



**ESOGU ELECTRICAL-ELECTRONICS ENGINEERING DEPARTMENT  
COURSE INFORMATION FORM**

Course Title	Course Code
ELECTROMAGNETIC WAVES	151224560

Semester in Program	Number of Course Hours per Week		ECTS Credit
	Theory	Practice	
4	3	0	5

Course ECTS Credit Distribution				
Basic Sciences	Engineering Sciences	Design	General Education	Social
0	5	0	0	0

Language of Instruction	Course Level	Course Type
English	Undergraduate	Required

<b>Prerequisite</b>	Electromagnetic Fields
<b>Objectives of the Course</b>	Introduction of Maxwell's equations, teaching fundamental concepts and applications related to time-harmonic and plane waves, analysis on propagation of plane waves in various media, reflection and transmission phenomena, analysis of waveguides.
<b>Brief Course Content</b>	Maxwell's equations and wave equation. Monochromatic waves. Electromagnetic spectrum. Helmholtz equation. Plane waves. Polarization of plane waves. Reflection and transmission of plane waves. Waveguides.

Learning Outcomes of the Course	Contributed POs	Teaching Methods *	Assessment Methods **
1 Defining wave equation	1c, 1d	1, 2	A, B
2 Solving problems related to time-harmonic waves	1c, 1d, 2	1, 2, 10	A, B
3 Defining plane electromagnetic waves.	1c, 1d	1, 2	A, B
4 Analyzing propagation of plane waves in various media	1c, 1d	1, 2	A, B
5 Understanding reflection and refraction of plane waves	1c, 1d	1, 2	A, B
6 Applying reflection and refraction phenomena in engineering problems	1c, 1d, 2	1, 2, 10	A, B
7 Analyzing several types of waveguides.	1c, 1d	1, 2	A, B
8 Solving fundamental problems related to waveguide	1c, 1d, 2	1, 2, 10	A, B

\***Teaching Methods** 1:Lecture, 2:Discussion, 3:Experiment, 4:Simulation, 5:Question-Answer, 6:Tutorial, 7:Observation, 8:Case Study, 9:Technical Visit, 10:Problem Solving, 11:Individual Work, 12:Team/Group Work, 13:Brain Storm, 14:Project Design / Management, 15:Report Preparation and/or Presentation

\*\***Assessment Methods** A:Exam, B:Quiz, C:Oral Exam, D:Homework, E:Report, F:Article Examination, G:Presentation, I:Experimental Skill, J:Project Observation, K:Class Attendance; L:Jury Exam

<b>Main Textbook</b>	David K. Cheng, Field and Wave Electromagnetics, Addison-Wesley; 2nd ed., 1989.
<b>Supplementary Resources</b>	- Branislav Notaros, Electromagnetics, Pearson Higher Ed., 1st ed., 2010. - Matthew N.O. Sadiku, Principles of Electromagnetics, Oxford University Press, 6th ed., 2015. - U.S. Inan, A. Inan and R. Said, Engineering Electromagnetics and Waves, Pearson Higher Ed., 2nd ed., 2015.
<b>Necessary Course Material</b>	-

Course Weekly Schedule	
1	Maxwell's equations and wave equation.
2	Time-harmonic waves, electromagnetic spectrum.
3	Helmholtz equation for Time-harmonic waves.
4	Complex Poynting vector and average power density
5	General form of plane electromagnetic waves and polarization.
6	Propagation of plane waves in various media.
7	Advanced problems.
8	Mid-Term Exams
9	Reflection and transmission of plane waves – the case of normal incidence.
10	Reflection and transmission of plane waves – the case of oblique incidence.
11	Applications of reflection and transmission phenomena.
12	Field relations in waveguides. Parallel-plate waveguides.
13	Rectangular waveguides.
14	Fundamentals of antennas.
15	Advanced problems.
16,17	Final Exams

Calculation of Course Workload			
Activities	Count	Time (Hour)	Total Workload (Hour)
Weekly classroom time	14	3	42
Weekly study time (review, reinforcing, preparation)	14	3	42
Homework	0	0	0
Taking a quiz	6	1	6
Studying for a quiz	6	4	24
Oral exam	0	0	0
Studying for an oral exam	0	0	0
Report writing (Preparation and presentation time included)	0	0	0
Project (Preparation and presentation time included)	0	0	0
Presentation (Preparation time included)	0	0	0
Mid-Term Exam	1	2	2
Studying for Mid-Term Exam	1	20	20
Final Exam	1	2	2
Studying for Final Exam	1	20	20
<b>Total workload</b>			<b>158</b>
<b>Total workload / 30</b>			<b>5.27</b>
<b>Course ECTS Credit</b>			<b>5</b>

Assessment	
Activity Type	%
Mid-term	30
Quiz	30
<b>Final Exam</b>	40
<b>Total</b>	100

<b>COURSE CONTRIBUTION TO THE PROGRAM OUTCOMES</b> (5: Very high, 4: High, 3: Middle, 2: Low, 1: Very low)		
<b>NO</b>	<b>PROGRAM OUTCOMES</b>	<b>Contribution</b>
<b>1</b>	a. Sufficient knowledge of mathematics	1
	b. Sufficient knowledge of basic sciences	1
	c. Sufficient basic engineering and Electrical-Electronics engineering knowledge	5
	d. Skill of applying all these knowledge and experience to complicated Electrical-Electronics engineering problems	5
<b>2</b>	Skill of defining, identifying, formulating and solving the complicated problems in Electrical-Electronics engineering and related areas by applying appropriate analysis and modelling methods.	5
<b>3</b>	Skill of designing a complicated process, system, equipment or product by applying modern design methods under realistic constraints and conditions.	1
<b>4</b>	To analyze and solve the complicated engineering problems: a. skill of developing, selecting and applying the required techniques and devices	1
	b. skill of using information technologies effectively	1
<b>5</b>	To study the complicated on the complicated Electrical-Electronics engineering problems and research subjects: a. skill of experimental design	1
	b. skill of performing the experiments, collecting the data and analyzing and interpreting the results	1
<b>6</b>	a. Skill of performing individual studies	1
	b. Skill of performing intra and interdisciplinary and multidisciplinary teamwork and studies	1
<b>7</b>	a. Skill of effective oral and writing communication in Turkish and English	1
	b. Skill of improving and using foreign language knowledge	1
	c. Skill of effective reporting, understanding the reports and preparing the design and production reports	1
	d. Skill of effective presentation and giving and getting clear and understandable instructions.	1
<b>8</b>	Awareness of the necessity of life-long learning and skill of accessing to information and following the improvements in contemporary science and technology	1
<b>9</b>	a. Awareness of necessity of behaving in accordance with the ethical principles and awareness of the importance of having professional ethical responsibilities	1
	b. Knowledge about legal regulations and standards of engineering	1
<b>10</b>	a. Knowledge about project management, risk management and change management	1
	b. Awareness of the significance of entrepreneurship and innovation	1
	c. Knowledge about sustainable development	1
<b>11</b>	Knowledge about the effects of engineering applications and practices on the global and social health, ecology and safety, knowledge about the current problems in relation to the working areas of Electrical-Electronics engineering; and awareness of the legal issues resulting from engineering solutions	1
<b>12</b>	Knowledge about modern problems in local and universal scale	1

<b>INSTRUCTORS</b>				
<b>Prepared by</b>	Gökhan ÇINAR			

**Date:** 06.07.2024