هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	Optical Properties of Semiconductors
Course Code:	2034218-3
Program:	Bachelor in Physics
Department:	Physics Department
College:	College of Science
Institution:	College of Science
Version:	1
Last Revision Date:	2020

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:					
The course introduces the basic optical properties of semiconductor materials. Therefore, it presents first the basic concepts of semiconductor materials before detailing the optical properties of such semiconductors, including the optical constants n (refractive index) and k (extinction coefficient) of thin semiconductor films, the absorption coefficient α and the energy gap Eg of thin semiconductor films via appropriate equations.					
5. Pre-requirements for this course (if any):					
None					
6. Co-requisites for this course (if any):					
None					
7. Course Main Objective(s):					
Extend the basic semiconductor-related knowledge in the required program courses (electronics and solid state 2) to cover in detail the semiconductor physics and the associated optical properties.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45 (3h per week)	100%
2	E-learning		
3	Hybrid • 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	State the basic concepts of semiconductor films and their optical properties.	K3	Lecture	Written exam and Homework reports
1.2	Recognize the basic theory of the absorption and luminescence phenomena in semiconductors.	K3	Lecture Group discussion	Written exam
2.0	**Skills**			
2.1	Explain physical phenomena and concepts relevant to the course and their applications.	S3	Lectures	Written exam and Homework reports
2.2	Develop physics problems solving skills related to optical phenomena in semiconductor thin films.	S2	Lecture Group discussion	Homework
3.0	**Values, autonomy, and responsibility**			
3.1	Show responsibility in working independently with continuous improvement of personal capacities.	V1	Group discussion	Essays
3.2	Communicate, verbally, graphically and in report form, physics concepts related to optical properties of semiconductors.		Groups discussion	Homework Essays

C. Course Content

No	List of Topics	Contact Hours
1.	Semiconductors.	3
2.	light as electromagnetic waves.	3
3.	The semiconductor absorption theory.	
4.	Techniques of measurement of optical properties of semiconductor thin films.	3
5.	Mid-term exam 1	3
6.	The relation between optical constant (n, k) and electrical properties	3
7.	Determination of (n, k) from spectrophotometric measurements (R, T) for semiconductor thin films.	3
8.	Determination of α for thin films using simple equations.	3
9.	Determination of the energy gap Eg of thin films using simple equations.	3
10.	The dispersion curve of (α).Example s :	3
11.	Revision and mid-term exam 2	3
12.	Type of transition and optical energy gap (direct allowed and forbidden transitions, indirect allowed and forbidden transitions).	6
13.	Determination of the dielectric constant at high frequency.	3
14.	Final revision	3
	Total	45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Activities	continuous	20%
2.	Midterm exam	8th	15%
3.	Periodical exam	12th	15%
4.	Final exam	16th	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	Optical Properties of Semiconductors Editors: Basov, N. G. (Ed.)
Supportive References	Fundamentals of Semiconductors Physics and Materials Properties Authors: YU, Peter, Cardona, Manuel
Electronic Materials	https://www.amazon.com/Optical-Properties-Semiconductors-Handbook-Vol/dp/0444891013

Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
Facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classroom
Technology equipment (projector, smart board, software)	Data show
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect
Effectiveness of Students assessment	Instructor Program coordinator Departmental council	Indirect
Quality of learning resources	Students Faculty	Indirect
The extent to which CLOs have been achieved	Program leaders Faculty	Direct
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
جامعة الطائف
TAIF UNIVERSITY