Theory of Condensed Matter

The University of Toledo
(College of Natural Science and Mathematics)
(PHYS 4510/5510) (59460, 58128)

Instructor:	Yanfa Yan	**Class Location**:	MH 4009
Email:	yanfa.yan@utoledo.edu	**Class Day/Time**:	MWF 2:00-2:50pm
Office Hours:	100:00AM-12:00pm (MWF)	**Lab Location**:	N/A
Office Location:	R1 2100D	**Lab Day/Time**:	N/A
Office Phone:	419 530 3918	**Credit Hours**:	3
Term:	Fall, 2015		

COURSE/CATALOG DESCRIPTION

Crystal lattices and structures, reciprocal lattice and kinematical diffraction theory. Survey of binding in crystals. Lattice dynamics and phonons. Thermodynamic, electronic, and optical properties of insulators, semiconductors, metals and alloys.

COURSE OVERVIEW

Crystal structural, , reciprocal lattice, diffraction, phonons, electronic and optical properties, semiconductors, and metals

STUDENT LEARNING OUTCOMES

Students are expected to understand the fundamentals of the physics of condensed Matters, specifically crystalline materials

TEACHING STRATEGIES

The teaching will include class lecture and office hour Q&A (face-to-face) and home work (email). Students are welcome to have face-to-face Q&A or course-related conversation at anytime.

PREREQUISITES AND COREQUISITES

*Undergraduate level **PHYS 3320** Minimum Grade of D- and Undergraduate level **PHYS 3410** Minimum Grade of D-*

REQUIRED TEXTS AND ANCILLARY MATERIALS

Text: Charles Kittel, Introduction to Solid State Physics (8th Edition)
Supplemental Texts: Solid State Physics, by Ashcroft and Mermin
Introductory Solid State Physics, by H. P. Myers
Condensed Matter Physics, by M. P. Marder

TECHNOLOGY REQUIREMENTS

None

UNIVERSITY POLICIES

Policy Statement on Non-Discrimination on the basis of Disability (ADA)

The University is an equal opportunity educational institution. Please read The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance.)

Academic Accommodations

The University of Toledo is committed to providing equal access to education for all students. If you have a documented disability or you believe you have a disability and would like information regarding academic accommodations/adjustments in this course please contact the Student Disability Services Office.)

GRADING

Midterm Grading

50%.

Final Grading

50%.

COURSE SCHEDULE

(Insert a detailed course schedule/calendar that (1) includes weekly topics; (2) aligns the topic to be covered with the student learning outcome; and (3) describes in detail how you will assess student learning.)

Approximate Lecture Schedule (Ch. numbers refer to the book by Kittel)

Week of	Topics	Reading
Aug. 24	Crystal Structure	Ch. 1
Aug. 31	Reciprocal Lattice and x-Ray Diffraction	Ch. 2
Sept. 9	Brilouin Zone, Structure factor, Deby-Walle factor	Ch. 2 App. A
(Sept. 7 Labor day, no class)		
Sept. 14	Crystal Binding, Phonons I	Ch. 3, Ch. 4
Sept. 21	Phonon I	Ch. 4
Sept. 28	Phonon II, DOS, Debye and Einstein models	Ch. 5
Oct. 7	Phonons II, scattering, thermal properties	Ch. 5
(Oct. 5 Fall break, no class)		
Oct. 12	Review, Exam 1	Ch. 1 - 4
Oct. 19	Free Electron Gas	Ch. 6, App. D
Oct 26	Electrical Conductivity	Ch. 6
Nov. 2	Energy Bands	Ch. 7
Nov. 9	Energy Bands	Ch. 5- 7
Nov. 16	Semiconductor – introduction	Ch. 7
Nov. 23	Semiconductor – mobility, holes, etc.	Ch. 8

(Nov. 25 and 27, No class, Thanksgiving)

Nov. 30	Fermi surfaces & energy band calculations	Ch. 9
Dec. 6	Review,	
Dec. 17 (Thursday)	Final Exam; 12:30-2:30	
