School of Engineering and Natural Sciences / Electrical and Electronics Engineering (English)

2024 - 2025 Academic Year

FUNDAMENTALS of PHOTONICS and ELECTRO-OPTICS

Syllabus

Course Description						
Name		**Code**	**Semester**	**T+A Hour**	**Credit**	**ECTS**
FUNDAMENTALS of PHOTONICS and ELECTRO-OPTICS		EEE4113194	Fall Semester	3+0	3	6
Prerequisites Courses	FİZİK II					
Recommended Elective Courses						
Language of Instruction	English					
Course Level	First Cycle (Bachelor's Degree)					
Course Type	Elective					
Course Coordinator	Assoc.Prof. Muhammed Fatih TOY					
Name of Lecturer(s)	Assoc.Prof. Muhammed Fatih TOY					
Assistant(s)						
Aim	It is aimed that the students can model and analyze optical systems using the basic optics theories namely ray optics and wave optics. Besides students will be familiar with the subjects of interference, coherence, diffraction, and holography.					
Course Content	This course contains; Nature of Light and Geometrical Optics,Optical Instrumentation,Properties of Laser and Wave Equations,Superposition of Waves,Interference of Light and Optical Interferometry,Coherence,Fiber Optics,Fraunhofer Diffraction and Diffraction Grating,Fresnel Diffraction,Matrix Treatment of Polarization, Production of Polarized Light,Holography,Optical Detectors and Displays,Matrix Methods in Paraxial Optics,Aberration Theory.					

Course Learning Outcomes	**Teaching Methods**	**Assessment Methods**
Design and analyze optical instruments.	12, 9	A, E, F
Explain the working principle of electro optical devices (sources, modulators and detectors).	12, 9	A, E, F
Apply the principles of interference and diffraction to understand coherent optical systems.	12, 9	A, E, F
Build prototypes of optical instruments.	12, 9	A, E, F
Develop interfaces with laser diodes, light emitting diodes, and photodiodes.	12, 9	A, E, F

Teaching Methods	12: Problem Solving Method, 9: Lecture Method
Assessment Methods	A: Traditional Written Exam, E: Homework, F: Project Task

Lecture Schedule

Sequence	**Topics**	**Preliminary Preparation**
1	Nature of Light and Geometrical Optics	Read the lecture notes
2	Optical Instrumentation	Read the lecture notes
3	Properties of Laser and Wave Equations	Read the lecture notes
4	Superposition of Waves	Read the lecture notes
5	Interference of Light and Optical Interferometry	Read the lecture notes
6	Coherence	Read the lecture notes
7	Fiber Optics	Read the lecture notes
8	Fraunhofer Diffraction and Diffraction Grating	Read the lecture notes
9	Fresnel Diffraction	Read the lecture notes
10	Matrix Treatment of Polarization, Production of Polarized Light	Read the lecture notes
11	Holography	Read the lecture notes
12	Optical Detectors and Displays	Read the lecture notes
13	Matrix Methods in Paraxial Optics	Read the lecture notes
14	Aberration Theory	Read the lecture notes

Evaluation Methods	**Weight(%)**
Midterm Exam	30
General Exam	70

Resources
Frank Pedrotti, Leno M. Pedrotti, and Leno S. Pedrotti, Introduction to Optics, Prentice Hall, 3rd Edition, 2007Eugene Hecht,Optics, 4th Ed. Addison-Wesley, 2002