

PHYS 403 / 604

Solid-State Physics

Fall 2020

Lecture Hours:	Tues. & Thurs. 10:00 – 11:15 AM, using Blackboard Collaborate
Instructor:	Matthew Pelton
Office Hours:	Tues. & Thurs. 11:30 AM – 12:30 PM, or by appointment
Instructor Webex:	https://umbc.webex.com/meet/mpelton
E-mail:	mpelton@umbc.edu
Text:	Steven H. Simon, <i>The Oxford Solid State Basics</i>

This course is being taught online this semester, and many changes have been made to the course to adapt to remote teaching. More changes may be made during the semester, based on new conditions, student feedback, etc. All changes will be announced to the class, and the version of this syllabus available on the course Blackboard page will always reflect the most recent changes.

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

Classes

Live Lectures

Live online lectures will take place during the scheduled class times using Blackboard Collaborate. To join the course session, click on “Join Session” below “Blackboard Collaborate” on the course Blackboard page, and select the session called “Solid-State Physics lecture.” Joining this session rather than the general “Course Room” will ensure that your attendance at the lecture is registered. The session will be available 15 minutes before class time; it is strongly recommended that you join early.

The lectures will be recorded and made available on the Blackboard page. The recording will capture the main Blackboard Collaborate room, including any audio or video shared by students. If you do not wish to have your video recorded, do not turn on your camera during the lecture. The recording will not include any breakout rooms or private chat sessions. The recordings will be available only to students enrolled in the class and will be available only for the duration of the course. Please do not record the lecture yourself and do not attempt to download the recordings from the Blackboard page.

Recorded Lectures

You are strongly encouraged to attend and participate in all of the live online lectures. If you are unable to attend a lecture, you will need to watch the recording of the lecture in order to receive credit for attendance. The recordings will be available on the course Blackboard page shortly after each lecture. Quizzes will be embedded in the recorded lectures, and you will need to complete the quizzes in order to advance in the recordings.

Assignments

Reading Assignments

Lecture notes will be posted before each lecture and will include assigned chapters in the textbook. You are expected to come to class prepared, having read the assigned chapters and reviewed the class notes. This preparation is especially important because of all the challenges and potential technical problems involved with online lectures. The lectures will cover key topics but will not go over all material in detail. You are responsible for all material in the assigned readings and in the lecture notes.

Homework

There will be a homework assignment about once a week. Homework assignments will be posted on the Blackboard page. The assignments will often have different questions for students in PHYS 403 and students in PHYS 604.

Homework assignments are due by the end of the day the Sunday after they are assigned. Late assignments will not be accepted. You will need to submit your assignment as a PDF file; this can be done by writing on a tablet or by using scanning software to take PDF images of handwritten work. The 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. The Blackboard Collaborate course room will be available any time outside of the scheduled lecture time and can be used to work together. However, all of the work that you turn in must be your own.

Exams

There will be 3 or 4 mid-term exams during the semester. There will be no 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.

Each exam will be available online for two days and can be completed any time during those days. However, you will have a fixed amount of time to answer each question once you start it and will not be able to go back to that question afterwards. Answers must be submitted as PDF files within the time limit. There will be certain questions that are different for students in PHYS 403 and students in PHYS 604. As for the homework assignments, receiving a complete grade will require that your solutions be legible, complete, and clearly explained.

I will be available for immediate assistance during the scheduled class time when the exam is open; outside of the class time, I will answer e-mails, but may take some time to do so. Make-up exams will be given only if you are unable to take the exam for a documented medical or legal problem or family emergency.

Online Discussions

Each learning module of the course on Blackboard will include a discussion board, which is intended to be a forum for learning as a group. You are encouraged to ask questions or make comments about the course material, such as things you don't understand completely, things you would like to know more about, thoughts about the subject, etc. You are also encouraged to answer each other's questions and to set up times to meet in the Blackboard Collaborate course room to work together.

Please be polite and respectful in the discussion boards. You can be as casual as you like, but keep in mind that everybody in the class (including the instructor) can read what you post. Do not post any private information about yourself or about other students in the class.

The discussion boards are not meant to be a way to contact me for help or for questions about the course; please contact me by e-mail instead.

Grading

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

Homework:	43%
Exams:	50%
Attendance:	5%
Online discussions:	2%

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.

Similarly, for each exam, the question on which you get the lowest score will be dropped, and the final score will be the total of the scores for the remaining questions.

Attendance at a lecture will mean either participating in the live lecture or viewing the recorded lecture. In order to be counted as present at the live lecture, you need to arrive on time (you are automatically considered absent if you arrive more than 10 minutes late), and you need to be connected for at least 75% of the lecture; in addition, you need to participate in the class discussions and quizzes. In order to receive attendance credit for viewing the recorded lecture, you need to watch the entire recording and complete all embedded quizzes. Credit for live quizzes or quizzes in the recordings is given for participation only (*i.e.*, it does not require getting the right answer).

You will receive credit for the online discussions if you engage meaningfully in the discussion boards. The grade will be based on the quality as well as quantity of your posts. (For example, posts like “Me too!” and “Good question” don’t count as meaningful engagement; asking a thoughtful question about the material does.)

In order to convert your numerical score into a letter grade, I will first calculate the average of the scores for the top 2 students in each of PHYS 403 and PHYS 604. This score will be the benchmark for determining letter grades for students in the corresponding courses. The benchmark and your letter grade will be based on the final score. (*I.e.*, I will be comparing your grade to the benchmark only once, at the end of the semester, and not for each exam or homework.)

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

Office hours

Office hours will be held virtually using Webex. You can reach me by joining my personal Webex room at <https://umbc.webex.com/meet/mpelton>. I will be available during office hours but can also be available by appointment at other times. To make sure that I’m connected to Webex when you want to meet, and to make sure that you don’t try to join while I’m already meeting with somebody else, please send me an e-mail beforehand letting me know what time you want to meet.