The University of Jordan
School of Engineering
Electrical Engineering Department
2nd Semester – A.Y. 2020/2021

Course:	**Optical Communications & Laser – 0943524 (3 Cr. – Elective Course)**
Instructor:	Dr. Yazan Albadarneh Office: E306, Telephone: 06/5355000 ext 22857, Email: yalbadarneh@ju.edu.jo Office Hours: Will be posted soon
Course website:	http://elearning.ju.edu.jo/
Catalog description:	Introduction. Step and graded index, multi-and single-mode optical fibers. Attenuation and dispersion. Guided wave propagation. Fields and modes in optical fibers. Principles of laser generation. Semiconductor lasers. Light amplifiers and their applications. Optical modulation techniques: direct modulation, external modulation. Multiplexing methods. Optical detectors and receivers: PIN, and APD. System performance. Optical integrated circuits. Practical considerations in optical systems. Optical communication systems: optical modem, digital optical networks. Introduction to nonlinear optics and soliton systems. Numerical simulation techniques in optical systems.
Prerequisites by course:	**EE** **0953421** Communications (I) (pre-requisite)
Prerequisites by topic:	Students are assumed to have a background in the following topics: • Analog and digital modulation and demodulation. • Basic electromagnetic principles and theories.
Textbook:	**Fiber Optic Communications by Joseph C. Palais, Pearson, 5th edition, 2005.**
References:	1. Optical Fiber Communications: Principles and Practice by John Senior, Pearson, 3rd edition, 2009. 2. Fiber-Optic Communication Systems by Govind P. Agrawal, Wiley, 4th edition, 2011. 3. Fiber-Optic Communications Technology by Djafar K. Mynbaev and Lowell L. Scheiner, Prentice Hall, 1st edition, 2001. 4. Fiber Optic Reference Guide by David Goff, Focal Press, 3rd edition, 2002. 5. Fiber Optic Communications by James N. Downing, Delmar Cengage Learning, 1st edition, 2005. 6. Fiber Optic Communications: Fundamentals and Applications by Shiva Kumar, M. Jamal Deen, Wiley, 1st Edition, 2014.

7. Fibre Optic Communication: Key Devices by Herbert Venghaus and Norbert Grote (Editors), Springer, 2nd edition, 2017.
8. Modeling and Simulating Optical Waveguides: with Solutions in Mathcad and FvWoP by Andrew Motes, AM Photonics, 1st edition, 2014.

Schedule: 16 Weeks, 42 lectures (50 minutes each) plus exams.

Course goals: The overall objective is to introduce the student to optical communication components and systems, especially analysis, design, and applications of optical fibers, lasers, and optical detectors.

Course learning outcomes (CLO) and relation to ABET student outcomes (SO):

Upon successful completion of this course, a student will:	[SO]
1. Understand the fundamentals of optical fibers and their applications as communication channels.	[1]
2. Understand the principle of operation of lasers and optical transmitters.	[1]
3. Understand the principle of operation of optical detectors and optical receivers.	[1]
4. Be familiar with optical communication devices and subsystems.	[1]
5. Be able to use tools available for the design, implementation and characterization of different optical systems.	[1, 2]

Course topics:	Hrs
1. Introduction to optical communication systems. Optical fibers: step index and graded index, multimode and single-mode fibers, attenuation and dispersion.	5
2. Fiber theory: guided wave propagation, fields and modes in optical fibers.	8
3. Lasers: Principles of laser generation. Semiconductor lasers. Light amplifiers and their applications.	8
4. Optical modulation techniques: Direct modulation, external modulation. Multiplexing methods: Wavelength Division Multiplexing (WDM) and Time division Multiplexing (TDM).	3
5. Optical detectors and receivers: PIN and APD. Quantum efficiency and responsively. Capacitance and bandwidth. Receiver circuits. System performance. Optical integrated circuits.	6
6. Practical consideration in optical systems (installation, measurements, characterization).	6
7. Optical communication systems: optical modem, digital optical networks.	3
8. Numerical simulation techniques in optical systems.	3

Ground rules: Attendance is required and highly encouraged. To that end, attendance will be taken every lecture. Eating and drinking are not allowed during class, and cell phones must be set to silent mode. All exams (including the final exam) should be considered cumulative. Exams are closed book. No scratch paper is allowed. You will be held responsible for all reading material assigned, even if it is not explicitly covered in lecture notes.

Assessment & grading policy:

Assignments	0%	Quizzes	0%
First Exam	30%	Projects	0%
Midterm Exam	30%	Lab Reports	0%
Final Exam	40%	Presentation	0%
		Total	**100%**

Last Revised: March 2021