

Syllabus*: Solid State Physics (1901021471)

Second Semester 2021 /2022

	COURSE INFO	DRMATION
Course Name:	Solid State Physics	Course Code: 1901012471
Semester:		Section: 1
Department:	Department of Physics	Core Curriculum:
Faculty: Science		
Day(s) and Time(s):	Sundays: 13:00-14:00	Credit Hours: 3
	Tuesdays: 13:00-14:00	Prerequisites: 110102364
Thursdays: Online le	ecture (Activities)	
Classroom:	Al-Husein Al-Baney C109	
	COURSE DES	SCRIPTION
Crystal lattice:	: Bravais lattice. Structure of solids	3: Crystal structure. Elastic scattering of waves.
Crystal bondir	ng: Van der Waals bonding. Lattice	e vibrations and phonons. Thermal properties of
crystalline sol	lids. Free electron model; nearly	free electron model, band theory and Fermi
surfaces.		
	DELIVERY N	NETHODS
The course will include:	be delivered through a combination	on of active learning strategies. These will
PowerPoint	lectures and active classroom base	ed discussion
Collaborative carried out v	e learning through small groups ac within the context of hybrid course	ting in an interdisciplinary context. This part will be
 E-learning re Team 	esources: e-reading assignments a	nd practice quizzes through Moodle and Microsoft

FACULTY INFORMATION					
Name					
Academic Title:	Professor				
Office Location:	Physics Building; Room # 204				
Telephone Number:	Extn: 4203				
Email Address:	rbadran@hu.edu.jo				
Office Hours:	Sundays 12.00-13.00				
	Tuesdays 12.00-13.00				
	Thursdays 14.00:15.00 Via MS Teams				
	Please send an e-mail (<u>rbadran@hu.edu.jo</u>) to meet at				
	any other time.				

REFERENCES AND LEARNING RESOURCES

Required Textbook: Introduction to Solid State Physics, 8th Edition

Author: Kittel C.

Publisher: (John Wiley: 2005) ISBN: 0-471-41526-X

Suggested Additional Resources:

Omar M. A., " Elementary Solid State Physics: Principles and Applications" (Addison-Wesley, 1992). Christman J. R.," Fundamentals of Solid State Physics" (John Wiley, 1988).

Hook J. R. and Hall H. E. " Solid State Physics" (John Wiley, 1991).

Rudden M. N. and Wilson J. "Elements of Solid State Physics" (John Wiley, 1993).

Rosenberg H. M. " The Solid State". (Oxford University Press 1997).

Useful Web Resources:

http://wug.physics.uiuc.edu/courses/phys389/fall02/ http://www.phy.ilstu.edu/Courses/355.html http://solidstate.physics.sunysb.edu/teach/intlearn/ http://cst-www.nrl.navy.mil/lattice/ http://www.physics-network.org/PhysNet/education.html http://buckminster.physics.sunysb.edu/intlearn/lattice/lattice.html

Core Curriculum Learning Outcomes	Program Learning Outcomes	Course Objectives	Course Student Learning Outcomes	Assessment Method
		1. Develop a transparent understanding of elementary solid state physics to enable students gaining a firm foundation for further study.	1. Know the basic crystal structure and describe different types of crystal structures in terms of the crystal lattice and the basis of constituent atoms. Understand spatial symmetries of different Bravais lattice structures.	 Exams Quizzes "On-line' Presentation assignments Study group assignments
		2. Provide strong links between solid state phenomena and the other basic laws of physics.	2. Understand the concept of reciprocal space and how to use it as a tool. Know the significance of Brillouin zones and their use to describe and analyze the electron energy in the band energy structure of crystals	 Exams Quizzes "On-line' presentation assignments Study group assignments
		3. Demonstrate the experimental roots of solid state theory and explain how fundamental quantities can be measured in some important experiments.	3. Recognize that the developed k- space formalism to describe phonons, electrons, is more general and can be used to describe waves in a periodic media and identify such 'out-of-the- course' physical situations/problems.	 Exams Quizzes "On-line' presentation assignments Study group assignments
		4. Explore the physical realization of much fundamental physics by shedding light on some technological applications.	4. Describe the different physical mechanisms involved in crystal binding identifying the repulsive and attractive interactions and correlate these with the atomic properties	 Exams Quizzes "On-line' presentation assignments Study group assignments
		5. Develop skills in solving problems in relevant to solid state	5. Explain crystal vibrations and the concept of phonon in solids. Perform estimates of phonons dispersive properties. Formulate the theory of	 "On-line" presentation assignments

