

SPRING 2023 Physics 4323-101

Instructor: Halyna Hodovanets 118 Physics halyna.hodovanets@mst.edu

Meeting room and time: Physics 00127 MWF 11:00-11:50 AM

Help Sessions: TBA

Webpage: Canvas

Textbook: Introduction to solid state physics, 8th Ed., Charles Kittel

Additional books:

G. Burns "Solid State Physics"

C. Kittel "Quantum Theory of Solids"

N.W. Ashcroft and N.D. Mermin "Solid State Physics"

J. M. Ziman "Principles of the Theory of Solids"

J. Callaway "Quantum Theory of the Solid State"

Description of the course:

This course covers the basics of physics of crystalline materials. You will become familiar with the concepts and terminology of crystal structure, lattice vibration, band structure, magnetism, and superconductivity. You will also learn about the physical and thermal properties of materials and how to measure them.

Objectives of the course:

- To increase understanding of solid-state physics and physics of materials
- To lay the foundation for the future studies and/or research in the areas of condensed matter physics
- To become proficient with the basic calculation methods and improve your problem-solving ability

Topics to be covered

Ch. 1: Classification of solids and crystal structures

Ch. 2: Crystallographic techniques: diffraction

Ch. 3: Crystal binding; elastic properties

Exam 1

Ch. 4: Lattice vibrations (phonons I)

Ch. 5: Thermal properties (phonons II)

Exam 2

Ch. 6: Electronic properties of metals. Free electron Fermi gas

Ch. 7: Nearly-free electron model; energy bands, band gaps

Ch. 9: Metals; Fermi surface; Tight-binding model

Exam 3

Ch. 11-12: Magnetism

Ch. 10: Superconductivity

Final Exam (cumulative) **Monday May 8th 2023 at 10:00 AM-12:00 PM**

N. B. According to the Student Academic Regulations all requests to change the final schedule because of conflicts or having three or more examinations scheduled on one day "are to be made in the Registrar's Office at least one week before the beginning of the final examination week", starting Monday, April 17 and ending on Friday, April 28.

Final grade make up:

Homework (12 assignments)	40%
Exam 1-3	35%
Final (cumulative)	25%

Homework:

- During each Friday class (excluding the weeks after the midterms) you will be assigned a problem set, which will consist of the end-of-the-chapter problem(s), and questions based on the chapter objectives.
- Neatly handwritten or typed solutions are due on Wednesday of the following week.
- Homework will be accepted only until the end of the class on Friday of the due week (with 50% penalty for turning the assignment after the deadline).
- There will be ten homework assignments during semester.
- At the end of the course one lowest homework grade will be dropped.
- You are encouraged to discuss your homework in groups. However, identical homework solutions will be given a grade zero.

Midterm and final exams:

- Midterm exams will be given on Monday, February 13, March 13, and April 17 during a regular class.
- The cumulative Final exam will be given on Monday, May 8, 10:00 am-12:00 pm in our regular lecture room.
- The midterm and the final exams will consist of 2-3 problems similar to homework.
- Tests are open notes format.
- The lowest out of three midterm exam scores may be dropped.

Test makeup policy:

- In exceptional cases of documented medical or personal emergencies, a makeup test will be provided.
- The instructor **MUST** be notified of such an emergency **PIOR** to the test.
- A makeup test will be composed using the same guidelines as the test missed.

Sick policy: Should you feel unwell, ill or are unable to attend class or take tests on campus please contact Student Health Services (mstshs@mst.edu), 573-341-4284 and notify the instructor, and do not come to the lecture. The homework due time will not be postponed unless the student is sick for more than a week. In the case the student is sick when the exam is taking place, that exam (except final) will count as the lowest score exam and will be dropped. The instructor must be notified *prior* to the exam.

Excessive absence:

- If you miss 3 assignments of any kind, an academic alert will be issued
- If you miss 5 assignments and/or 2 exams you will be dropped from the course for excessive absence

Final Grade: The letter grades will be assigned based on the following cut offs (to four significant figures):

- A - 89.50% of total possible points
- B - 79.50% of total possible points
- C - 69.50% of total possible points
- D - 59.50% of total possible points
- F - less than 59.50% of possible points

The grade cuts are absolute and will not be lowered. Points will not be added to a student's grade to bring it above the cutoff.

Covid-19 contingency plan: If Missouri S&T will switch to remote teaching due to the ongoing pandemic, all class meetings will be held via ZOOM synchronously, and all assignments will continue as scheduled. Exams will be held via ZOOM as well. The web-camera will be required to show the work area for proctoring.

