

Faculty of Engineering & Technology

Optical Electronics

Information :

Course Code : ELE 412

Level : Undergraduate

Course Hours : 3.00- Hours

Department : Specialization of Electronics & Communication

Instructor Information :

Title	Name	Office hours
Associate Professor	KAMEL MOHAMED MAHMOUD HASSAN	2
Assistant Lecturer	Mahmoud Ahmed Nasr Kamal Abdo Mostafa	

Area Of Study :

- Understand the principles of operation of photonic components.
- Develop the students' knowledge about optical and photonic components.
- Prepare students to analyze the photonic components.
- Perform the basic calculations of optical sources and optical detectors.
- Train students to perform basic experiments on optical and photonic components.

Course outcomes :

a.Knowledge and Understanding: :

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| 1 - | a1. Review the main concepts of geometrical optics and Quantum theory. |
| 2 - | a2. Recognize the theory of semiconductor materials and their optical properties. |
| 3 - | a3. Explain the operating principles of LEDs, Lasers, SLDs, and optical detectors. |
| 4 - | a4. Review knowledge and understanding optical and photonic devices. |

b.Intellectual Skills: :

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| 1 - | b1. Analyze the main parameters related optical and photonic components. |
| 2 - | b2. Examine the basic parameters of photonic devices. |
| 3 - | b3. Compare of the different types of the used optical sources and detectors in optical fiber communications. |

c.Professional and Practical Skills: :

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| 1 - | c1. Follow-up safety requirements at work. |
| 2 - | c2. Edit and present a professional technical report. |
| 3 - | c3. Interpret carefully the data sheets of optical and photonic devices. |
| 4 - | c4. Build-up experimental set-up to test the basic parameters of the optical component and photonic devices. |

d.General and Transferable Skills: :

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| 1 - | d1. Demonstrate a self-directed manner. |
| 2 - | d2. Show the ability to work coherently and successfully as a part of a team. |

3 - d3. Manage time and meet deadlines.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Introduction, Photons & Electrons. Maxwell's equations, Wave nature light, Emission of and Absorption processes.	5	3	2
Fundamentals of Optics, Ray optics: reflection, refraction, critical and Brewster angles. Interference of light, Interferometers, Diffraction and Polarization.	10	6	4
Light and matter: Emission, Propagation and Absorption Processes.	10	6	4
Optical Coherence and Correlation: Definition, Measurement of coherence and Practical examples.	5	3	2
Essential Physics of Radiation and Solids: Black body radiation, Classical results and Quantum results. Rate Equations and the Gain mechanism. Laser Structure, Mode locking and Q switching.	10	6	4
Electrons in solids: Laser sources (He=Ne Laser, Argon Laser and ND-YAG Laser), SC sources (LEDs and SLDs)	10	6	4
Optical Modulators: Internal modulation, External modulators: Electro optic, Magneto optic and Acousto-optic modulator.	10	6	4
Photo detectors: photo-emissive, photoconductive and photovoltaic detectors.	5	3	2
Testing of the basic characteristics of optical sources, detectors, and optical components.	5	3	2
Assignments Presentation and discussions.	5	3	2

Teaching And Learning Methodologies :

Interactive Lecture

Discussion

Problem Solving

Experimental Learning

Cooperative Learning

Research

Project

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Final exam	40.00		
o Assignments and Course Project	15.00		
o In Class Quizzes and Homework	10.00		
o Lab test	5.00		
o Mid-Term exams	30.00		

Recommended books :

"Fundamentals of Photonics" Bahaa E. A. Saleh, Malvin Carl Teich.