face component should encourage students to stay home in these circumstances.
- Faculty will be notified if assigned seating will be required by an instructor for a face-to-face class session (for both face-to-face and hybrid delivery modes) to facilitate contact tracing. If assigned seating is necessary, it will be up to course instructors to establish the assigned seats. If required, students are to sit in only designated seats.
- An instructor should work with their department chair if the instructor expects to be absent from class.

Attendance Policies
(Language in this section can be inserted into syllabus.)

- If you need to isolate due to contracting the coronavirus at any point this semester, you should do so, and email me as soon as possible. I will work with you to help you continue your progress in the course. More information on isolation protocols can be found at https://coronavirus.olemiss.edu/.
- Quarantines are an important tool for controlling the spread of the virus. If you need to quarantine at any point this semester, you should do so, and email me as soon as possible. In your email, state how long you expect not to attend class. I [will/will not] be able to provide recordings of class sessions, and we can work together to establish a plan for completing the necessary work. You will have access to your texts, my course slides, and our Blackboard course site. More information on quarantine protocols can be found at https://coronavirus.olemiss.edu/.
- Students attending the virtual component of hybrid or online courses are subject to the same attendance policy and procedures as traditional students. However, participation is defined in a different manner. The University's "Attendance Policy for Online Education" states: "Student attendance in online courses is defined as active participation in the course as described in the individual course syllabus." If students fail to meet online attendance requirements as stated in the syllabus, they will be given an absence.

Student Support Services
(Language in this section can be inserted into syllabus.)

- Students are encouraged to visit the University's Keep Learning site https://keeplearning.olemiss.edu/ to access information and resources related to COVID-19 support. The site provides links to University student services to facilitate and support learning.
- Students with diagnosed health concerns that may affect their compliance with COVID-19 health requirements should contact UM's Student Disability Services (SDS) Office https://sds.olemiss.edu/ to see if they are eligible for an SDS accommodation as soon as possible.
- The University Counseling Center is a professional facility offered by the University of Mississippi to assist students, faculty, and staff with many types of life stressors that interrupt day-to-day functioning, including the stressors associated with the COVID-19 pandemic. They offer individual counseling, couple's counseling, group counseling, stress management, crisis intervention, assessments and referrals, outreach programs, consultations, and substance abuse services. There is no fee for currently enrolled University students and everything you say to your counselor is confidential. You can contact the Counseling Center for information about mental health issues at https://counseling.olemiss.edu, counslg@olemiss.edu, 662-915-3784, 320 Lester Hall, and https://www.facebook.com/universitycounselingcenterolemiss/. You can schedule an appointment or get information about appointments by calling the UCC at 662-915-3784.

Updated Contact Information
(Language in this section can be inserted into syllabus.)

- The University must have accurate contact information, including cell phone numbers, to facilitate student communications and contact tracing. Students should check and update their University contact information available at https://olemiss.edu/mystudentprofile.

Examinations and Last Week of Class
(Information for faculty – Policy ACA.AR.200.002)

- Exams, tests, or quizzes exceeding 10% of the grade are not be given on the last three days of classes. Papers and projects (so long as due dates are in the syllabus) are allowed during these last three days, just not exams, tests, or quizzes. The Fall 2021 semester will end on Friday, Dec. 3, 2021. Thus, exams, tests, or quizzes exceeding 10% of the total grade) are not permitted on the Wednesday (Dec. 1), Thursday (Dec. 2), or Friday (Dec. 3) of that week.

University Visitor Policy
(Information for faculty)

- All University visitors must follow COVID-19 emergency health and safety protocols.