



Ministry of Higher Education and Scientific Research

Republic of Iraq

University: University Of Basrah

College: Science

Department : Physics



Year : 2022-2023

Semester :

SYLLABUS: < Solid State Physics Course >

INSTRUCTOR:	Phone: 07718686096
Hours: 3	Office: College of Science/Department of Physics
Home Page: https://faculty.uobasrah.edu.iq/faculty/2248	Email: m.a.mahdi@uobasrah.edu.iq

COURSE OVERVIEW

The course aims to introduce the student to Solid State Physics

GOALS AND OBJECTIVES

- The study of advanced solid-state physics, which includes the physical properties of solid matter (metals, semiconductors, insulators), discusses the model of free electrons and electric current when applying an external field to the participation of electrons in calculating specific heat.
- It is also the introduction to important concepts of the Fermi surface level, which will be used to revise the method for describing and treating electrical and thermal conductivity in metals.
- It also explains the traditional model of the gas of free electrons (the classical theory), the quantum theory of free electrons, the physical state of the electron gas, and the effect of the magnetic field on the movement of free electrons.

TEXTBOOK AND READINGS

- Solid state physics authorship by Dr. Sobhi Saeed Al-Rawi
- Introduction to solid state physics authorship by Charles Kittel

COURSE ASSESSMENTS

The course grade (100 points) will be based on the following elements:

	Points
Exams	Final Exam (60), Monthly Exams (40)
Reading Checks	1

Participation	1	
Attendance	1	
Assignments	10	

COURSE DESCRIPTION AND ASSIGNMENT SCHEDULE

This **NO.** -credit hour course is 15 weeks long. You should invest **NO.** hours every week in this course.

WK	DATE	TOPIC	READING	ASSIGNMENT
1	First week	Chapter One:	Free Electrons in Metals Introduction, Drude Model, Electrical Conductivity of DC in Metals, Specific Resistivity of Metals, Thermal Electronic Conductivity of Metals.	
2	Second week	Chapter Two:	The Quantum Theory of Free Electrons Introduction, classical model of free electron gas, quantum theory of free electrons, Fermi surface, Fermi energy calculation for metal, state density of electron phase, electronic specific heat of metals, effect of Fermi surface on electrical conductivity, thermal conductivity in metals, motion of electron in magnetic field, Hall effect.	
3	Third week	Chapter 3	The bands theory in solids Introduction, origin of bands in solids, periodic potential, Bloch function, one-dimensional lattice crystal, density of electronic state, actual mass, concept of positive holes, Fermi surface study, surface anomaly, orbital frequency (sictron), acoustic magnetic phenomenon, Phenomenon De Hass-Van Alfen.	
4	Fourth week	Exam	Assignment 1	
5	Fifth week	Discussion Three chapters	Solve the problems of chapter one, two and three	
6	Sixth week	Exam	Assignment 2	
7	Seventh week		1 st semester exam	
8	Eighth week	Chapter Four	Electrical and Optical Properties of Solids AC electrical conductivity and optical properties,	
9	Ninth week	Chapter Four	low frequency region ($\omega\tau \ll 1$), high frequency region ($\omega\tau \gg 1$), thermal ion emission.	
10	Tenth week	Exam	Assignment 2	
11	Eleventh week	Discussion	solving chapter 4 problems	
12	Twelfth week	Chapter Five:	Crystal Defects Introduction, Point Defects, Point Defects in Ion Crystals, Schottky Spaces, Frenkel Spaces, Other Types of Point Defects, Line Defects, Edge Dislocations, Permian Dislocations, Berker Circle Vector and Circle, Plane Defects, Defects Due to Packing Faults (stacking), Free Surfaces , grain limits, phase	

			limits, stacking defects (packing), finding the concentration and activation energy for vacuum formation, finding the vacuum forming energy experimentally.	
13	Thirteenth week	Exam	Assignment 2	
14	Fourteenth week	Discussion	Fourth and Fifth chapters Exam	
15	Fifteenth week		Review and solve the problems about the fifth chapter	

Is it possible to develop the curriculum <within the teaching authority 20%> to include vocabulary that serves sustainability	
1- Yes, it is possible (point an appropriate aspect)	<p>1- Fighting poverty 2- No hunger 3- Developing life-long learning and education 4- Green chemistry 5- Sustainable development 6- Water purification 7- Water recycling for agriculture 8- Creativity and production -9- Sustainable energy (wind Sun and organic energy) -10- Environmental development- 11- pollution measurement -12- child care program-13- public health development program-14- measuring the efficiency of health institutions-15- gender equality-16- non-extremism- 17- drug efficiency 18- Food efficiency for infants, children, adults and the elderly -19- Efficiency of the overall environment -20- Waste recycling-21- Heavy water disposal mechanisms-22- Literacy program- 23- Mechanisms for preserving biodiversity-24- Mechanisms for spreading peace and justice in society- 25- Developing life in the seas and oceans-26- Studying the level of university education and the mechanisms for its development-27- Mechanisms for developing the local industry in Iraq-28- Mechanisms for developing infrastructure in Iraq-29-Reducing racial discrimination in all its forms-30-The basics of sustainable cities- 31- Mechanisms to reduce consumption and increase production- 32- Mechanisms to provide job opportunities for all-33- Study aspects of developing green areas-34- Study climatic phenomena in the country-35- Mechanisms for obtaining good health and well-being.</p>
2- Suggest aspect that serves sustainability	