PHYS – 427: INTRODUCTION TO CONDENSED MATTER PHYSICS SPRING - 2026

Instructor: Dr. Igor Ostrovskii
Lectures: M, W 03 pm – 4:15 pm Room 228 Lewis Hall
Office hours: **TH 3:30 – 4:30 p.m. (207 Lewis Hall), and by appointment.**
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Recommended Textbooks:

- ***Condensed Matter Physics***, by Michael P. Marder, 2nd edition (selected chapters), Published by John Wiley and Sons, Inc.
  ISBN: 978-0-470-61798-4 (Print); ISBN: 978-0-470-94994-8 (E-Book).
- ***Introduction to Solid State Physics***, by Charles Kittel, 8th edition (selected chapters), Published by Wiley, ISBN 10: 047141526X ; ISBN 13: 9780471415268

Prerequisites: Phys 303 or 317

Learning Objectives:

1. Introduce undergraduate students in physics, related engineering, and chemistry disciplines to contemporary "Condensed Matter Physics" including crystal structure and binding, phonons and electrons in crystals, semiconductor physics, and basics of noncrystalline condensed matter.
2. To introduce the ideas of quantum physics applications to condensed matter physics.
3. To enhance critical thinking, analytical reasoning, and problem-solving skills.
4. Expand awareness of a scientific basis for advancements in contemporary scientific and technological applications.

Information about the grading process and standards:

GRADING SCALE:
A's ---------- 87 – 100
B's ---------- 76 – 86
C's ---------- 65 – 75
D's ---------- 50 - 64

EVALUATION:

Grades will be based on homework, 2 chapter closed-book exams, class activity, and the final examination:
Homework --25%; Midterm tests -- 25%;
Class activity -- 10%; Final examination --- 40%.

TOTAL: 100 points.

Course Description:

1. This is a one-semester course covering the introduction to Condensed Matter Physics for undergraduate students in physics, and related engineering and chemistry disciplines.
2. We start with the concept of an ideal crystal and consider three-dimensional lattices, which define the positions of atoms in the ideal crystal lattice.
3. Then we consider real condensed matter that usually has surfaces, interfaces, and may be arranged as different complex structures.
4. Special topics to be covered will include electronic structure, band structure, vibrations of a crystal lattice and phonons, and electron transport phenomena.
5. An important part of the course is devoted to semiconductor physics and the optical properties of condensed matter.
6. An overview of alloys, liquids, glasses, liquid crystals, and polymers is the last part of this course.

Homework information and recommendations:

1. Assignments will be given after some topics are covered, approximately after 3 - 4 lectures.
2. Students should submit their homework on paper in a classroom one week after the assignment is given.
3. Write your paper by using a 12-point font or bigger or type it on a computer and print it.
4. Homework papers must include diagrams, equations, derivations, calculations, and explanations of the physical approach used to clarify what you are doing.
5. Include your reasoning with enough English to be understandable.
6. Encircled final answer/solution.
7. Homework answers should have units and a reasonable number of significant digits.
8. Doing the homework is imperative to make a good grade in this course.
9. Homework will be graded with consideration for their physics content, clarity and correctness of the explanations.

Final examination: THURSDAY, MAY 7, 2026, 08 am – 11 am.

Other policies:

- **Attendance/absences**: Please bring in a document that explains your absence.
- It 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.

- All cellular phones, pagers, and other electronic equipment must be turned off during the class period.

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 an examination without the consent of the examiner or attempting any portion of an examination without submitting his or her answers shall fail the examination. **Tardiness beyond 15 minutes forfeits a student's right to an examination.**

Last Week's 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 student's instructors before 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 accommodation for a major exam or assessment, the student may appeal to the department chair or program director (or dean, when the instructor is a 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.**

- **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.**