TED UNIVERSITY

Syllabus for
EE 444-01 Antenna Engineering
Spring 2016-2017

Instructor:	**Prof. Dr. Erdem YAZGAN**
Office:	**318**
Phone:	**(0312) 585-00-27**
E-mail:	**erdem.yazgan@tedu.edu.tr**

Time Schedule:	**Monday (13.00 – 14.50), Wednesday (10.00 – 12.50)**
Office Hours:	**Monday (15.00 - 17.00), Tuesday (15.00 - 16.00) (or by appointment)**
Classroom:	**A326- A317L**

Faculty	Engineering	**Department**	Electrical and Electronics Engineering

Course Code & Number	EE444	**Course Title**	Antenna Engineering
Type of Course	☐ Compulsory ☑ Elective	**Semester**	☐ Fall ☑ Spring ☐ Summer
Course Credit Hours	(2+2+0) 3	**Number of ECTS Credits**	5
Pre-requisite	EE341 or consent of the department	**Co-requisite**	N/A
Mode of Delivery	☑ Face-to-face ☐ Distance learning	**Language of Instruction**	☑ English ☐ Turkish
Course Coordinator	Prof. Dr. Erdem YAZGAN	**Course Lecturer(s)**	Prof. Dr. Erdem YAZGAN
Required Reading	C.A. Balanis, "Antenna Theory, Analysis and Design", 3rd ed, John Wiley & Sons, NY, 2005.	**Recommended Reading**	1) W.L. Stutzman, G.A. Thiele, "Antenna Theory and Design", 2nd ed, John Wiley & Sons, 1998. 2) Elliott, Robert S., "Antenna Theory and Design", Wiley-IEEE Press, 2003.

Course Catalog Description	Basic antenna parameters. Radiation fields of an antenna. Linear wire antennas. Ground interference effects. Antenna arrays. Aperture type antennas. Microstrip antennas.
Course Objectives	The goal of this course is to lay a background on the fundamentals of antenna theory and various types of antennas including linear wire antennas, loop antennas, antenna arrays, aperture antennas and microstrip antennas.

Course Learning Outcomes	Having successfully completed this course, students will be able to: 1. Identify, analyze and interpret the fundamental parameters of antennas. 2. Formulate and analyze Friis transmission equation and radar range equation. 3. Formulate the radiation fields of an antenna, at both near- and far-zone; and identify the duality and reciprocity principles. 4. Formulate and analyze the radiation from wire antennas (dipoles, monopoles, loop antennas). 5. Utilize the image theory to analyze an antenna near an infinite conducting ground. 6. Formulate and analyze the antenna arrays. 7. Formulate and analyze the aperture antennas. Identify the field equivalence principle. 8. Formulate and analyze the microstrip antennas. 9. Ability to design and conduct experiments, gather data, analyze and interpret results for investigating antenna engineering problems.
Course Contents	Basic antenna parameters. Radiation fields of an antenna. Linear wire antennas. Ground interference effects. Antenna arrays. Aperture type antennas. Microstrip antennas.

Teaching Methods & Learning Activities	☑ Telling/Explaining ☑ Discussions/Debates ☑ Questioning ☑ Reading ☐ Peer Teaching ☐ Scaffolding/Coaching ☐ Demonstrating ☑ Problem Solving ☑ Inquiry ☐ Collaborating ☐ Think-Pair-Share ☐ Predict-Observe-Explain ☐ Microteaching ☐ Case Study/Scenario Analysis	☐ Simulations & Games ☑ Video Presentations ☐ Oral Presentations/Reports ☐ Concept Mapping ☑ Brainstorming ☐ Drama/Role Playing ☐ Seminars ☐ Field Trips ☐ Guest Speakers ☑ Hands-on Activities ☐ Service Learning ☑ Web Searching ☑ Experiments ☐ Other(s): .....

Assessment Methods (Formal & Informal)	☑ Test/Exam ☑ Quiz ☐ Oral Questioning ☐ Performance Project ☐ Written ☐ Oral	☐ Observation ☐ Self-evaluation ☐ Peer Evaluation ☐ Portfolio ☐ Presentation (Oral, Poster) ☐ Other(s): .....

Student Workload (Total 164 Hrs)	☑ Lectures .....**28**.. hrs ☑ Course Readings .....**40**.. hrs ☐ Workshop ..... hrs ☐ Online Discussion ..... hrs ☐ Debate ..... hrs ☐ Work Placement ..... hrs ☐ Field Trips/Visits ..... hrs ☐ Observation ..... hrs ☑ Lab Applications .....**28**. hrs ☑ Hands-on Work .....**30**.. hrs ☑ Quizzes .....**10**.. hrs ☑ Midterm I.....**12**.. hrs ☑ Midterm II.....**12**.. hrs ☑ Final.....**18**.. hrs	☐ Resource Review ..... hrs ☐ Research Review ..... hrs ☐ Report on a Topic ..... hrs ☐ Case Study Analysis ..... hrs ☐ Oral Presentation ..... hrs ☐ Poster Presentation ..... hrs ☐ Demonstration ..... hrs ☐ Web Designs ..... hrs ☐ Mock Designs ..... hrs ☐ Team Meetings..... hrs ☐ Other ..... hrs

COURSE POLICIES

I. Attendance

• Regular class attendance is expected for all students at the University. You are not required but advised to attend all classes.
 You will be rewarded with 3% extra *bonus* credits, if your attendance rate is at least 90% at the end of the semester. This means that you may miss only 4 single-hours to get this bonus.
 Please sign the attendance sheet when you come to the class. Any false signatures will result in zero participation grades for all parties involved.
 Please send your professor a brief e-mail to explain your absence in advance.
 Your absence will not reduce your attendance rate *if and only if* you have a legitimate reason for missing a class (such as illness, death in family, a traffic accident, etc.). In case of an illness or emergency, you must supply a formal documentation that supports your claim.
 Classes start on the hour. Please be respectful of your classmates by being on time.
 All electronic equipment should be turned off and kept out of sight before lecture starts.

