MUTAH UNIVERSITY
Faculty of Engineering
Department of Electrical Engineering

Course Syllabus

Course Code	Course Name	Credits	Contact Hours
0401462	Lasers and Opto Electronics	3	3 T

INSTRUCTOR/COORDINATOR	
Name	Dr. Aser M. Matarneh
Email	aser.matarneh@mutah.edu.jo
Office Hours	10:00-11:00 (Sun, Tues, Thur)

TEXTBOOK	
Title	Fiber Optics Communications. *Pearson, 2008, 3rd ed.*
Author/Year/Edition	S. O. Kasap
Other Supplemental Materials	
Title	Optoelectronics and Photonics: Principles and Practices, Prentice Hall.
Author/Year/Edition	Senior, J. M.

SPECIFIC COURSE INFORMATION
A. Brief Description of the Content of the Course (Catalog Description)
The course is to provide both an analytical and a physical understanding of Optoelectronic devices, with particular emphasis on Semiconductor Lasers, Light Meeting Diodes (LED), Photodetectors, Optical Amplifiers, Phototransisitors, and basic introduction to Solar Cells. Their characteristics, principle of operations and some practical applications in different aspects will be discussed.
B. Pre-requisites (P) or Co-requisites (C)
Electronics (2) (0401362)
C. Course Type (Required or Elective)
Elective
SPECIFIC GOALS
A. Course Learning Outcomes (CLOs)

By the end of this course, the student should be able to:
CLO 1. Understand the light conversion and the physics of semiconductor Lasers and LED [1].
CLO 2. Explain the working principle of light sources and optical amplification process [1].
CLO 3. Discuss the photodetection process in optolectronic devices [1].
CLO 4. Present and discuss different scenarios related to the latest topics in Laser Optoelectronics [7].

B. Student Learning Outcomes (SOs) Addressed by the Course

1	2	3	4	5	6	7
✓						✓

BRIEF LIST OF TOPICS TO BE COVERED

List of Topics	No. of Weeks	Contact Hours
Introduction to the lightwave • Light waves in a homogeneous medium • Refractive index, phase velocity, and Group velocity • Energy flow and Irradiance • Snell's law • Polarization of light	2	6
Semiconductors pn junction and light emitting diodes	1	3
• Stimulated emission process • Light Amplification Process • Types of optical sources: LED and Lasers	2	6
Semiconductor Lasers • Laser types • characteristics • Single and multimode lasers • Laser rate equations • Application	3	9
Semiconductor Optical Amplifiers	1	3
Photodetectors: PIN photodetector • Function and layers • Structure • Analysis and applications	1	3
Photodetectors: APD photodetectors • Function and layers • Structure • Analysis and applications	1	3

Phototransistor: • Principle of operation • Structure • Analysis and applications	1	3
Solar Cells • Basics operation • Structure • Comparison with conventional photodetectors	2	6
Total	*14*	*42*

EVALUATION		
Assessment Tool	**Due Date**	**Weight (%)**
Mid Exam	According to the university calendar	30
Course Work (Homeworks, Quizzes, Projects, …etc.)	One week after being assigned	20
Final Exam	According to the university calendar	50

ABET's Students Learning Outcomes (Criterion # 3)		
	Relationship to program outcomes	
ABET 1-7		**Engineering Student Outcomes**
1	√	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2		an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3		an ability to communicate effectively with a range of audiences.
4		an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5		an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6		an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7	√	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.