AGU Graduate School of Engineering and Science Electrical and Computer Engineering Program

COURSE RECORD

Code	**ECE 525**
Name	**Nanophotonics**
Hour per week	3
Credit	3
ECTS	7,5
Level/Year	Graduate
Semester	Fall
Type	Elective
Location	Classroom
Prerequisites	Undergraduate level electromagnetics knowledge is necessary.
Special Conditions	-
Coordinator(s)	Asst. Prof. Talha Erdem
Webpage	-
Content	This course covers the basic physical phenomena, principles, experimental advances and potential impact of light propagation, emission, absorption, and scattering in complex nanostructures. Within this framework, introductory quantum theory of solids and quantum confinement effects will be discussed together with wave optics and wave mechanics of complex structures as well as light-matter interactions.
Objectives	(1) Introducing the basic principles and applications in nanophotonics (2) Presenting a comprehensive view on physical phenomena related to nano-optics and light-matter interactions (3) Providing the necessary tools for students to track the latest advancements in the area of nanophotonics (4) Making the students familiar with simulations and experimental methods in nanophotonics
Learning Outcomes	LO1: Understand the basics of nanophotonics and nanooptics LO2: Knowledge about how nanophotonic devices work LO3: Gaining the capability to design nanophotonic devices LO4: Learning how to find the information required to solve a problem related to nanophotonics LO5: Gaining the capability to prepare technical presentations and academic reports on nanophotonics
Requirements	Text book: Introduction to Nanophotonics, S. V. Gaponenko, Cambridge University Press, Online ISBN: 9780511750502
Reading List	Nanophotonics, P. N. Prasad, John Wiley & Sons, ISBN 0-471-64988-0
Ethical Rules and Course Policy	University Ethics Rules apply.

LEARNING ACTIVITIES *Please, use this one as a reference for your course*

Activities	**Number**	**Weight (%)**
Lecture	12	40%
Group Works	3	15%
Presentations	2	15%
Laboratory Visits	1	5%
Literature Research	1	10%
Use of out-of-class Computational Tools	1	15%
	Total	100

ASSESSMENT

Evaluation Criteria	**Weight** (%)
Quizzes	15%
Weekly Assignments	15%
Group Project Assignments & Presentations	10%
Midterm Exams	35%
Final Exam	25%
Total	100%

For a detailed description of grading policy and scale, please refer to the website https://goo.gl/HbPM2y section 28.

COURSE LOAD *Please, use this one as a reference for your course*

Activity	**Duration** (hour)	**Quantity**	**Work Load** (hour)
In class activities	3	14	42
Group work	3	6	18
Required Readings	3	10	30
Research (web, library)	3	6	18
Pre-work for Presentation	5	3	15
In-class Presentation	1	2	2
Assignments	6	5	30
Laboratory Visit	1	1	1
Quiz	6	5	30
Studying for Midterm Exams	25	2	50
Studying for Final Exam	25	1	25
		General Sum	**261**

ECTS: 10 (Work Load/25-30)

CONTRIBUTION TO PROGRAMME OUTCOMES*

	PO1	PO2	PO3	PO4	PO5	PO6
LO1	5	2	1	2	1	1
LO2	5	5	4	3	1	1
LO3	5	5	5	5	5	5
LO4	2	4	1	5	5	3
LO5	4	1	1	5	5	5

* Contribution Level: 0: None, 1: Very Low, 2: Low, 3: Medium, 4: High, 5: Very High

WEEKLY SCHEDULE

W	**Topic**	**Outcomes**
1	Properties of Electromagnetic Waves Lab/Activity: Lecture	LO1, LO2
2	Wave optics and wave mechanics Lab/Activity: Lecture	LO1, LO2
3	Electrons in periodic structures and quantum confinement effects Activity: Lecture	LO1, LO2
4	Electrons in periodic structures and quantum confinement effects Activity: Lecture	LO1, LO2
5	Spontaneous emission of photons and lifetime engineering Activity: Lecture and group work	LO1, LO2, LO3
6	Stimulated emission and lasing Activity: Lecture and group work	LO1, LO2, LO3
7	Photovoltaics Activity: Lecture and group work	LO1, LO2, LO3
8	Semiconductor nanocrystals Activity: Lecture and group work	LO1, LO2, LO3, LO4
9	Plasmonics with metal nanoparticles Activity: Lecture and group work	LO1, LO2, LO3, LO4

10	Photonic crystals Activity: Lecture and group work	LO1, LO2, LO3, LO4
11	Plasmonics with metal-dielectric nanostructures Activity: Lecture and group work	LO1, LO2, LO3, LO4
12	Density of states on optical processes Activity: Lecture	LO1, LO2, LO3
13	Presentations Activity: Group work and presentations	LO4, LO5
14	Presentations and laboratory visits Activity: Group work and site visit	LO4, LO5

Asst. Prof. Talha Erdem
20/05/2019