PHYSICS 4500 / 5450
Introduction to Solid State Physics / Survey of Solid-State Physics
Spring 2026

Physics Bldg 311, TTh 11:00AM – 12:20PM

Professor & Office: Yuanxi Wang, Physics Bldg 330
Office Hours: Thu 2–3pm, and by appointment
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Optional Textbooks:
The following textbooks are optional. Canvas modules will be mainly adapted from the following texts and distributed as Jupyter notebooks on Canvas.

- *The Oxford Solid State Basics*, by Steven H. Simon. (Kindle Edition available on Amazon)
- *Solid State Physics*, by Neil Ashcroft and David Mermin.
- *Introduction to Solid State Physics*, *8th Edition*, by Charles Kittel

Topics and General Information:
This course provides an introductory treatment of the fundamentals of solid state physics. It is intended primarily for graduate and upper undergraduate students in physics and engineering, preparing students for research in condensed matter physics, chemistry, materials science, and electronics.

The course will make use of computational tools as an integral component of research in condensed matter physics. All computational components will be fully guided so no prior Python knowledge is required; these components will serve to exemplify the main theory concepts we introduce.

Prerequisites
There are no required prerequisites. However, undergraduate-level statistical mechanics and quantum mechanics is often assumed. You must bring your laptop (or equivalent device with internet connection) to every class.

Grading
• Most of the work will be done in class in groups of 3–4 students. Attendance is mandatory since you will be evaluated by your group on your participation to group discussions. Within a group, each student will provide evaluation for the participation of all other students for each module, on a scale of 20.

• Groups will be reshuffled for every module. After discussions and work are done in groups, you will return your assignments individually as jupyter notebooks through Canvas.

• Each module will be graded out of 100 points, 80 of which from the correctness of your solution, and the rest 20 from your presence in class and engagement as evaluated by your group members. If you have justified reasons for missing a session please let me know ahead of time.

• Zero tolerance policy on late assignments submission.

Weekly schedule
• Tuesday: discussion on notebook, quick warm-up problems, group discussions on the assignments.

• Thursday: detailed discussion on the notebook and computational projects, finish assignments.

• Due Friday 11:59pm: assignments due on Canvas

Tentative teaching schedule

- Module 1: Specific Heat of Solids - Einstein model
- Module 2: Specific Heat of Solids - Debye model
- Module 3: Electrons in Metals - Drude model
- Module 4: Electrons in Metals - Sommerfeld model
- Module 5: Structure of materials - the periodic table
- Module 6: Structure of materials - chemical bonding
- Module 7: Electrons and phonons in 1 dimension
- Module 8: Electrons and phonons in 1 dimension (many atoms case)
- Module 9: Crystal structure
- Module 10: Reciprocal lattice and x-ray diffraction
- Module 11: Electrons in a periodic potential – nearly free electron model
- Module 12: Electrons in a periodic potential – band structure
- Module 13: Semiconductors physics
- Module 14: Semiconductor devices
- Module 15: Magnetism

Other Information

Canvas. The Canvas module section will be used to post course materials, lecture notes, announcements, grades, and the most up-to-date version of this syllabus (https://unt.instructure.com/). You may use your UNT EUID and password to log on and select this course.

Course Evaluation – Student Perceptions of Teaching (SPOT). Student feedback is an essential part of participation in this course. Providing the student evaluation of instruction instrument is a requirement for all organized classes at UNT.

A short SPOT survey will be provided to you with an opportunity to evaluate how this course is taught. You will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Once you complete the survey you will receive a confirmation email. For additional information, please email spot@unt.edu.

Office hours: Connect with me through attending office hours! During busy times my inbox may be rather full - if you contact me and don't receive a response within two business days, please send a follow-up email. A gentle nudge is always appreciated.

ADA Policy: The University of North Texas makes reasonable academic accommodation for students with disabilities. Students seeking reasonable accommodation must first register with the Office of Disability Access (ODA) to verify their eligibility. If a disability is verified, the ODA will provide you with a reasonable accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request reasonable accommodations at any time, however, ODA notices of reasonable accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of reasonable accommodation for every semester and must meet with each faculty member prior to implementation in each class. Students

are strongly encouraged to deliver letters of reasonable accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the studentFor additional information, refer to the Office of Disability Access website at https://studentaffairs.unt.edu/office-disability-access. You may also contact ODA by phone at (940) 565-4323.

Academic Integrity: UNT policy on Academic Dishonesty can be found at: https://vpaa.unt.edu/ss/integrity

Emergency Notification & Procedures: UNT uses Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas Announcements for contingency plans for covering course materials.