

PHYSICS – 303 Physical Theory and Techniques Fall - 2023

This course covers fundamental physical principles widely applicable to the undergraduate physics curriculum. Emphasis is placed on understanding physical theories explaining principles and development techniques for solving classical and modern physics problems using calculus and advanced algebraic concepts.

Lecture: TTh (TX) 8:00 am - 9:15 am, Room 109 Lewis

Instructor: Dr. Ostrovskii, Igor

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Office Hours: TTh 1:30 – 2:30 pm (207 Lewis Hall)

Textbook: Fundamentals of Physics, 12th Edn. by Halliday, Resnik, Walker

ISBN: 978-1-119-77351-1, 2022. E-Book Rental (120 Days, ~ \$39.00) , E-Book ~ \$112.50.

• All students who wish to request a **disability-related accommodation** must be approved by UM SDS. The SDS will communicate with individual academic units regarding the student's need.

The student is responsible for all documentation necessary for SDS-accommodation in class.

<https://sds.olemiss.edu/>

Attendance and participation: Attendance is expected and may be recorded each day of class. To comply with attendance verification, a report of your attendance will be made.

1. General description of the course's purpose

We consider the Physical Principles formulated as mathematical problems in differential and integral calculus. **Prerequisites:** MATH 262 and PHYS 212 or 214.

Course goals

- To guide students through the process of learning how to effectively read scientific material, and improving the ability to explain the logic of the physics problems, both orally and in writing.
- To identify fundamental concepts and reasoning through scientific questions.
- To solve quantitative problems using calculus as a problem-solving tool.
- To enhance the critical thinking, analytical reasoning and problem-solving skills.
- To learn calculus-based physics models, including the Newton's second law, the Laws of Thermodynamics, the Maxwell's equations and electro-magnetic waves.

2. Learning objectives of the course

The learning objectives and outcomes answer a question: "What will a student know, think and be able to do as a result of taking this class and passing the final examination."

After completing this course, a student should be able to:

- Understand the main physics principles and solve typical problems in the following branches of Physics: 1) Mechanics, 2) Thermodynamics; and 3) Some parts of Modern Physics including Relativity, Photons, Matter waves.
- Understand the basic principles of 20th century Physics including but not limited to Einstein theory of Relativity, Quantum and Atomic physics, Matter waves.
- Develop a comprehension of the current basis of upper level classes in Physics.
- Significantly improve critical thinking, analytical reasoning, and problem-solving skills.
- Cultivate a usage of interactive methods & Internet for independent course learning.

3. DESCRIPTION OF EXAMINATIONS AND OTHER STUDENT REQUIREMENTS

Tests and Final examination schedule:

Test 1 (Mechanics), Chapters 4, 7, 8, 10, 15 ----- Class # 11, Tuesday, September 26

Test 2 (Thermodynamics), Chapters 18, 19, 20 ----- Class # 20, Thursday, October 26

➤ **Final examination ----- Tuesday, December 5, 2023, 8:00 a.m.**

Lecture and test requirements:

• **PLEASE READ THE TEXTBOOK OR NOTES FOR LECTURES POSTED IN A BLACKBOARD FOR PHYS-303 COURSE BEFORE THE CORRESPONDING LECTURES.**

- Turn off your phone before class and put it in your bag!
- It is not allowed to use of any smart devices (smartphones, programmable calculators, etc.) during the tests/exams.
- Any recording in class is in contradiction with the Copyright Law and is not permitted.
- Note taking skills should be developed. Please make your own lecture notes.
- It is articulated and stressed the role of daily class participation in the learning process.
- Absence may jeopardize your standing because you are responsible for any in-class activities.
- Academic integrity: While in class, you are expected to attend to and participate in discussion; you are NOT allowed to engage in private conversation or other behaviors that would disrupt class activities. You are expected to be civil to others in the class.

Homework requirements:

- Homework is assigned after some sections are covered and is due in a week.
 - Write your paper by **12-point font or bigger or type on a computer and print it.**
 - Homework papers should be stapled allowing their reading and grading.
 - Show all your work; the answer alone is not worth anything.
 - Homework papers must include: diagrams, equations, derivations, calculations, and explanations of what you are doing / reasoning, enough English to be understandable; and encircled final answer/solution.
6. Homework answers should have units and a reasonable number of significant digits.
7. Encircle the answers that you want to be graded. **(Nothing encircled, - nothing graded).**

4. Information about the grading process and standards

Grading Scale: A's --- 87 – 100%; B's --- 71 – 86%; C's--56 –70%; D - 40 – 55%; F < 40%.

