

**“Antennas”**  
**ECE 4310: Call#11534**  
**ECE 5310: Call#11535**  
**Winter Semester 2018**

<b>Instructor:</b>	Daniel N. Aloï, Ph.D.	<b>Office Number:</b>	446B Engineering Center
<b>Office Hours:</b>	By Appointment	<b>Office Telephone:</b>	248-370-2185 (w) <a href="mailto:aloi@oakland.edu">aloi@oakland.edu</a>
<b>Class Schedule:</b>	5:30pm-7:17pm TR	<b>Classroom:</b>	367 SFH
<b>Prerequisite:</b>	ECE 345 or ECE352 or Instructor permission	<b>Credit Hours:</b>	4.00

**Course Text:**

1. Balanis, Constantine A., Antenna Theory, Analysis and Design, Fourth Edition, John Wiley & Sons, 2005, Hoboken, New Jersey, ISBN: 978-0-471-66782-7.

**Course Description:**

Introduction to antenna performance parameters including field patterns, power patterns, beam area, directivity, gain, beam efficiency, radiation intensity, antenna apertures, impedance, polarization and the radio communication link. Dyadic Green's Function, radiation from current elements such as a dipole and a current loop, far-zone fields, arrays of point sources. Antenna modeling and measurement tools will be introduced. Course will incorporate labs and/or laboratory demonstrations.

**ABET/Program Outcomes:**

The Program Outcomes are a set of skills that assure the achievement of the program educational objectives. Before graduating, SECS students will demonstrate their skills in the following key areas:

- a. an ability to apply knowledge of mathematics, science, and engineering
- b. an ability to design and conduct experiments, as well as to analyze and interpret data
- c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- d. an ability to function on multi-disciplinary teams
- e. an ability to identify, formulate, and solve engineering problems
- f. an understanding of professional and ethical responsibility
- g. an ability to communicate effectively
- h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i. a recognition of the need for, and an ability to engage in life-long learning
- j. a knowledge of contemporary issues
- k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**ABET Program Outcomes:**

a, b, e, i, k

**Course Objectives:**

The following objectives shall be accomplished upon successful completion of this course:

- Be able to identify basic antenna parameters;
- Understand the concepts of polarization and polarization loss factor;
- Be able to derive the expressions for infinitesimal electric dipoles and thin wire antennas;
- Be able to derive the expressions for simple antenna arrays comprised of isotropic point sources;
- To perform a literature survey in a specific area of antennas and be able to communicate results in both written and oral format.

**Exams:**

There will be three midterm exams and a final exam. At my discretion one of the examinations may be done outside of class.

**Homework/Computer Projects:**

Homework will be assigned throughout the course. Students are encouraged to work in study groups but are required to do their own homework. Failure to do so will most likely result in poor performance on your exams. Some of the homework assignments may have problems that require the use of MATLAB or FEKO. FEKO is a full-wave electromagnetic field solver based on the method of moments

**Final Project:**

A final project will be assigned to students in ECE 447 and ECE547. Each group will be required to study and simulate a specific antenna. The students will be required to design the antenna in FEKO. Once designed, a parametric analysis will need to be performed to various physical parameters of the antenna to see its impact on performance parameters such as, but not limited to, VSWR, Peak Gain, and HPBW. A final power point presentation of the entire design process and resulting performance will be given by each group in front of the class. Specifics of the presentation will be given at a later point in time.

**Laboratory Demonstrations:**

This course will incorporate laboratory demonstrations with the Applied Electromagnetics and Wireless Laboratory's Outdoor Automotive Antenna Range. The Outdoor Automotive Antenna Range was made possible in part by an award from the National Science Foundation's 2005 Major Research Instrumentation solicitation. The laboratory component of this class may comprise of demonstrations and/or computer assignments to illustrate the theoretical concepts conveyed in this course.

**Academic Dishonesty:**

Cheating on exams, projects and homeworks will not be tolerated. Anyone caught cheating faces penalties ranging from a zero on the exam to expulsion from the University. However, I do encourage group work on homework assignments.

**Grading:**

<u>Final Grade:</u>	<b>ECE4310</b>	<b>ECE5310</b>
Midterm Exam 1	15%	15%
Midterm Exam 2	15%	15%
Midterm Exam 3	15%	15%
Homework	10%	10%
Project	15%	15%
Final Exam	30%	30%

**Grading Scale:**

The basic undergraduate and graduate grading system at Oakland University is a 32-point system of numerical grades, with passing grades ranging from 1.0 to 4.0, by tenths, and a non-credit grade of 0.0.

**ECE 447/547**  
**ECE Winter 2018**  
**Tentative Schedule**

	Date	Lecture Topic	Notes
Week 1	1/3/2018	Chapter 1 / FEKO	
Week 2	1/8/2018	Chapter 2: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7	HW1 Assigned
	1/10/2018	Chapter 2: 2.8, 2.9, 2.10, 2.11, 2.12	
Week 3	1/15/2018	No Class – Martin Luther King	
	1/17/2018	Chapter 2: 2.13, 2.14, 2.15	HW1 Due (Ch. 1) / HW2 Assigned
Week 4	1/22/2018	Chapter 2: 2.16, 2.17	
	1/24/2018	Chapter 3: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8	HW2 Due (Ch. 1) / HW3 Assigned
Week 5	1/29/2018	Midterm #1 Examination (Chapters 1 & 2)	
	1/31/2018	Chapter 4: 4.1, 4.2	
Week 6	2/5/2018	Chapter 4: 4.3, 4.4	
	2/7/2018	Chapter 4: 4.5	
Week 7	2/12/2018	Chapter 4: 4.6	
	2/14/2018	Chapter 4: 4.7	HW3 Due (Ch. 4) / HW4 Assigned
Week 8	2/19/2018	Winter Break – No Class	
	2/21/2018	Winter Break – No Class	
Week 9	2/26/2018	Chapter 4: 4.8	
	2/28/2018	Chapter 5: 5.1, 5.2	
Week 10	3/5/2018	Chapter 5: 5.3, 5.4	HW4 Due (Ch. 4) / HW5 Assigned
	3/7/2018	Midterm #2 Examination (Chapters 3 & 4)	
Week 11	3/12/2018	Chapter 5: 5.5	
	3/14/2018	Chapter 6: 6.1, 6.2	
Week 12	3/19/2018	Chapter 6: 6.3	HW5 Due (Ch. 5) / HW6 Assigned
	3/21/2018	Chapter 6: 6.4, 6.5	
Week 13	3/26/2018	Chapter 6: 6.6, 6.7	
	3/28/2018	Chapter 6: 6.8	
Week 14	4/2/2018	Chapter 6: 6.10	HW6 Due (Ch. 6)
	4/4/2018	Midterm #3 Examination (Chapter 5 & 6)	
Week 15	4/9/2018	Final Project Presentations	
	4/11/2018	Final Project Presentations	
Week 16	4/16/2018	Final Project Presentations	
	<b>4/25/2018</b>	Final Examination (7:00pm-10:00pm)	