Form: Course Syllabus		
	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	
	Deans Council Approval Decision Number	2/3/24/2023
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	Number of Pages	06

1.	**Course Title**	Solid State Physics
2.	**Course Number**	0352771
3.	**Credit Hours (Theory, Practical)**	3
	Contact Hours (Theory, Practical)	3
4.	**Prerequisites/ Corequisites**	
5.	**Program Title**	Physics
6.	**Program Code**	2
7.	**School/ Center**	Science
8.	**Department**	Physics
9.	**Course Level**	Graduate
10.	**Year of Study and Semester (s)**	Second semester, 2023-2024
11.	**Other Department(s) Involved in Teaching the Course**	None
12.	**Main Learning Language**	English
13.	**Learning Types**	X Face to face learning ☐Blended ☐Fully online
14.	**Online Platforms(s)**	☐Moodle ☐Microsoft Teams
15.	**Issuing Date**	
16.	**Revision Date**	9/06/2024

17. Course Coordinator:

Name: Riad Shaltaf Contact hours:

Office number: Phone number: 22023

Email:

18. Other Instructors:

Name:
Office number:
Phone number:
Email:
Contact hours:
Name:
Office number:
Phone number:
Email:
Contact hours:

19. Course Description:

As stated in the approved study plan.

20. Program Intended Learning Outcomes: (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

SO1: to be able to identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline.

SO2: to be able to formulate or design a scientific system, process, procedure or program to contribute achieving scientific desired needs.

SO3: to be able to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions.

SO4: to be able to communicate his/her scientific contributions effectively with a range of audiences.

SO5: to be able to recognize and demonstrate social, ethical and professional responsibilities and the impact of technical and/or scientific solutions in global economic, environmental, and societal contexts.

SO6: to be able to function effectively independently and on teams for establishing goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

21. Course Intended Learning Outcomes: (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. Understand the fundamental of Drude model, and its success and failure, use it to describe the electronic properties metals including heat capacity, Hall effect, AC and DC conductivity and heat conductivity
2. Understand the fundamentals of Somerfield model, and explain how it better explains the electronic heat capacity and thermal Seebek ratio
3. Understand the fundamentals of atomic arrangements, Bravais lattice and crystal structures
4. Understand the fundamentals of reciprocal lattice First Brillouin zone, Lattice planes and Miller indices
5. Understand Bragg's law of X-ray diffraction, Von Laue formulation, Ewald construction and how it can be sued to identify crystal structure with practical exercises.
6. Develop knowledge of Bloch's theorem of electrons in a periodic potential, Born-von Karman boundary conditions, Fermi surface, Brillion zones and density of states
7. Develop understanding of behavior of Electrons in a week periodic potential and how it effects energy levels near Bragg plane and the concepts of energy bands and gap
8. Develop problem solving skills through the application of principles learned to analyze and solve material-related issues or scenarios.
9. Develop understanding of Tight binding approximation and its application to Alkali metals (s-tight binding band.

Course ILOs	The learning levels to be achieved					
	Remembering	**Understanding**	**Applying**	**Analysing**	**evaluating**	**Creating**
1	✓	✓		✓		
2	✓	✓		✓		
3		✓	✓	✓	✓	
4		✓	✓	✓	✓	
5	✓	✓		✓		
6		✓	✓	✓	✓	
7		✓	✓	✓	✓	
8	✓	✓	✓	✓	✓	
9	✓	✓	✓	✓	✓	

٢٢. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Program ILOs / Course ILOs	ILO (1)	ILO (2)	ILO (3)	ILO (4)	ILO (5)
1	✓	✓			
2	✓	✓			
3	✓	✓			
4	✓	✓			
5	✓	✓			
6	✓	✓			
7	✓	✓			
8	✓	✓			
9	✓	✓			

٢٣. Topic Outline and Schedule:

Week	Lecture	Topic	ILO/s Linked to the Topic	Learning Types (Face to Face/ Blended/ Fully	Platform Used	Synchronous / Asynchronous	Evaluation Methods	Learning Resources
1	1.1	Basic assumptions of Drude's model; DC conductivity in metals	1	F			Test	Text book and suggested references Classroom lectures
	1.2	Hall effect and magnetoresistance	1	F			Test	Text book and suggested references Classroom lectures
2	2.1	AC conductivity in metals	1	F			Test	Text book and suggested references Classroom lectures
	2.2	Thermal conductivity in metals	1	F			Test	Text book and suggested references Classroom lectures
3	3.1	Sommerfeld model of metals	2	F			Test	Text book and suggested references