II. Make-up Exams

Make-ups for Midterm Exams 1 and 2 will be available *if and only if* you have a legitimate reason for missing the exam (such as illness, death in family, a traffic accident, etc.). In case of an illness or emergency, you must supply a formal documentation that supports your claim.

III. Late Assignment Submission Policy

Late submissions will not be graded. There will be *no* make-up for quizzes and homework/Matlab assignments. Missed assignments and quizzes will result in a grade of zero (0).

IV. Participitation

In their book, The Adult Student's Guide to Survival & Success, Al Siebert and Mary Karr suggest that the most effective learning technique of all is to study by *asking and answering questions*. Develop the habit of reading textbooks, taking lecture notes, and studying by asking and answering questions. When you do this, you save many hours of studying and have time to spend with your family or friends.

There are several ways to go about asking and answering questions.

 When studying on your own, write questions that occur to you while you're reading and then go back and find the answers.

 If you're part of a study group, make a list of questions to ask the group.

V. Cheating & Plagiarism

Collaboration is strongly encouraged; however, the work you hand in must be solely your own. Cheating and plagiarism are very serious offenses and will be penalized accordingly by the university disciplinary committee.

Cheating has a very broad description which can be summarized as "acting dishonestly". Some of the things that can be considered as cheating are the following:

- Copying answers on exams, homeworks and lab works,
- Using prohibited material on exams,
- Lying to gain any type of advantage in class,
- Providing false, modified or forged data in a report,
- Plagiarising (see below),
- Modifying graded material to be re-graded,
- Causing harm to colleagues by distributing false information about an exam, homework or lab.

All of the following are considered plagiarism:

- Turning in someone else's work as your own,
- Copying words or ideas from someone else without giving credit,
- Failing to put a quotation in quotation marks,
- Giving incorrect information about the source of a quotation,
- Changing words but copying the sentence structure of a source without giving credit,
- Copying so many words or ideas from a source that it makes up the majority of your work, whether you give credit or not.

(www.plagiarism.org)

COURSE ASSIGNMENTS

A. Mid-terms [40%]

20% for each mid-term exams

B. Quiz and Attendance [30 %]

10% for quizes; 10% for Lab. Works, 10%Homeworks

C. Final [30%]

TENTATIVE COURSE OUTLINE				
W	**Day**	**Topics**	**Readings**	**Assignments**
1		Radiation mechanism, Types of antennas		
2		Electromagnetic fundamentals, Radiation from a short current filament		Homework #1
3		Basic antenna parameters (radiation pattern, beamwidth, radiation power density, radiation intensity);		
4		Basic antenna parameters (directive gain and directivity, beam solid angle, beam efficiency, gain, antenna efficiency)		Homework #2
5		Basic antenna parameters (polarization, effective area, Friis transmission equation, radar range equation and radar cross section); **2nd Quiz**		
6		Basic antenna parameters (input impedance, radiation resistance, bandwidth, antenna noise temperature)		Homework #3
7		Radiation fields of an antenna (Fields radiated by electric and magnetic type currents, duality principle, far-field approximations, reciprocity principle); **1st MID-TERM**		
8		Linear wire antennas (Infinitesimal dipole, small dipole, dipole of arbitrary length)		Homework #4
9		Small loop antenna, Antennas above or on an infinite plane conductor, Monopole antenna		
10		Antenna arrays (Linear, planar, circular arrays, array factor, principle of pattern multiplication); **2rd Quiz**		Homework # 5
11		Antenna Arrays (N element linear array, Binomial array, Array of arrays)		
12		Aperture Type Antennas (Field equivalence principles,		

		Calculation of radiation fields from aperture fields); **2nd MID-TERM**		
13		Rectangular apertures		
14		Microstrip antennas		
		FINAL EXAMS WEEK, MAY, 2016 (date and time to be announced later).		

COURSE ASSESSMENTS & LEARNING OUTCOMES MATRIX	
Assessment Methods	**Course Learning Outcomes**
1st Quiz	#1, #2
2nd Quiz	#3, #4, #5
1st Mid-term Exam	#1, #2, #3,
2nd Mid-term Exam	#1, #2, #3, #4, #5, #6
Final Exam	#1, #2, #3, #4, #5, #6, #7, #8, #9

TED UNIVERSITY CODE OF ACADEMIC INTEGRITY
EXAMPLE TED University takes academic integrity seriously. "We, the students and faculty of the TED University, dedicate ourselves to upholding the highest standards of academic integrity. Academic integrity means that one's work is the product of one's own effort, and one neither receives nor gives unauthorized assistance in any assignment. Because advanced academic work depends on the sharing of information and ideas, academic integrity at the college level includes rigorous adherence to the conventions for acknowledging one's use of the words and ideas of other people, and instruction in this fundamental skill of college life is available to all TED University students ... (Code of Academic Integrity, TEDU, p. 2)." ***Please read through the entire code and acquaint yourself with how violations are defined!*** Entire code might be found at the following link: http://catalog.tedu.edu.tr/.....

Prepared By & Date	Prof.. Dr. Erdem YAZGAN 04/02/2017	**Revision Date**	