COURSE INFORMATION					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
Photonics	PHYS 656	4	4 + 0	4	10

Prerequisites	-

Language of Instruction	English
Course Level	Postgraduate
Course Type	Compulsory
Course Coordinator	Prof. Dr. Ertan AKŞAHİN
Instructors	Prof. Dr. Ertan AKŞAHİN
Assistant	
Goals	To make students aware that photonics is a rapidly growing field that touches almost every field of research in science and technology, from laser manufacture to biological and chemical sensing, medical diagnostics and therapy, display technology, and optical computing. To ensure students realise that photonics was the basis for the telecommunications revolution over the past two decades and that its potential applications are virtually unlimited in nearly all research fields.
Content	Optical radiation, fibre optics, optical activity, non-linear optics, photonics in precision time and frequency metrology, non-linear laser spectroscopy, future applications.

Learning Outcomes	**Teaching Methods**	**Assessment Methods**
An understanding of the way optical radiation is detected, perceived and measured by humans.	1 ,2,12	A
How optical radiation is quantified by the system international (SI) and its base unit.	1 ,2,12	A
Ensuring students understand the working principles of novel instrumentation and techniques required for innovative photonic applications.	1 ,2,3	A,B,C

Ensuring students understand modern applications of photonics	1 ,2,3	A, B,C
An understanding of the great potential of photonics in spectroscopy	1 ,2,3	B, C
An appreciation of the future applications of photonics	1 ,2,3	A

Teaching Methods:	1: Lecture, 2: Question-Answer, 3: Discussion, 9: Simulation, 12: Case Study
Assessment Methods:	A: Testing, B: Presentation, C: Homework

COURSE CONTENT

Week	Topics	Study Materials
1	Optical Radiation: Photometry, radiometry and colorimetry in the SI	Lectures and resources
2	Optical Radiation: Photometry, radiometry and colorimetry	Lectures and resources
3	Fibre optics; fibre optic applications Fibre-optic gyroscope, Fibre-optic bio and chemo-sensing	Lectures and resources
4	Optical activity, induced optical effects	Lectures and resources
5	MidTerm Exam 1	
6	Non-linear optics; frequency doubling, phase conjugation	Lectures and resources
7	Non-linear optics in quantum confined structures	Lectures and resources
8	Photonic crystals, the photorefractive effect; optical data storage I	Lectures and resources
9	Photonic crystals, the photorefractive effect; optical data storage II	Lectures and resources
10	MidTerm Exam 2	
11	Opto-atomics: Optical cooling. atomic, optical lattice and ion clocks for precision time and frequency metrology	Lectures , resources, publications
12	Non-linear laser spectroscopy, Raman, pump-probe, The Franz–Keldysh and Stark effects: I	Lectures and resources
13	Non-linear laser spectroscopy, Raman, pump-probe, The Franz–Keldysh and Stark effects: II	Lectures and resources

14	Future applications: Metamaterials, &Quantum computing	Lectures, resources, publications

RECOMMENDED SOURCES	
Textbook	Contemporary nonlinear optics, G.P. Agrawal, R. W. Boyd(ed) (1992)
Additional Resources	Fundamentals of photonics, E.A. Saleh, Malvin Carl Teich., Photonics and lasers : an introduction / R. S. Quimby, Essentials of photonics, Rogers, A. J.

MATERIAL SHARING	
Documents	Journal publications.
Assignments	Four homework assignments
Exams	Two mid-term exams and one final

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-terms	2	30
Lab practicals	0	0
Assignment	4	10
Seminars	1	5
Total		**45**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		55
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		45
Total		**100**

COURSE CATEGORY	Expertise/Field Courses

COURSE'S CONTRIBUTION TO PROGRAM						
No	Program Learning Outcomes	Contribution				
		1	2	3	4	5

1	Gets a sound base for the main fields of physics such as Classical Mechanics, Quantum Mechanics and Electromagnetism,					X
2	Gets the ability of interpreting, analysing, forming a synthesis and relationships between the main fields of physics and/or other sciences,					X
3	Obtains the education required for the measurements in scientific and technological areas and the contribution of physics in the industrial applications and on the macroscopic scale such as the society,				X	
4	Follows the up-to-date scientific developments, makes the analysis/synthesis for the new ideas and evaluates them,				X	
5	Uses the academic sources, the computer technology and the related devices,		X			
6	Joins the working and research groups, also the scientific meetings, communicates well at the national and international level,		X			
7	Gets the ability of creative and critical thinking, problem solving, researching, producing a new and original work, improving himself/herself in his/her own fields of interest,					X
8	Gains the concepts of ethics and responsibility. Undertakes the responsibility for the solutions to the problems related with his/her field as required for having an intellectual identity.		X			

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Including the exam week: 16x Total course hours)	16	4	64
Hours for off-the-classroom study (Pre-study, practice)	16	9	144
Mid-terms	2	2	4
Homework + presentation assignments	4	6	24
Final examination	1	2	2
Total Work Load			238
Total Work Load / 25 (h)			9.52
ECTS Credit of the Course			10