ECE4370 Course Syllabus

ECE4370

Antenna Engineering (3-0-0-3)

CMPE Degree

This course is Elective for the CMPE degree.

EE Degree

This course is Selected Elective for the EE degree. * (Selected Elective means this course is one of a few choices that are required for the degree.)

Lab Hours

0 supervised lab hours and 0 unsupervised lab hours

Course Coordinator

Durgin,Gregory David

Prerequisites

ECE 3025

Corequisites

None

Catalog Description

Basic theory, application, and design of a broad range of antennas.

Textbook(s)

Stutzman and Theile, *Antenna Theory and Design* (3rd edition), Wiley, 2013. ISBN 0470576642, ISBN 9780470576649 (required)

Course Outcomes

Upon successful completion of this course, students should be able to:

1. Analyze electromagnetic radiation, including near- and far-field solutions of the Hertzian dipole.
2. Define and use common antenna parameters such as impedance, efficiency, directivity, gain, beamwidth, bandwidth, etc.
3. Calculate radiation and resistance for straight-wire antennas.
4. Estimate path loss between transmit and receive antennas in realistic environments.
5. Apply simple numerical techniques to study radiative systems.
6. Identify and analyze canonical antenna types such as dipoles, monopoles, patches, helices, loops, horns, dishes, spirals, etc.
7. Interpret data from an antenna measurement system.
8. Calculate a link budget for RADAR applications
9. Analyze antenna behavior in a backscatter or load-modulation link configuration.

Student Outcomes

In the parentheses for each Student Outcome:
"P" for primary indicates the outcome is a major focus of the entire course.
“M” for moderate indicates the outcome is the focus of at least one component of the course,

but not majority of course material.
“LN” for “little to none” indicates that the course does not contribute significantly to this outcome.

1. (P) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. (M) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. (LN) An ability to communicate effectively with a range of audiences
4. (LN) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. (M) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. (M) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. (LN) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Topical Outline

1. Radiation Equations
2. Antenna Parameters
3. Patterns, Parameters, Polarization
4. Friis Transmission Equation
5. Linear Wire Antennas
6. Loop Antennas
7. Small-scale Fading
8. Propagation Modeling
9. Numerical Modeling of Antennas
10. Antenna Arrays
11. N-Element Linear Array
12. Matching Techniques
13. Helical Antennas
14. Broadband Antennas
15. Aperture Antennas
16. Horn Antennas
17. Reflector Antennas
18. Antenna Measurements
19. RADAR and Backscatter Systems