



University of Tehran
School of Electrical and Computer Engineering

Course:	8101722 – Fundamentals of Photonics									
Course type:	EE*						CE*			Credit: 3
	Com	E	P	B	Con	D	SW	HW	IT	
	Required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Elective	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level:	Undergraduate <input type="checkbox"/> Graduate <input checked="" type="checkbox"/>									
Co-requisite(s):	None									
Prerequisite(s):	Theory of Electromagnetics (8101450)									
Prerequisite by topic:	Theory of electromagnetics, fundamentals of quantum physics									
Textbook(s):	[1] B. E. A. Saleh and M. C. Teich, <i>Fundamentals of Photonics</i> . New Jersey: John Wiley, second edition, 2007. [2] K. Iizuka, <i>Elements of Photonics</i> . New York: John Wiley, vol. 1 and 2, 2002.									
Coordinator:	Mahmoud Shahabadi, Professor , School of ECE									
Goals:	The course covers ray optics, electromagnetic optics, and quantum optics and specifies the domain of applicability of each of these theories. The interaction of light and matter will also be studied with the help of both classical and quantum mechanical theories. Students will learn the physics of basic devices such as integrated optical waveguides, couplers, and resonators. Commonly used analytical and numerical techniques for the analysis of such devices will be introduced. In addition, the course will present the physics and applications of photonic crystals. Finally, after an introduction to the quantum theory of light, the course deals with the operation principle of lasers.									
Outcome:	Upon successful completion of the course, students will be able 1. to understand interaction of light and optical materials, 2. to understand optical effects such as birefringence, optical activity, Faraday effect, etc., 3. to analyze and design integrated optical waveguides, 4. to analyze and design optical resonators,									

	<ol style="list-style-type: none"> 5. to acquire basic knowledge on photonic crystals, 6. to understand the mechanism of absorption, spontaneous emission, and stimulated emission in optical materials, 7. to understand the operation principle of lasers. 								
Topics:	<ol style="list-style-type: none"> 1. Introduction 2. Electromagnetic Optics 3. Polarization and Crystal Optics 4. Integrated Optical Waveguides 5. Optical Resonators 6. Photonic Crystals 7. Photon Optics (Quantum Theory of Light) 8. Photon-Atom Interaction 9. Laser Amplifiers and Oscillators 								
Computer usage:	MATLAB								
Assignments:	10 homework assignments								
Projects:	Included in the assignments								
Grading:	<table style="width: 100%; border: none;"> <tr> <td style="width: 80%;">Assignments:</td> <td style="text-align: right;">20 %</td> </tr> <tr> <td>Quiz:</td> <td style="text-align: right;">10 %</td> </tr> <tr> <td>Final exam:</td> <td style="text-align: right;">40 %</td> </tr> <tr> <td>Project:</td> <td style="text-align: right;">30 %</td> </tr> </table>	Assignments:	20 %	Quiz:	10 %	Final exam:	40 %	Project:	30 %
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Further readings:	<p>[1] E. Hecht, <i>Optics</i>. Addison-Wesley, second edition, 1987.</p> <p>[2] A. Yariv and P. Yeh, <i>Photonics</i>. New York: Oxford University Press, 2007.</p> <p>[3] R. Loudon, <i>The Quantum Theory of Light</i>. New York: Oxford University Press, 2000.</p>								
Prepared by:	Mahmoud Shahabadi								
Date:	Oct. 12, 2017								

*EE: Electrical Engineering		CE: Computer Engineering	
Com	Communications	SW	Software
E	Electronics	HW	Hardware
P	Power	IT	Information Technology
B	Bioelectronics		
Con	Control		
D	Digital System		