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

Instructor: Yanfa Yan  
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Office Hours: 100:00AM-12:00pm (MWF)  
Office Location: R1 2100D  
Office Phone: 419 530 3918  
Term: Fall, 2015

Class Location: MH 4009  
Class Day/Time: MWF 2:00-2:50pm  
Lab Location: N/A  
Lab Day/Time: N/A  
Credit Hours: 3

COURSE/CATALOG DESCRIPTION

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

REQUIRED TEXTS AND ANCILLARY MATERIALS
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)

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