Course Specification
(Bachelor)

Course Title:	Physics of Semiconductors
Course Code:	2034222-3
Program:	BSc. of Physics
Department:	Physics
College:	College of Science
Institution:	Science
Version:	2023
Last Revision Date:	

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: 8th Level / 4th Year)					
4. Course general Description:					
Introduction to semiconductor materials, Elemental and compound semiconductors, Intrinsic and extrinsic semiconductors, electronic properties of semiconductors, Carrier transport phenomena, Optical processes in semiconductors, Theory of p-n junctions, Ideal current-voltage characteristics, Metal-Semiconductor contact, Schottky barriers and Ohmic contacts, Semiconductor heterojunctions.					
5. Pre-requirements for this course (if any):					
Non					
6. Co-requisites for this course (if any):					
Non					
7. Course Main Objective(s):					
Review the basic concepts of semiconductors. Learn the properties of semiconductors. Derive the basic equations of carrier concentrations and currents. Learn the basic concepts of semiconductor devices. Obtain the knowledge of new trends in semiconductor materials.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3	100%
2	E-learning		
3	Hybrid		

No	Mode of Instruction	Contact Hours	Percentage
	• Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Recognize the basic concepts of semiconductors.	K1	Lectures	Recognize the basic concepts of semiconductors.
1.2	Outline the methods of solid-state physics to study the semiconductor phenomena and their applications.	K3	Lectures Discussions	-Assignments -Written exams
2.0	**Skills**			
2.1	Explain the daily life applications of the studied topics.	S1	Lectures Discussions	-Assignments -Written exams
2.2	Develop skill versatility in solving problems related to semiconductor physics.	S2	Problem solving	-Assignments -Written exams
3.0	**Values, autonomy, and responsibility**			
3.1	Show responsibility for working independently and for continuous	V1	Class participation and Essays	-Essays and activities evaluation

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	improvement of personal capacities.			

C. Course Content

No	List of Topics	Contact Hours
1.	Unit 1: Characteristics of semiconductor materials. Crystal structures of semiconductors	8
2.	Unit 2: Theory of bands and semiconductors. Energy gap in semiconductors. Measurement of energy gap.	8
3.	Unit 3: Dynamics of electrons in semiconductor conduction band. Holes and hole properties. Density of carriers in semiconductors. Fermi level in semiconductors, Optical processes in semiconductors	9
4.	Unit 4: Effects of dopants in semiconductors. p- and n-types of doping, Charge balance and movement. Ionization of donors and acceptors.	8
5.	Unit 5: Theory of p-n junctions, Ideal current-voltage characteristics, Metal-Semiconductor contact, Schottky barriers and Ohmic contacts, Semiconductor heterojunctions	8
6.	Revision	4
	Total	45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Activities	continuous	10%
2.	Midterm exam	6th	30%
3.	Short exam	9th	10%
4.	Final exam	12th	50%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	•S. M., SZE, Semiconductor Devices: Physics and Technology, AT& T Bell Laboratories, Murray Hill, New Jersey, John Wiley & Sons, 1985.

	•R. A. Smith, Semiconductors, 2nd edition, Cambridge University Press, 1986.
Supportive References	•S. M., SZE, Semiconductor Devices: Physics and Technology, AT& T Bell Laboratories, Murray Hill, New Jersey, John Wiley & Sons, 1985. •R. A. Smith, Semiconductors, 2nd edition, Cambridge University Press, 1986.
Electronic Materials	http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html https://en.wikipedia.org/wiki/Main_Page
Other Learning Materials	•Neaman D. A., Semiconductor Physics & Devices – Basic Principles, 4th edition, McGraw Hill edition, 2011. •M. S. Tyagi, Introduction to Semiconductor Materials and Devices, John Wiley& Sons, 2008. •Pallab Bhattacharya, semiconductor optoelectronic devices, Pearson Education, Second edition (2017).

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom
Technology equipment (projector, smart board, software)	Data show Laptop Smart board
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of Students' assessment	Pear reviewer Program coordinator. Departmental council Faculty council	Indirect
Quality of learning resources	Program coordinator. Relevant committee	Direct
The extent to which CLOs have been achieved	Students Instructor Faculty	Indirect
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	PHYSICS DEPARTMENT COUNCIL
REFERENCE NO.	NO. 4-45
DATE	27/09/2023 (12/03/1445)

قسم الفيزياء
Physics Department
TU
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