

PHYS 617, Physics of the Solid State Spring 2017 Syllabus Texas A&M University

PHYS 617 is a survey of solid state physics, including the physics of electrons and phonons, applications to semiconductors, superconductivity, and magnetism as time permits, and also an introduction to selected additional current topics in condensed matter physics. The topics as listed below may be adjusted slightly depending on class interest.

Course web-page: rossgroup.tamu.edu/617page.html

Lectures: MWF, 10:20-11:10, room 107 Mitchell Physics Building (MPHY)

Instructor: J. H. Ross: Office: 448 MPHY. Lab: B03 ENPH (845-7823).

My email: ross@physics.tamu.edu

Office hours: MW 11:30-12:30, **Thurs 1-2**. (Normally in my MPHY office; I'll email everyone in case I am in my lab at these times.) I am happy to meet other times; email me to arrange a specific meeting.

Text: Ashcroft & Mermin, *Solid State Physics*.

Additional materials will be provided in class as supplement.

Prerequisites: PHYS 408 or 607 (Thermo./Stat. Mech.) and 412 or 606 (Quantum Mechanics) or their equivalents. (You need not have had a previous Solid State Physics course.)

Grading:	Homework (most weeks)	20%
	Exam 1 & Exam 2	25% each
	Final Exam	30%

Schedule with corresponding chapters in Ashcroft and Mermin. **Exams:** may possibly be moved to evenings close to the indicated date if schedules allow.

week 1	1-18 to 1-20	Overview; Classical and quantum electron gas. Ch. 1-2.
week 2	1-23 to 1-27	Crystal classification and symmetries, reciprocal lattices; Ch. 3-5.
week 3	1-30 to 2-3	Symmetry properties continued; also x ray scattering; Ch. 6-7.
week 4	2-6 to 2-10	Electrons in crystal lattices; nearly-free electrons; Ch. 8-9.
week 5	2-13 to 2-17	Tight-binding, bandstructures, recent developments; Ch. 10-11, 17, handouts.
week 6	2-20 to 2-24	Fermi surfaces in metals; parts of Ch. 14, 15, 19.

Exam 1: Weds. February 22

week 7	2-27 to 3-3	Semiclassical electron dynamics; imperfect crystals, nanostructures; Ch. 12, handouts.
week 8	3-6 to 3-10	Harmonic crystal, classical lattice vibrations; Ch. 21, 22.
week 9	3-20 to 3-24	Quantized lattice vibrations & phonons; ch. 23, 24.
week 10	3-27 to 3-31	Phonons in metals and introduction to electrical transport properties; Ch. 26.
week 11	4-3 to 4-7	Semiconductors; also physics related to devices & 2DEG's; chapter 28, 29.
week 12	4-10 to 4-12	Magnetic behavior of solids; selected topics: Ch. 31-32. Short week.

Exam 2: Weds. April 12

week 13	4-17 to 4-21	Magnetism continued, superconductivity. Ch. 33-34
week 14	4-24 to 4-28	Superconductivity continued and/or other topics to be determined.
Week 15	5-1 to 5-2	continuation, review.

Final Exam Monday May 8, 8:00 AM

Further Information: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please contact Disability Services, on West Campus next to the White Creek Apartments, call 845-1637, or visit disability.tamu.edu.

You should also know the Aggie Honor Code: "An Aggie does not lie, cheat, or steal or tolerate those who do," and consult the Rules and Procedures; see aggiehonor.tamu.edu, and student-rules.tamu.edu/aggiecode.