



WISCONSIN'S POLYTECHNIC UNIVERSITY

PHYS-327

Solid State Physics

Lecture: Tu/Th/F, 11:15 AM, JSW 105

Professor Marlann Patterson

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Office: JSW 234D, Lab: JSA 145/7

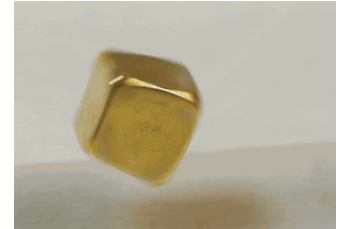
Ph: (715)232- (O) 2560, (L) 5273

Office Hours:

Tuesdays 8:00 AM - 11:15 AM

2:30 PM - 3:25 PM

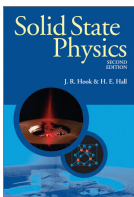
Thursdays: 2:30 PM - 3:25 PM



Course Description: Crystalline structure, lattice vibration and energy states, Brillouin zones, electrons in metals, energy bands and gaps, diffraction.

Prerequisites: PHYS-282 or PHYS-242, and MATH-157 or MATH-154 or consent of instructor;

Credit Hours: 3



Required Text: *Solid State Physics*, 2nd Edition

Authors: Hook and Hall; **ISBN-13:** 978-0471928058

Required Readings: To Be Assigned.

Course Objectives: At the completion of this course, you will be able to:

- A) Recognize periodic structures, crystal planes, Miller Indices, and the space filling geometries.
- B) Discuss crystal dynamics using phonons and the concepts of effective mass and crystal momentum.
- C) Relate the Bragg Law, diffraction concepts, and the reciprocal lattice.
- D) Describe the free and nearly-free electron models, and the tight-binding approximation.
- E) Discuss the energy bands of metals, insulators, and semiconductors.
- F) Represent energy bands in various zone schemes.

Assignment Weight Distribution:

Homework & Activities	60%
Quizzes	20%
Summative Assessment	20%

Attendance Multiplier: We will have up to 42 class periods together. An absence for any of those classes will result in a smaller fraction of days attended. At the end of the semester, I will multiply your attendance fraction by your average and use that as your final grade. For example, if you miss 1 day, and have a grade average of 87%, I would multiply it by 41/42 to get 85%. That drops the grade from a B+ to a B. On the other hand, showing up to all classes will have no negative impact on your final grade - and that's what I'm hoping for! If you do have a legitimate medical or other issue, please notify me before class when possible. I can excuse absences that are unavoidable.

Letter Grade Distribution:

93 - 100	A	73 - 76	C
90 - 92	A-	70 - 72	C-
87 - 89	B+	67 - 69	D+
83 - 86	B	63 - 66	D
80 - 82	B-	60 - 62	D-
77 - 79	C+	0 - 59	F

Tentative Course Content By Week: The topics might change a bit from week to week, but this is the plan.

Week	Content	Assignment(s) Due
1	Lattice, basis, typical structures	Hook and Hall Ch 1 Sections 1-3
2	Bragg Law, XRD, bonding	Hook and Hall Ch 1 Sections 4, 6
3	Wave Review	Hook and Hall Ch 2 Sections 1-2
4	1D Chain of Atoms	Hook and Hall Ch 2 Section 3
5	Phonons	Hook and Hall Ch 2 Section 3

Week	Content	Assignment(s) Due
6	Free electron model	Hook and Hall Ch 3 Sections 1-2
7	Free electron model	Hook and Hall Ch 3 Section 3
8	Nearly-free electron model	Hook and Hall Ch 4 Sections 1-2
9	Nearly-free electron model	Hook and Hall Ch 4 Section 4
10	Diffraction Part 1	Hook and Hall Ch 11 Sections 1-2

Week	Content	Assignment(s) Due
11	Diffraction Part 2	Hook and Hall Ch 11 Section 4
12	Diffraction Part 3	Hook and Hall Ch 12
13	Fermi surfaces	Hook and Hall Ch 13 Sections 1-2
14	Zone schemes	Hook and Hall Ch 13 Sections 1-4
15	Finals Week	

Data for Research Disclosure: Any and all results of in-class and out-of-class assignments and examinations are data sources for research and may be used in published research. All such use will be anonymous.

