PHYS 403/604

Solid State Physics

Fall 2025

Class time:	Tuesday & Thursday, 10:00 – 11:15 AM
Instructor:	Geoffrey M. Diederich
Email:	gdieder2@umbc.edu
Office hours:	Thursday, 11:30 – 12:30 (tentative)
Textbook:	Steven H. Simon, *The Oxford Solid State Basics*

Course objectives:

This course provides an introduction to the physics of solid matter. Solid-state physics, or more broadly condensed-matter physics, is the most active field of contemporary physics, with the most direct impact on modern technology. As well as enabling applications, condensed-matter physics has provided profound and fundamental insights and has connections to nearly all other fields of physics.
You will have succeeded in this course if, at the end of the semester, you

- are familiar with the language and terminology of solid-state physics
- understand basic classical and quantum-mechanical models to describe the thermal, mechanical, and electrical properties of solid-state systems
- understand the microscopic structure of solids, how it is described mathematically and determined experimentally, and how it is related to the physical properties of the materials
- can critically evaluate the approximations involved in models used to understand the solid state
- can apply knowledge of models to solve problems in solid-state physics using appropriate mathematical tools

Assignments:

Reading:

You are expected to come to class prepared, having read the assigned chapters and reviewed any provided class notes. The lectures will cover key topics but will not go over all material in detail. You are responsible for all material covered in the assigned readings and in the lectures.

Homework:

There will be a homework assignment about once a week. Homework assignments will be posted on the Blackboard page. The assignments may have different questions for students in PHYS 403 and students in PHYS 604. Due dates for the assignments will be posted on the Blackboard page. Assignments are to be submitted at the beginning of class on the day that they are due.

Your handwriting must be clear in order for me to be able to grade your work. You will get full credit for a question only if you show all steps and clearly explain your work – just getting the right answer does not guarantee that you get the full grade.

You are allowed to work with other students on the homework. However, all of the work that you turn in must be your own.

Exams:

There will be 4 mid-term exams during the semester, during scheduled class time. There will be no comprehensive final exam. Exams will include all course material covered up to the day of the exam, with an emphasis on the material covered since the previous exam. As for the homework assignments, receiving a complete grade will require that your solutions be legible, complete, and clearly explained. You may bring one page (double sided) of hand-written notes into the exams. Bring your own paper, pencils, etc. to class for the exam, and hand the exam in at the end of class.

As an additional assignment, you will be tasked with writing a question (and solution) for the final midterm exam. The questions will be graded for correctness and for insight into the course material. At least one of the questions that you answer on the final exam will be a question written by your fellow students.

Grading:

Your final grade will be determined by a numerical score, calculated as follows:

Homework: 36% (4% each)
Written final exam question: 4%
Exams: 60% (15% each)

The homework assignment on which you got your lowest grade will be dropped, and the remaining assignments will be weighted equally in determining the homework portion of your score. This is meant to allow for things that come up unexpectedly, and additional accommodation will be possible only if there are valid extenuating circumstances. I will use the following scheme to adjust your numerical score into a letter grade:

A: $\geq 90\%$
B: 80 – 89%
C: 70 – 79%
D: 50 – 69%
F: $< 50\%$