



**Department of ...Physics.....**

**College of .....Education.....**

**University of .....Salahaddin.....**

**Subject .....Solid State Physics**

**Course Book – *For Fourth Years Students***

**Lecturer's name -Asst.Prof.Dr.saeed O. Ibrahim**

**Academic Year: 2022/2023**

# Course Book

1. Course name	Solid State Physics	
2. Lecturer in charge	Asst.Prof.Dr. Saeed O. Ibrahim	
3. Department/ College	Physics Dept./ College of Education	
4. Contact	e-mail: Saeed.Ibrahin@su.edu.krd Mobil No. +9647504671843	
5. Time (in hours) per week	Theory: 3 Hours Practical: 0	
6. Office hours	2 Hours/Week	
7. Course code		
8. Teacher's academic profile	<p>1-B. Sc. – Complete B.Sc.Physics, Department of Physics, College of Science, University of Sulaimanyah, Iraq, 26/6/1977.</p> <p>2- Master – Complete M.Sc. In Nuclear Physics, Department of Physics, College of Science, Sulaimanyah University, Iraq 1980.</p> <p>3- PhD - PhD Awarded Ph.D. In Theoretical physics, Univ. of Al-Mustansiryia, Iraq 18/10/2000.</p>	<p>My research area is in Theoretical Physics, Specially in High Temperature Superconducting Materials and recently in Nanomaterials</p>
9. Keywords	Solid State Physics, Crystallography, Crystal Structures, Braggs Diffraction	
10. Course overview:	<p>- The course gives an <b>introduction</b> to solid state physics, and will enable the student to employ classical and quantum mechanical theories needed to</p>	

understand the physical properties of solids. Emphasis is put on building models able to explain several different phenomena in the solid state.

- The Principle objectives for this course are for you to learn the fundamental concepts, and theories of **Solid State Physics** and to develop the ability to solve problems. Compared with your previous physics course, you may find that concepts have a greater emphasis.

Here. Lectures are structured to help you understand the conceptual

Basis of **Solid State Physics** and examples are designed to re-enforce

- Principles of Solid State Physics presents a unified treatment of the basic models used to describe the solid state phenomena.

-A goal of Solid State Physics is to try to **understand how the macroscopic properties of solids result from their microscopic, atomic scale properties.**

So, Solid State Physics forms the theoretical basis of Materials Science. ...

"Solid State Physics" is a very large, very broad physics sub-field!

Solid-state physics is the study of rigid matter, or solids, through methods such as quantum mechanics, crystallography, electromagnetism, and metallurgy.

This should not be less than 200 words

**11. Course objective:**

\_\_\_The course **gives an introduction to solid state physics**, and will enable the student to employ classical and quantum mechanical theories needed to understand the physical properties of solids. ... The course gives an introduction to the physics of the solid state.

**12. Student's obligation**

Event beyond your control may cause you to miss a class, homework due to date, or an exam. Examples of such events include a documented illness and a family crisis. In such case, its best to inform the **Heat of Dept.** will then inform all your instructors that you face a situation that requires you to miss class, and you are granted an excused absence. Its then your responsibility to contact each of your instructors after you recover from your illness or return

to campus. In the event of a missed exam. Due to an excused absence, you are required to take a make-up exam. If a homework due date is missed as a result of an excused absence, the due date will be extended.

### 13. Forms of teaching

The course gives an introduction to **Solid State Physics**, and will enable the student to employ classical and quantum mechanical theories needed to understand the physical properties of solids. Emphasis is put on building models able to explain several different phenomena in the solid state.

The course conveys an understanding of how **solid state physics** has contributed to the existence of a number of important technological developments. In order for the students to understand the content of the interview.

The presentation must be presented using different means such as the use of PowerPoint, blackboard and other means of illustration developments of importance in our lives now and in the future.

### 14. Assessment scheme

Your grade for the course will be based on your performance on graded **homework, surprise quiz**, and on the **midterm** and **final** examination.

The weight attributed to each of the course has the following;

<b>Graded homework</b>	<b>5%</b>
<b>Quiz</b>	<b>5%</b>
<b>Midterm Examination</b>	<b>30%</b>
<b>Final Examination</b>	<b>60%</b>

### 15. Student learning outcome:

The Principle objectives for this course are for you to learn the fundamental concepts, and theories of **Solid State Physics** and to develop the

ability to solve problems. Compared with your previous physics course, you may find that concepts have a greater emphasis

Here. Lectures are structured to help you understand the conceptual Basis of **Solid State Physics** and examples are designed to re-enforce those concepts.

**16. Course Reading List and References:**

- 1- Introduction to Solid State Physics, By C. Kittel (sixth Edition)
- 2- Solid State Physics, By Blackmore
- 3- Elementary Solid State Physics, By M. Ali Omer

**17. The Topics:**

**Lecturer's name**

**Lecture One:**

**Introduction:**

Solids  
 Amorphous and Crystalline Materials  
 Crystal Structure  
 Periodic Array of Atoms  
 Lattice Translation Vectors  
 Basis and the Crystal Structure  
 The Crystal Lattice  
 Fundamental Types of Lattice  
 Two-Dimensional Lattice Types  
 Three- Dimensional Lattice Types  
 Lattice with a Basis  
 Unit cells  
 Primitive and Non-Primitive Unit Cells  
 Symmetry and Symmetry Elements  
 Crystal Plane and Miller Indices

Lecturer's name  
**Solid State Physics**  
 (3 hrs)/ week

ex: 23/8/2022

**Lecture Two:**

**Wave Diffraction And The Reciprocal Lattice**

Reciprocal Lattice  
 Brillouin Zones  
 Diffraction Of X-Rays by Crystals  
 Single crystal and Powder Method  
 Braggs Law  
 Reciprocal Lattice vectors  
 Diffraction Conditions, Laue Condition, Ewald Construction  
 Atomic and Geometrical Factor

<p>Simple Numerical Problem on SC, BCC, FCC.</p> <p><b><u>Lecture Three:</u></b>  <b>Elementary Lattice Dynamics:</b>                  Lattice Vibration and Phonons                  Linear Monatomic and Diatomic Chains                  Acoustical and Optical Phonons                  Qualitative Description of the Phonon Spectrum in Solids                  Group Velocity                  Long wave length Limit                  Quantization of Elastic Waves                  Phonon Momentum                  Inelastic Scattering by Phonon</p> <p><b><u>Lecture Four:</u></b></p>	
<p><b>18. Practical Topics (If there is any)</b></p>	
<p><b>No Practices Topics</b></p>	
<p><b>19. Examinations:</b></p> <p><b>1. <i>Compositional:</i></b> In this type of exam the questions usually starts with Explain how, What are the reasons for...?, Why...?, How....?                  With their typical answers                  Examples should be provided</p> <p><b>2. <i>True or false type of exams:</i></b></p> <p>In this type of exam a short sentence about a specific subject will be provided, and then students will comment on the trueness or falseness of this particular sentence. Examples should be provided</p> <p><b>3. <i>Multiple choices:</i></b></p> <p>In this type of exam there will be a number of phrases next or below a statement, students will match the correct phrase. Examples should be provided.</p>	
<p><b>20. Extra notes:</b></p> <p>There are some notes that must be given to students and alert them to follow daily lessons and the use of scientific references in addition to interest in daily duties</p>	

**21. Peer review**

**Asst. Prof. Dr. Saeed Omer Ibrahim**  
**The Lecturer**