FUTURE UNIVERSITY IN EGYPT جامعة المستقبل

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 :

Develop the studentsôknowledge about 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.

Description :

Introduction, Photons & Electrons. Maxwell's equations, Wave nature of light, Fundamentals of Optics. Interaction of radiation and atomic systems, particle/wave property, De-Broglie wave length, Uncertainty principle, Optical Coherence and Correlation. Radiation and Solids: Light and matter (light propagation in uniform dielectric medium, Rayleigh scattering, susceptibility, optical dispersion), rate equations and gain medium for two level system. Theory of laser oscillation: Fabry-Perot laser, Three-level System. Four-level System. Optical Sources- Gas Laser, Nd-YAG Laser, Semiconductor sources (LEDs & LDs). Optical Modulators. Photo detectors (PINs & APDs).

Course outcomes :

a.Knowledge and Understanding: :	
1 -	Review the main concepts of geometrical optics and Quantum theory.
2 -	Explain the theory of semiconductor materials and their optical properties.
3 -	Explain the operating principles of LEDs, Lasers, SLDs, and optical detectors.
4 -	Review the fundamentals of optical and photonic devices.
b.Intellectual Skills: :	
1 -	Analyze the main parameters related optical and photonic components.
2 -	Examine the basic parameters of photonic devices.
3 -	Compare of the different types of the used optical sources and detectors in optical fiber communications.
c.Professional and Practical Skills: :	
1 -	Follow-up safety requirements at work.

2 -	Edit a professional technical report.
3 -	Interpret carefully the data sheets of optical and photonic devices.
4 -	Build-up experimental set-up to test the basic parameters of the optical component and photonic devices.
d.General and Transferable Skills: :	
1 -	Demonstrate a self-directed manner.
2 -	Show the ability to work coherently and successfully as a part of a team.
3 -	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.	10	6	4

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
ÅFinal exam	40.00		
Lab test	10.00		

Mid- Exam I	15.00		
Mid- Exam II	15.00		
Participation	10.00		
Quizzes	10.00		

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