STUDENT LEARNING OUTCOMES MATRIX*

	model and laws using analytical approaches	lattice vibrations (phonons) and use that to determine thermal properties of solids.	A	Study group assignments
	6. Acquire progressive theme of improvement to model the physical properties of solids and at each stage explain why they are necessary, what added knowledge is obtained and what draw-backs still remain	6. Calculate thermal and electrical properties in the free-electron model.	A	Study group assignments
		7. Formulate the problem of electrons in a periodic potential, examine its consequence on the band-structure of the solid and develop a framework that explains the physical properties of solids in terms of its band-structure.	AAA	Exams Quizzes Study group assignments
		8. Know the principles of structure determination by diffraction. Account for how crystalline materials are studied using diffraction, including concepts like form factor, structure factor, and scattering amplitude.	AAA	Exams Quizzes "On-line' presentation assignments

ACADEMIC SUPPORT

It is The Hashemite University policy to provide educational opportunities that ensure fair, appropriate and reasonable accommodation to students who have disabilities that may affect their ability to participate in course activities or meet course requirements. Students with disabilities are encouraged to contact their Instructor to ensure that their individual needs are met. The University through its Special Need section will exert all efforts to accommodate for individual's needs.

Special Needs Section: Tel: Location: Email:

COURSE REGULATIONS

Participation

Class participation and attendance are important elements of every student's learning experience at The Hashemite University, and the student is expected to attend all classes. A student <u>should not miss more than 15%</u> of the classes during a semester. *Those exceeding this*

limit of 15% will receive a failing grade regardless of their performance. It is a student's responsibility to monitor the frequency of their own absences. Attendance record begins on the first day of class irrespective of the period allotted to drop/add and late registration. It is a student's responsibility to sign-in; failure to do so will result in a non-attendance being recorded.

In exceptional cases, the student, with the instructor's prior permission, could be exempted from attending a class provided that the number of such occasions does not exceed the limit allowed by the University. The instructor will determine the acceptability of an absence for being absent. A student who misses more than 25% of classes and has a valid excuse for being absent will be allowed to withdraw from the course.

Plagiarism

Plagiarism is considered a serious academic offence and can result in your work losing marks or being failed. HU expects its students to adopt and abide by the highest standards of conduct in their interaction with their professors, peers, and the wider University community. As such, a student is expected not to engage in behaviours that compromise his/her own integrity as well as that of the Hashemite University.

Plagiarism includes the following examples and it applies to all student assignments or submitted work:

- Use of the work, ideas, images or words of someone else without his/her permission or reference to them.
- Use of someone else's wording, name, phrase, sentence, paragraph or essay without using quotation marks.
- Misrepresentation of the sources that were used.

<u>The instructor has the right to fail the coursework or deduct marks where plagiarism is</u> <u>detected</u>

Late or Missed Assignments

In all cases of assessment, students who fails to attend an exam, class project or deliver a presentation on the scheduled date without prior permission, and/or are unable to provide a medical note, will automatically receive a fail grade for this part of the assessment.

- Submitting a term paper on time is a key part of the assessment process. Students who fail to submit their work by the deadline specified will automatically receive a 10% penalty. Assignments handed in more than 24 hours late will receive a further 10% penalty. Each subsequent 24 hours will result in a further 10% penalty.
- In cases where a student misses an assessment on account of a medical reason or with prior permission; in line with University regulations an incomplete grade for the specific assessment will be awarded and an alternative assessment or extension can be arranged.

Student Complaints Policy

Students at The Hashemite University have the right to pursue complaints related to faculty, staff, and other students. The nature of the complaints may be either academic or non-academic. For more information about the policy and processes related to this policy, you may refer to the students' handbook.

COURSE ASSESSMENT

Course Calendar and Assessment

Students will be graded through the following means of assessment and their final grade will be calculated from the forms of assessment as listed below with their grade weighting taken into account. The criteria for grading are listed at the end of the syllabus

Assessment	Grade Weighting	Deadline Assessment
Midterm Exam	30%	12/5/2022/13.00- 14:00
Activities Include a) power point presentation b) Study Group Discussions		
Power point presentation	20%	29/3- 26/5/2022/13.00- 14:00
Study-Group Assessment	10%	29/3- 26/5/2022/13.00- 14:00

	Student	Presentation No.	Date	Time*	Total Mark
1.	Tasneem	9	29/3/2022	13:00-13:18	
2.	Alreem	10	29/3/2022	13:20-13:38	
3.	Nesreen	11	29/3/2022	13:40-13:58	
4.	Malak	5	7/4/2022	Ramadan time*	
5.	Науа	6	14/4/2022	Ramadan time*	

6.	Ameeneh	8	21/4/2022	Ramadan time*	
7.	Abdelrahman	7	21/4/2022	Ramadan time*	
8.	Ibrahim	2	28/4/2022	Ramadan time*	
9.	Hedaya	3	28/4/2022	Ramadan time*	
10.	Fares	13	19/5/2022	Ramadan time*	
11.	Nour	14	19/5/2022	Ramadan time*	
12.	Shefa	4	26/5/2022	Ramadan time*	
13.	Tamara	1	26/5/2022	Ramadan time*	
14.	Wejdan	12	26/5/2022	Ramadan time*	

*Order of time of presentation will be same as first three presenter-times but due to Ramadan timing

Description of Exams

Test questions will predominately come from material presented in the lectures. Semester exams will be conducted during the regularly scheduled lecture period. Exam will consist of a combination of multiple choice, short answer, match, true and false and/or descriptive questions. **Homework:** Will be given for each chapter, while the chapter in progress you are supposed to work on them continuously and submit in next lecture when I finish the chapter.

