هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**Optical properties of semiconductors**
Course Code:	**2034218-3**
Program:	**Bachelor in Physics**
Department:	**Physics Department**
College:	**College of Science**
Institution:	**Taif University**

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A. Course Identification

1. Credit hours: 3
2. Course type **a.** University ☐ College ☑ Department ☐ Others ☐ **b.** Required ☐ Elective ☑
3. Level/year at which this course is offered: 12th level / 4th year
4. Pre-requisites for this course (if any)**:** None
5. Co-requisites for this course (if any)**:** None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	4	100%
2	**Blended**	0	0%
3	**E-learning**	0	0%
4	**Distance learning**	0	0%
5	**Other**	0	0%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	40

B. Course Objectives and Learning Outcomes

1. Course 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 E_g of thin semiconductor films via appropriate equations.

2. Course Main Objective

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.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	State the basic concepts of semiconductor films and their optical properties.	K3
1.2	Recognize the basic theory of the absorption and luminescence phenomena in semiconductors.	K3
2	**Skills :**	
2.1	Explain physical phenomena and concepts relevant to the course and their applications.	S3
2.2	Develop physics problems solving skills related to optical phenomena in semiconductor thin films.	S2
3	**Values:**	
3.1	Show responsibility in working independently with continuous improvement of personal capacities.	V1
3.2	Communicate, verbally, graphically and in report form, physics concepts related to optical properties of semiconductors.	

C. Course Content

No	List of Topics	Contact Hours
1	Brief review of semiconductor	3
2	Light as electromagnetic waves.	2
3	The semiconductor absorption theory.	4
4	Techniques of measurement of optical properties of semiconductor thin films.	4
5	Mid-term exam 1	2
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.	4
8	Determination of α for thin films using simple equations.	3
9	Determination of the energy gap E_g of thin films using simple equations.	3
10	The dispersion curve of (α). Examples	3
11	Revision and mid-term exam 2	2
12	Type of transition and optical energy gap (direct allowed and forbidden transitions, indirect allowed and forbidden transitions).	4
13	Determination of the dielectric constant at high frequency.	3
Total		40

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	State the basic concepts of semiconductor films and their optical properties.	Lecture	Written exam and Homework reports
1.2	Recognize the basic theory of the absorption and luminescence phenomena in semiconductors.	Lecture and Group discussion	Written exam
…			
2.0	**Skills**		
2.1	Explain physical phenomena and concepts relevant to the course and their applications.	Lectures	Written exam and Homework reports
2.2	Develop physics problems solving skills related to optical phenomena in semiconductor thin films.	Lecture and Group discussion	Homework
…			
3.0	**Values**		
3.1	Show responsibility in working independently with continuous improvement of personal capacities.	Group discussion	Essays
3.2	Communicate, verbally, graphically and in report form, physics concepts related to optical properties of semiconductors.	Groups discussion	Homework and essays
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments and Interaction during lectures	continuous	10%
2	Midterm exam	6th	30%
3	Short exam	9th	10%
4	Final exam	12th	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

6 Hours per week during office-hours, in teacher's staffroom or as per the arrangement made by the teacher.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Optical Properties of Semiconductors Editors: **Basov**, N. G. (Ed.)
Essential References Materials	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	NONE

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture room with max 60 seats Labs
Technology Resources (AV, data show, Smart Board, software, etc.)	data show, Smart Board, software
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	NONE

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student Feedback on Effectiveness of Teaching	• Students	Indirect
Evaluation of Teaching	• Instructor • Program coordinator • Departmental council • Faculty council	Indirect
Improvement of Teaching	• Program leaders • Relevant committee	Direct
Quality of learning resources	• Students • Instructor Faculty	Indirect
Extent of achievement of course learning outcomes,	• Program leaders • Instructor	Direct
Course effectiveness and planning for improvement	• Program leaders • Instructor	Indirect

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	October 2, 2022