Grades will be based on homework, tests, and the final examination:

Homework: 24%; Two tests: 36% (#1--18%, #2 --18%); Class/Quizzes: 10%, Final exam: 30%.

5. OUTLINE OF COVERED TOPICS

PART 1: MECHANICS (Kinematics and Dynamics)

1. **Motion in Two and Three Dimensions** (Ch.4) [2 classes]
2. **Kinetic Energy and Work** (Ch. 7) [1.5 class]
3. **Potential Energy and Conservation of Energy** (Ch. 8) [2 classes]
4. **Rotation** (Ch. 10) [2 classes]
5. **Oscillation** (Ch. 15) + **HELP # 1** [2.5 classes]

TEST # 1 (MECHANICS) (class 11) Chapters 4, 7, 8, 10,15. Tuesday, September 26

PART 2: THERMODYNAMICS

6. **Temperature, Heat, and the First Law of Thermodynamics** (Ch. 18) [3 classes]
7. **The Kinetic Theory of Gases** (Ch. 19) [3 classes]
8. **Entropy and the Second Law of Thermodynamics** (Ch. 20) + **HELP # 2** [2 classes]

TEST # 2 (THERMODYNAMICS) (class 20) Chapters 18, 19, 20. Thursday, October 26

PART 3: OVERVIEW OF MODERN PHYSICS

9. **Relativity** (Ch. 37) [4 classes]
10. **Photons and Matter Waves** (Ch. 38) [3 class]
11. **REVIEW + HELP FOR FINAL EXAM** (Last class # 28) [1 class]

➤ **Final examination ----- Tuesday, December 5, 2023, 8:00 a.m.**

* - The dates are tentative, and may be changed (**but not the Final Examination!**)

6. Other policies

- **Attendance / absences:** Please bring in a document that explains your absence.
- It is articulated and stressed the role of daily class participation in the learning process.
- Absence may jeopardize your standing because you are responsible for any in-class activities.
- Academic integrity: While in class, you are expected to attend to and participate in a discussion; you are NOT recommended to engage in a private conversation or other behaviors that would disrupt class activities. You are expected to be civil to others in the class.

The University of Mississippi Regulations Governing All Examinations

A student's failure to appear for an examination without an acceptable excuse, inability to present valid identification, absence from the room during the course of an examination without the consent of the examiner, or attempting any portion of an examination without submitting his or her answers shall result in failure of the examination. **Tardiness beyond 15 minutes forfeits a student's**

right to an examination.

- **Last Week Policy:** During the period of Wednesday through Friday of the last week of class, instructors are not to give exams, tests, or quizzes that contribute more than 10% of the final grade for a class.
- **UM Attendance guidelines for sports teams:** Faculty and staff who supervise student organizations and teams, including NCAA sports teams, are expected to schedule competitions and performances in such a way as to minimize the number of classes that students will miss. Names of participating students and the dates of class conflicts should be provided to the students' instructors prior to participation. In cases where absence from class results from travel delays or the unanticipated continuation of participation in a competition, the student or supervisor should inform the instructor within one business day so that reasonable accommodations for absences due to university-sponsored activities can be made.
- **UM Attendance guidelines:** If a student informs an instructor in advance about an anticipated absence and the instructor decides not to provide an accommodation for a major exam or assessment, the student may appeal to the department chair or program director (or dean, when the instructor is chair or program director) who oversees the course. An appeal must be based on (a) failure of the instructor to articulate a policy, (b) failure of the instructor to follow the articulated policy, or (c) failure by the instructor to offer a reasonable accommodation for a documented absence **that caused a student to miss an assessment that is worth 20% or more of the course grade.**
- Based on UM "Class Attendance Guidelines,"-
- **No accommodations for missed chapter tests will be made.**
- **If the instructor articulates in the syllabus the role of daily class participation in the learning process, reasonable grade deductions can be made for absences.**
- *The Faculty Senate produced the document, which encourages faculty members to include the following text in their syllabi:* "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."

The END.