You are also expected to work on in-chapter examples, self-tests and representative number of end of chapter problems. The answers of self-tests and end of chapter exercises are given at the end of the book.

Quizzes: Unannounced quizzes will be given during or/and at the end of each chapter based upon the previous lectures. It will enforce that you come prepared to the class.

No make-up exams, homework or quizzes will be given. Only documented absences will be considered as per HU guidelines.

Grades are not negotiable and are awarded according to the following criteria*:

Letter Grade	Description	Grade Points
A+	Excellent	4.00
А		3.75
A-		3.50
B+	Very Good	3.25
В		3.00

В-		2.75
C+	Good	2.50
С		2.25
C-		2.00
D+	Pass	1.75
D	Pass	1.50
F	Fail	0.00
I	Incomplete	-

WEEKLY LECTURE SCHEDULE AND CONTENT DISTRIBUTION

Note: For SSP 471 sections with 2 lecture periods per week (S/T, M/W or T/R), one lecture period covers 1.5 lecture hours (80 minutes).

Topics	No. of	Contact
	Weeks	Hours*
Crystal Structure	2	6
Reciprocal Lattice	3	9
Crystal Binding	3	9
Crystal Vibrations	3	9
Thermal Properties	2	6
Free Electron Fermi Gas	1	3
Energy Bands	1	3
Total	15	45

*Contact Hours include lectures, quizzes, student's activities and exams.

ASSESSMENT RUBRICS

Classroom Participation: Assessment Criteria

Classroom Participation: Oral Presentation										
Element		Excellent Satisfactory		Needs Improvement			P o i n t s			
	8	7	6	5	4	3	:	2 1	0	
Organization	 There of info Title s are info 	is a logical s ormation. lide and clos cluded appro	sequence sing slide opriately.	 Ther sequ Title are in 	e is some log ence of infor slide and clo ncluded.	ical mation. sing slides	 The log in Tire sli 	nere is little or n gical sequence of formation. tle slide and/ or ides are not inc	of closing luded.	
Slide Design (text, colors, background, illustrations, size, titles, subtitles) and creativity in using Demos	 Preser and at Used at 	ntation is att ppealing to v demos are e	tractive viewers. xcellent	 Prese appe Usec 	entation is so aling to view demos are g	omewhat ers. good	 Lif be pr to No de 	ttle to no attem een made to ma resentation app o viewers. o substantive us emos	pt has ike ealing se of	
Content and quality of references	 Preser compl Inform appro 	ntation cove letely and in nation is clea priate, and a	ers topic depth. ar, accurate.	 Prese esser Som some incor 	entation inclu ntial informatio e informatio ewhat confus rect, or flaw	udes some tion. n is ing, ed.	 Pr lit in In in 	resentation inclu tle essential formation. formation is con accurate, or flav	udes nfusing, wed.	
	Outsta used	anding Refei	rences are	> Good	l References	are used	> Re er	eferences are no ncouraging and	ot useful	
Language	 Spellir and pu accura Fluent 	ng, grammar unctuation a ate t and effectiv	r, usage, are ve	Ther spell and/	e are minor p ing, grammaı or punctuatio	problems in r, usage, on.	 Thergr pr Le ef 	nere are persiste rrors in spelling, rammar, usage, unctuation. ess or not fluent	ent and/or and	
Delivery	 Ideas with e voice delive There contact There other comm 	were comm enthusiasm, projection a ry. was sufficie ct with audie were suffici non-verbal nunication sk	unicated proper nd clear ent eye ence. ent use of kills.	 Ther commonstraints Ther commonstraints Insufactor Insufactor Delivactor appr 	e was some on nunicating ic projection, l aration, incom or insufficien act. ficient use of nunication sl ery pace is so opriate.	difficulty leas due to lack of mplete work, it eye f non-verbal kills. omewhat	 Th di id pr pr ey No cc 	here was great fficulty commun eas due to poor rojection, lack or reparation, inco ork, and/or little ye contact. o use of non ver ommunication si	nicating r voice f mplete e or no rbal kills.	

	Appropriate delivery pace		Inappropriate delivery	
	was used.		pace was used.	
Interaction	Answers to questions are	Most answers to questions are	Answers to questions are	
with	coherent and complete.	coherent and complete.	neither coherent nor	
Audience			complete.	
(Answering	Answers demonstrate	Answers somehow		
questions)	confidence and extensive	demonstrate confidence and	Is tentative or unclear in	
	knowledge.	extensive knowledge.	responses.	
	Total Score (Y x 5/16) =			