COURSE TRAINING PROGRAM FORM

Course Name	Code	Regular Semester	ECTS Credits	Credits	Lecture	4
					Application	0
ELECTROMAGNETIC WAVE THEORY	*0143041*	*5*	*7*	*4*	Laboratory (Hour/Week)	*0*

Compulsory or Elective	**Compulsory**
Instructor	Prof. Dr. Taner ŞENGÖR
Course Contents	Maxwell's Equations. Generalized Current Concept. Energy and Power of Electromagnetic Waves. Electromagnetic Waves in Complex Form. Wave Equation and the Principles for Its Solutions. Reduced Wave Equation in Simple Medium. D'Alembert's Solution in Time Domain. Initial Value Problem. Wave Propagation in Bounded Mediums. Maxwell's Equations in Discontinuous Mediums, The Concept of Distributions, Boundary Conditions. Helmholtz's Equation and Its Solution. Wave Velocity. Boundary Value Problems Related with Wave Equation and Their Solutions: Dirichlet, Neuman, and Mixed Boundary Conditions; Expansion Method to Eigenfunction Series: The Solution of Wave Equation by using Fouier Series; Integral Transformations Techniques: The Solution of Wave Equation by using Laplace's and Fourier's Transformations; The Method of Green's Functions: The Solution of Wave Equation by using Green's Function. The Plane Wave, Polarization. Propagation. Reflection and Refraction. Vector and Scalar Potentials, Dipoles. Hertz's Vector. Guided Waves. Propagation in General Cylindrical Waveguides. Cavities. The Concept of Antenna. Far Field Approximations.
Course Objectives	The electromagnetic wave theory provides the basic of the knowledge involved in the applications related with electrical, electronics, communication, and computer engineering disciplines. The lecture aims to teach the basic rules of time varying electromagnetic phenomena with a model constructed by using the vector analysis. The lecture is focused on both understanding and providing the ability of solving basic engineering problems involving such phenomena. The principle of the lecture is to give the culture and correct orientations to direct the person on scientific research.
Course Outcomes (The knowledge and the skills that the student will gain at the end of the course)	To gain the abilities both configuring and obtaining the compact solutions and results of basic problems related with electromagnetic waves by learning how the logic of mathematical and physical sciences are considered in correct sense.

Textbook	Lecture Notes of Electromagnetic Wave Theory, T. ŞENGÖR (unpublished). Photocopies are available for the attandees of the lecture.		
Additional References	1) Constantine A. Balanis, Advanced Engineering Electromagnetics, John Wiley&Sons Inc., 1989USA. 2)Jin Au Kong, Electromagnetic Wave Theory, John Wiley&Sons Inc., 1990, USA. (EMW Publishing, 2000, USA). 3) R. F. Harrington, Time-Harmonic Electromagnetic Fields, McGraw-Hill Book Company, Inc., N.Y., 1961. 4) Robert M. Fano, L. Jen Chu, Richard B. Adler, Electromagnetic Fields, Energy, and Forces, John Wiley&Sons, Inc., N.Y., 1960. 5) R. E. Collin, Foundations for Microwave Engineering, McGraw-Hill International Editions, Literatür Yayıncılık, Ankara, 1994. 6) J. Van Bladel, Electromagnetic Fields, McGraw-Hill, 1964, USA. 7) J. Van Bladel, Electromagnetic Fields, Revised Printing, New York:Hemisphere, 1985, USA.		
Prerequisite Courses			
Prerequisite Subjects	Topics of Engineering Mathematics. Vector Analysis. Partial Differential Equations. Topics of Electromagnetic Field Theory.		
Homework/Project			
Laboratory			
Computer Applications			
Additional Practices			
Course Evaluation		**Number**	**Effective Proportion %**

Criteria	**Midterm Exams**	2 (1 classical and 1 test exam in random order)	52
	Quiz		
	Homework	random	2
	Term Projects	1	3
	Term Papers		
	Laboratory		
	Other (Answers to the questions directed to the class during the lecture)	random	3
	Final Exam	1	40

WEEKLY COURSE PLAN

Week	Subject
1	Maxwell's Equations. Classification of Mediums. Generalized Current Concept.
2	Energy and Power of Electromagnetic Waves. Conservation of Electromagnetic Energy. Poynting's Theorem. Electromagnetic Waves in Complex Form, The Concept of Frequency.
3	Wave Equation and the Principles for Its Solutions. Reduced Wave Equation in Simple Medium. D'Alembert's Solution in Time Domain. Initial Value Problem.
4	Wave Propagation in Bounded Mediums. Maxwell's Equations in Discontinuous Mediums, The Concept of Distributions, Boundary Conditions.
5	Helmholtz's Equation and Its Solution. Wave and Several Velocity Concepts.
6	Boundary Value Problems Related with Wave Equation and Their Solutions: Boundary Value Problems in Dirichlet, Neuman, and Mixed Types; Expansion Method to Eigenfunction Series: The Solution of Wave Equation by using Fouier Series.
7	Midterm Exam. Integral Transformations Techniques: The Solution of Wave Equation by using Laplace's and Fourier's Transformations.
8	The Method of Green's Functions: The Solution of Wave Equation by using Green's Function.
9	The Plane Wave and Its Properties, Polarization.
10	Propagation in Simple Medium. Reflection and Refraction.
11	Vector and Scalar Potentials, Dipoles. Midterm Exam.
12	Hertz's Vector. Guided Waves.
13	Propagation in General Cylindrical Waveguides.
14	Cavities. Excitation of Electromagnetic Waves. Excuse Exam.
15	The Concept of Antenna. Far Field Approximations.

Course Outcomes

	The objective knowledge and abilities earned by the student with the Electronics and Communications Engineering Department Program	**1**	**2**	**3**
1	Ability to apply knowledge of natural science and engineering			X
2	Ability to design and conduct experiments, as well as to analyze and interpret data		X	
3	Ability to design a system		X	
4	Ability to function as a team member		X	
5	Ability to identify, formulate, and solve engineering problems			X
6	Understanding of professional and ethical responsibility			X
7	Ability to communicate effectively			X
8	Knowledge of the impact of the profession in a global and social context			X
9	Recognition of the need for life-long learning			X
10	Knowledge of contemporary issues			X
11	Ability to use modern engineering tools and the techniques			X
12	Providing the opportunity to the student gain more detailed knowledge of chosen research subject in electronics and communications engineering and to apply it.		X	

Contribution of the course: **1:** None, **2:** Partial, **3:** Full.