								Classroom lectures
	3.2	The Fermi-Dirac (FD) distribution	2	F			Test	Text book and suggested references Classroom lectures
4	4.1	Thermal properties of metals and FD distribution	2	F			Test	Text book and suggested references Classroom lectures
	4.2	Sommerfeld theory of conduction in metals	2	F			Test	Text book and suggested references Classroom lectures
5	5.1	Bravais lattice and primitive vectors	3	F			Test	Text book and suggested references Classroom lectures
	5.2	Primitive cell and Wigner-Seitz cell	3, 8	F			Test	Text book and suggested references Classroom lectures
6	6.1	Cubic system; Crystal structure	3, 8	F			Test	Text book and suggested references Classroom lectures
	6.2	Diamond structure; Zincblende; Sodium chloride structure	3, 8	F			Test	Text book and suggested references Classroom lectures
7	7.1	Close Packing	3	F			Test	Text book and suggested references Classroom lectures
	7.2	Review of crystal structure	3	F			Test	Text book and suggested references Classroom lectures
8	8.1	**1st Exam**						
	8.2	Definition of the reciprocal lattice; First Brillouin zone	4, 8	F			Test	Text book and suggested references Classroom lectures
9	9.1	Lattice planes and Miller indices	4, 8	F			Test	Text book and suggested references Classroom lectures
	9.2	Bragg's law of X-ray diffraction	5, 8	F			Test	Text book and suggested references Classroom lectures
10	10.1	Von Laue formulation; Ewald's construction	5	F			Test	Text book and suggested references Classroom lectures
	10.2	The geometrical structure factor	5	F			Test	Text book and suggested references Classroom lectures
11	11.1	Bloch's theorem of electrons in a periodic potential	6	F			Test	Text book and suggested references Classroom lectures
	11.2	Born-von Karman boundary conditions	6	F			Test	Text book and suggested references Classroom lectures
12	12.1	Remarks about Bloch's theorem; Fermi surface Density of levels, van Hove singularities,	6	F			Test	Text book and suggested references Classroom lectures
	12.2	2nd Exam	6, 8	F			Test	Text book and suggested references Classroom lectures

13	13.1	Electrons in a week periodic potential	7	F			Test	Text book and suggested references Classroom lectures
	13.2	Energy levels near Bragg plane	7	F			Test	Text book and suggested references Classroom lectures
14	14.1	Energy bands and energy gap	7, 8	F			Test	Text book and suggested references Classroom lectures
	14.2	Brillouin zones	7	F			Test	Text book and suggested references Classroom lectures
15	15.1	Tight binding approximation	9	F			Test	Text book and suggested references Classroom lectures
	15.2	*s*-tight binding band	9, 8	F			Test	Text book and suggested references Classroom lectures

٢٤. Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	ILO/s Linked to the Evaluation activity	Period (Week)	Platform
First Exam	30	Drude, Sommerfeld, Crystal structure	1-3,8	8	
Second Exam	30	Reciprocal lattice, X-ray, Bloch	4-6,8	12	
Final Exam	40	All material	1-9		

٢٥. Course Requirements:

(e.g.: students should have a computer, internet connection, webcam, account on a specific software/platform…etc.):

2٦. Course Policies:

A- Attendance policies: B- Absences from exams and submitting assignments on time: C- Health and safety procedures: D- Honesty policy regarding cheating, plagiarism, misbehavior: E- Grading policy: F- Available university services that support achievement in the course:

2٧. References:

A- Required book(s), assigned reading and audio-visuals: Ashcroft and Mermin, Solid State Physics, (Saunders College, Philadelphia, 1976) B- Recommended books, materials, and media: • Charles Kittel; Introduction to Solid State Physics, 8th Ed., (John Wiley & Son Hoboken, NJ, 2005) • J.S. Blakemore, Solid State Physics, 2nd Ed., (Cambridge University Press, Cambridge, 1985)

2٨. Additional information:

Name of the Instructor or the Course Coordinator:	Signature:	Date:
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Name of the Head of Quality Assurance Committee/ Department	Signature:	Date:
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Name of the Head of Department	Signature:	Date:

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Name of the Head of Quality Assurance Committee/ School or Center	Signature:	Date:
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Name of the Dean or the Director	Signature:	Date:
…….	……...……	……..……