Course Charter

ECE1463 Antenna Theory 4QH

Introduces the fundamental principles of antenna theory. Applies these principles to the design and analysis of practical systems. Covers fundamental antenna parameters, radiation integrals and auxiliary potential functions, linear and loop antenna, antenna arrays, broadband dipoles and impedance matching techniques, traveling wave and broadband antennas, and frequency independent, aperture, and reflector antennas

Prerequisites: ECE1360

Textbooks: C. A. Balanis, *Antenna Theory, Analysis , and Design*, John Wiley and Sons, Inc., New York, 1997.

Reserve: R. C. Johnson and H. Jasik, *Antenna Engineering Handbook*, McGraw-Hill, New York, 1984.

Course Objectives:
Upon completion of this course, a student should:

1) be able to calculate radiation pattern, directivity, gain, and input resistance of linear and array antennas.
2) be able to calculate beam efficiency, radiation efficiency, effective area, effective length of linear and aperture antenna.
3) be able to calculate power scattering from antennas and targets.
4) be able to calculate power linkage between any two antenna systems.
5) be able to trace all of the power delivery from transmitter source to the receiver detector for simple or complex systems of antennas.

Topics Covered:

1. Antennas–Chap. 1 (1 wk)
2. Fundamental parameters of Antennas–Chap. 2 (2 wks)
3. Radiation Integrals and Auxiliary Potential Functions–Chap. 3 (2 wks)
4. Linear Wire Antennas–Chap. 4 (2.5 wks)
5. Arrays: Linear and Planar–Chap. 6 (2 wks)
6. Aperture Antennas: Rectangular Apertures–Chap. 12 (1.5 wks)

Class/laboratory Schedule: Class: 3x65 min periods/week
Lab: N/A

Contribution of course to meeting the professional component:
Engineering topics: 4 QH
General engineering component: See relation to Program Objectives below.

Relationship of course to program objectives:

Program Objective	Assessed
1.1 Formulate and solve EE problems (specified in course objectives)	HE: One midterm and one final exam graded by instructor count 75% of grade. Homeworks count 25% of grade.
1.2 Laboratory and computing tools	H: MATLAB used for homework problems
1.3 Design/conduct experiments, analyze data	N/A
1.4 Design systems, components, or processes	N/A
2.1 Understand/apply mathematics	
2.1.1 Differential Calculus	
2.1.2 Integral Calculus	H: Integrations required for directivity, gain, etc.
2.1.3 Complex algebra/analysis	H: Algebraic skills used extensively
2.1.4 Differential/Difference Equations	N/A
2.1.5 Linear Algebra	N/A
2.1.6 Multivariate Calculus	N/A
2.1.7 Probability/Stochastic Processes	N/A
2.2 Understand/apply physics	
2.2.1 Solid-state physics	N/A
2.2.2 Electricity & Magnetism	C: Used in development of antenna theory
2.3 Apply knowledge of programming	
2.3.1 Flow-charting/program design	H: Special project using MATLAB counts 10% of grade
2.3.2 Language syntax/debugging	H: MATLAB solution to microwave network problems
2.3.3 Output analysis	H: Special project and homework projects
2.4 Connect EE subfields	H: Reduction of fields to equivalent circuits
2.5 Information sources/literacy	N/A
2.6 Connect between theory and application	N/A
2.7 Connect between classroom and work/co-op	N/A
3.1 Effective written communication	N/A
3.3 Effective oral communications	N/A
3.2 Analyze information/compare alternatives	N/A
3.4 Multidisciplinary teams	N/A
4.1 Professional/ethical issues	N/A
4.2 Lifelong learning	N/A
4.3 Career management	N/A
5.1 Social/cultural context of EE	N/A
5.2 Historical/contemporary issues of EE	N/A
5.3 Esthetics in engineering	N/A
5.4 Esthetics in written/oral expression	N/A

Prepared by Carmine Vittoria, July 11, 2000