Accessibility and Accommodations

It is the university's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on a disability, please contact Student Disability Services at (573) 341-6655, sdsmst@mst.edu, visit <http://dss.mst.edu/> for information. You will need to request a letter from Disability Support Services verifying your disability and specifying the accommodation you need and give the letter to Dr. Hodovanets by the end of the second week of classes before accommodation can be arranged. Testing accommodations **require seven-day notice.**

Student Honor Code and Academic Integrity

- All students are expected to follow the [Honor Code](#).
- [The Student Academic Regulations handbook](#) describes the student standard of conduct relative to the University of Missouri System's Collected Rules and Regulations section 200.010, and offers descriptions of academic dishonesty including cheating, plagiarism and sabotage (<http://registrar.mst.edu/academicregs/index.html>), any of which will be reported to the physics department chair and Vice Provost for Academic Support.

Well-Being and UCARE (<https://go.mst.edu/ucare-report>)

Any of us may experience strained relationships, increased anxiety, feeling down, alcohol/drug misuse, decreased motivation, challenges with housing and food insecurity, etc. When your mental well-being is negatively impacted, you may struggle academically and personally. If you feel overwhelmed or need support, please make use of S&T's confidential mental health services at no charge. If you are concerned about a friend or would like to consult with a Care Manager,

please make a UCARE referral for support and assistance. UCARE is the central point of contact to connect a student who may be experiencing a personal, academic, financial, wellbeing, and/or other concern to support and resources. A referral can be submitted at <https://go.mst.edu/ucare-refer> or by emailing ucare@mst.edu. For urgent matters, check out the after-hour and urgent resources.

Writing Center. The Writing Center's mission is to assist **all students** in their efforts to become better writers, communicators, and critical thinkers. They offer clients structured one-on-one and small-group conversations with peer consultants. Writing Center consultants are fellow students whose strong writing skills and special training allow them to offer meaningful feedback and guidance for any genre of writing. Students, faculty, and staff across all disciplines can make appointments in-person, online, and asynchronously. More information can be found at their website and through email: writing@mst.edu.

Student Success Center. The Student Success Center (SSC) supports student development through individualized tutoring, peer-to-peer life skill coaching, and campus programming – all while providing free coffee and hot beverages! The SSC was developed to provide additional assistance for students academically and help bolster non-academic life skills, such as goal setting and time-management. All student Miners are encouraged to utilize the SSC's free services to get timely support and to enhance their S&T Miner Experience. Visit the SSC at 198 Toomey Hall, contact us at success@mst.edu, or join us on social media [@sandtssc](https://twitter.com/sandtssc). To see the course offerings and times for SSC Tutoring, visit studentsuccess.mst.edu/tutoring/.

Nondiscrimination, Equity, and Title IX

Missouri University of Science and Technology is committed to the safety and well-being of all members of its community, and to creating an environment free from discrimination and harassment.

The University does not discriminate on the basis of race, color, national origin, ancestry, religion, sex, pregnancy, sexual orientation, gender identity, gender expression, age, disability, protected veteran status, and any other status protected by applicable state or federal law. As used in this policy, the word “sex” is also inclusive of the term “gender.”

Missouri S&T's Equity Officer and Title IX Coordinator is Chief Diversity Officer Anitra Rivera. Contact their office at (573) 341-6038; 203 Centennial Hall) to report violations of the university's nondiscrimination policies, including Title IX. To learn more about resources and reporting options (confidential and non-confidential) available to Missouri S&T students, staff, and faculty, please visit <http://titleix.mst.edu>.

Class schedule

January (6 lectures)

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

February (11 lectures)

S	M	T	W	T	F	S
29	30	31	<u>1</u>	2	3	4
5	6	7	<u>8</u>	9	10	11
12	13	14	15	16	17	18
19	20	21	<u>22</u>	23	24	25
26	27	28				

Homework #1 is due in class on Wednesday

Homework #2 is due in class on Wednesday

Exam #1

Homework #3 is due in class on Wednesday

March (9 lectures)

S	M	T	W	T	F	S
26	27	28	<u>1</u>	2	3	4
5	6	7	<u>8</u>	9	10	11
12	13	14	15	16	17	18
19	20	21	<u>22</u>	23	24	25
26	27	28	29	30	31	

Homework #4 is due in class on Wednesday

Homework #5 is due in class on Wednesday

Exam #2

Homework #6 is due in class on Wednesday

April (11 lectures)

S	M	T	W	T	F	S
26	27	28	29	30	31	1
2	3	4	<u>5</u>	6	7	8
9	10	11	<u>12</u>	13	14	15
16	17	18	19	20	21	22
23	24	25	<u>26</u>	27	28	29
30						

Homework #7 is due in class on Wednesday

Homework #8 is due in class on Wednesday

Exam #3

Homework #9 is due in class on Wednesday

May (3 lectures)

S	M	T	W	T	F	S
30	1	2	<u>3</u>	4	5	6
7	<u>8</u>	9	10	11	12	13

Homework #10 is due in class on Wednesday

Final Exam (10 am – 12 pm)

We may deviate from this schedule. Exam and homework material will be adjusted accordingly.