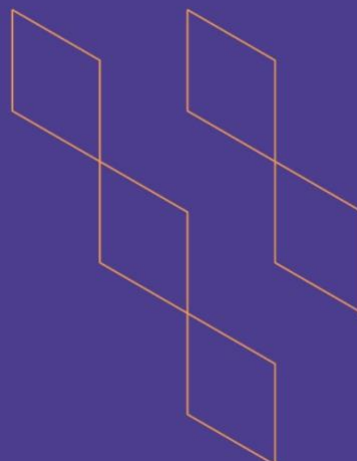




T-104
2022

Course Specification



Course Title:	Semiconductor Physics
Course Code:	Phys423
Program:	B.Sc. in Physics
Department:	Department of Physics and astronomy
College:	College of Science
Institution:	King Saud University
Version:	2.0.0
Last Revision Date:	Sep 2023



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A. General information about the course:

Course Identification	
1. Credit hours:	2(2+0+0)
2. Course type	
a.	University ☐ College ☐ Department ☒ Track ☐ Others ☐
b.	Required ☐ Elective ☒
3. Level/year at which this course is offered: 8 th	
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): PHYS 371	
6. Co- requirements for this course (if any):	
7. Course Main Objective(s) 1. The student should get acquainted with the carrier concepts and conduction in semiconductor junctions and device physics. 2. The student should understand the methods of solid state physics to solve the semiconductor phenomena and their applications.	

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	30	100%
2.	E-learning	0	0
3.	Hybrid • Traditional classroom • E-learning	0	0
4.	Distance learning	0	0

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	0
5.	Others (specify)	0
	Total	30



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	get acquainted with the carrier concepts and conduction in semiconductor junctions concepts and conduction in semiconductor junctions	K1	- Lectures - video	- Assignment - In class Discussion - Give quizzes, mid-term exam and final exam.
2.0	Skills			
2.1	understand the methods of solid state physics to solve the semiconductor phenomena and their applications.	S1	- Give extensive examples during lecture - Give problem sheets to be discussed during lecture. - assignments.	- Hold Class discussion, - Give quizzes, mid-term exam and final exam.
3.0	Values, autonomy, and responsibility			
3.1	Work in a team and acknowledge others' work.	V1	Assignment	Hold Class discussion,

C. Course Content

No	List of Topics	Contact Hours
1.	Characteristics of semiconductor materials. Crystal structures of semiconductors.	4
2.	Theory of bands and semiconductors. Energy gap in semiconductors. Measurement of energy gap.	6
3.	Dynamics of electrons in semiconductors conduction bands. Holes and Properties of holes. Density of carriers in semiconductors. Fermi level in semiconductors, optical processes in semiconductors	8
4.	Effects of dopants in semiconductors. P- and n-types, charges balance and movement. Ionization of donors and acceptors.	4
5.	Theory of p-n junctions, Ideal current-voltage characteristics, Metal- Semiconductor contact, Schottky barriers and Ohmic contacts, Semiconductor heterojunctions.	8
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	First Midterm examination	Approx. 7	15%
2.	Second Midterm examination	Approx. 12	15%
3.	Assignment	Weekly	30%
4.	Final examination	From 16 to 18	40%

*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	Neaman D. A., Semiconductor Physics & Devices – Basic Principles, 4th edition.
Supportive References	S. M., SZE, Semiconductor Devices: Physics and Technology, AT& T Bell Laboratories, Murray Hill, New Jersey, John Wiley & Sons, 1985.. 9 th edition, 2016. Prentice Hall.



	Introduction to Semiconductor Materials and Devices, M. S. Tyagi, John Wiley & Sons 2008 Semiconductor optoelectronic devices, 2nd edition, Pallab Bhattacharya, 2017.
Electronic Materials	None
Other Learning Materials	Internet sites relevant to the course

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	A classroom which accommodates 25 students.
Technology equipment (projector, smart board, software)	Whiteboard and Smart board
Other equipment (depending on the nature of the specialty)	Not applicable

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students \ Peer Reviewer	Indirect \ direct
Effectiveness of students assessment	Students- Faculty	Direct
Quality of learning resources	Students	Indirect
The extent to which CLOs have been achieved	Faculty	Indirect
Other	None	None

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

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	Physics Department's council
REFERENCE NO.	8 th (1 st term/1445)
DATE	06/06/1445

