هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	PHOTONICS
Course Code:	2034223-3
Program:	Bachelor in Physics
Department:	Physics
College:	Science
Institution:	Taif University
Version:	2nd
Last Revision Date:	10/10/2023

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 / 4th Year)					
4. Course general Description:					
This course provides students with a working knowledge of optical physics, including diffraction and physical optics, atomic physics and optical spectroscopy, laser physics and photonics. It also provides a basis for further study in optics and photonics. Content will include: Optical fibers, microstructured optical fibers, fiber Bragg gratings, fiber sensors, optical materials, photonic crystals. Lorentz electron oscillator and dispersion, Fresnel equations and multi-layer dielectric coatings, polarization and birefringence. Fresnel-Kirchhoff integral and diffraction, Fourier optics, Abbe's theory of imaging, image processing. Lasers; Einstein equations, stimulated and spontaneous emission and absorption, optical amplification, resonators and modes, rate equations, pulsed and continuous lasers, mode-locked lasers.					
5. Pre-requirements for this course (if any)**:**					
None					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
This course aims at providing students with the systematic introduction to the concepts of modern photonics (the application and use of light in modern technologies) and subsystems for applications in optical communications, optical sensing and imaging, optical data-storage and computing and solid-state illumination.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	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	Explain the concept of light propagation and guided-wave in different media	K1	Lecture	Written exam and Homework reports
1.2	Recall the properties and applications of photonic devices including lasers, modulators and detectors	K3	Lecture and Group discussion	Written exam
2.0	**Skills**			
2.1	Design an optical system for communications.	S1	Lectures	Written exam and Homework reports
2.2	Combine previously acquired knowledge and skills in	S1	Lecture and Group discussion	Homework reports

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	mathematics, solid state physics, electromagnetism and optics with new theory to analyze and design the practical photonic components and systems			
3.0	**Values, autonomy, and responsibility**			
3.1	Show responsibility for working independently and for continuous improvement of personal capacities.	V1	Group discussion	Project
3.2				

C. Course Content

No	List of Topics	Contact Hours
1.	Nature of light and how it is manipulated	5
2.	Basic Geometrical Optics and Physical Optics	5
3.	Optical Waveguides	3
4.	Fiber Optic Communications	5
5.	Optical Resonators and Optical Amplifiers	3
6.	Photonic Sources: Light Emitting Diode (LED) and Semiconductor Lasers	5
7.	Light Processing Devices	3
8.	Detection of Light Radiation and Optical Receivers	5
9.	Light Modulation Techniques	3
10.	Photonic Devices and Applications	3
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	Throughout Semester	20
2.	1st Periodic Exam	7	15
3.	2nd Periodic Exam	12	15

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
4.	Final Exam	16	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	1- R. Boyd, Nonlinear optics, Handbook of Laser Technology and Applications (Three-Volume Set). Taylor & Francis, 2003. 161-183. 2- Fundamentals of Photonics: spie.org/x17229.xml
Supportive References	1- B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, Second Edition 2007 (Third Printing, January 2009) (Wiley-Interscience). 2- A. Yariv, , and P. Yeh. Photonics: optical electronics in modern communications. Vol. 6. New York: oxford university press, 2007.
Electronic Materials	1- http://www.rp-photonics.com/encyclopedia.html 2- http://ocw.mit.edu/resources/res-6-006-video-demonstrations-in 3- lasers-and-optics-spring-2008/index.htm.
Other Learning Materials	1- MATLAB software. 2- Mathematica software

2. Required Facilities and equipment

Items	Resources
facilities	A classroom with movable tables and chairs conducive to group discussion and teamwork.
Technology equipment	Data show, smart board
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Peer Reviewer	Direct
Student Feedback on Effectiveness of Teaching	Students	Indirect
Evaluation of Teaching	Pear reviewer Program coordinator Departmental council Faculty council	Indirect
Improvement of Teaching	Program coordinator Relevant committee	Direct
Quality of learning resources	Students Instructor Faculty	Indirect
Extent of achievement of course learning outcomes,	Program coordinator Instructor	Direct
Course effectiveness and planning for improvement	Program coordinator Instructor	Indirect

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)

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Physics Department
TU
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TAIF UNIVERSITY