Academic Honesty: The Board of Regents, administrators, faculty, academic staff and students of the University of Wisconsin System believe that academic honesty and integrity are fundamental to the mission of higher education and to the University of Wisconsin System. The university has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonesty. Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others academic endeavors. Students who violate these standards must be confronted and must accept the consequences of their actions. Academic misconduct include copying the work of someone else,

aiding other students with exams, and other forms of plagiarism or cheating. Possible penalties for engaging in these activities include receiving a zero score for the exam or assignment in question, receiving a failing grade in the course, or other actions approved by the university. Please see www3.uwstout.edu/stusrv/dean/chp14 for an explanation of your rights and responsibilities should misconduct occur.

Accommodations: All disabilities will receive accommodation. Religious holidays and occurrences will also be accommodated. See me for details. The university's official statement follows. *UW-Stout strives for an inclusive learning environment. If you anticipate or experience any barriers related to the format or requirements of this course please meet with me so that we can discuss ways to ensure full access. If you determine that additional disability-related accommodations are necessary please contact the Disability Services office (206 Bowman Hall, 715-232-2995, www.uwstout.edu/disability.)*

Semester Calendar: This calendar is provided to help you manage your time.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Jan 23rd	24th 1 Week 1 Day 1 Welcome!	25th	26th 2 Week 1 Day 2 Ch. 1 Lecture 1	27th 3 Week 1 Day 3 Active Friday 1
30th	31st 4 Week 2 Day 1 Ch. 1 Lecture 2	Feb 1st	2nd 5 Week 2 Day 2 You Present 1	3rd 6 Week 2 Day 3 Active Friday 2
6th	7th 7 Week 3 Day 1 Ch. 2 Lecture 1	8th	9th 8 Week 3 Day 2 You Present 2	10th 9 Week 3 Day 3 Active Friday 3
13th	14th 10 Week 4 Day 1 Ch. 2 Lecture 2	15th	16th 11 Week 4 Day 2 You Present 3	17th 12 Week 4 Day 3 Active Friday 4
20th	21st 13 Week 5 Day 1 Ch. 3 Lecture 1	22nd	23rd 14 Week 5 Day 2 You Present 4	24th 15 Week 5 Day 3 Quiz 1
27th	28th 16 Week 6 Day 1 Ch. 4 Lecture 1	Mar 1st	2nd 17 Week 6 Day 2 You Present 5	3rd 18 Week 6 Day 2 Active Friday 6
6th	7th 19 Week 7 Day 1 Ch. 4 Lecture 2	8th	9th 20 Week 7 Day 2 You Present 6	10th 21 Week 7 Day 3 Active Friday 7
13th Spring Break	14th Spring Break	15th Spring Break	16th Spring Break	17th Spring Break

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
20th	21st 22 Week 8 Day 1 Ch. 11 Lecture 1	22nd	23rd 23 Week 8 Day 2 You Present 7	24th 24 Week 8 Day 3 Active Friday 8
27th	28th 25 Week 9 Day 1 Ch. 11 Lecture 2	29th Advising - no classes	30th 26 Week 9 Day 2 You Present 8	31st 27 Week 9 Day 3 Active Friday 9
Apr 3rd	4th 28 Week 10 Day 1 Ch .11 Lecture3	5th	6th 29 Week 10 Day 2 You Present 9	7th 30 Week 10 Day 3 Quiz 2
10th	11th 31 Week 11 Day 1 Ch. 12 Lecture 1	12th	13th 32 Week 11 Day 2 You Present 10	14th 33 Week 11 Day 3 Active Friday 11
17th	18th 34 Week 12 Day 1 Ch. 12 Lecture 2	19th	20th 35 Week 12 Day 2 You Present 11	21st 36 Week 12 Day 3 Active Friday 12
24th	25th 37 Week 13 Day 1 Ch. 13 Lecture 1	26th	27th 38 Week 13 Day 2 You Present 12	28th 39 Week 13 Day 3 Active Friday 13
May 1st	2nd 40 Week 14 Day 1 Ch. 13 Lecture 2	3rd	4th 41 Week 14 Day 2 You Present 13	5th 42 Week 14 Day 3 Active Friday 14
8th Finals Day 1	9th Phys-327 Final @ 2PM	10th Finals Day 3	11th Finals Day 4	12th Finals Day 5