ECE 7813: Advanced Antenna Theory and Design

Course Description
Topics in Advanced Antenna Theory and Design.

Prior Course Number: ECE 711 and 815
Transcript Abbreviation: Adv Antn Thy & Des
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Graduate
Student Ranks: Masters, Doctoral
Course Offerings: Autumn
Flex Scheduled Course: Never
Course Frequency: Even Years
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Prereq: 5011 or 613, or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.
Exclusions: Not open to students with credit for 815.
Cross-Listings:

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: No
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1001
Subsidy Level: Doctoral Course

Course Goals

Analysis and design parameters pertaining to aperture, horns, lens and reflector antennas
Analysis and design parameters pertaining to printed antennas and arrays on various substrates
Analyis and design parameters pertaining to waveguide slot arrays
Analyze near field antenna measurement techniques (including compact ranges), and antenna diagnostics
Mutual coupling among antennas and arrays; antennas on platforms (such as ground vehicles and aircraft) and their coupling interactions
Smart antennas, beam steering, nulling and direction finding
Antennas for wireless communications and related applications

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Analysis and design parameters pertaining to aperture, horns, lens and reflector antennas	5.0	5.0						
Analysis and design parameters pertaining to printed patch antennas and arrays on various substrates; frequency selective surfaces; beam steering and scan blindness	5.0	5.0						
Analysis and design parameters pertaining to waveguide slot arrays	5.0	5.0						
Analysis of near field antenna measurement techniques (including compact ranges), and antenna diagnostics	5.0	5.0						
Mutual coupling among antennas; antennas on platforms (such as ground vehicles and aircraft) and their coupling interactions	5.0	5.0						
Smart antennas, beam steering, nulling and direction finding	5.0	5.0						
Antennas for wireless communications and related applications; millimeter wave antennas and related materials	5.0	5.0						
Numerical solution techniques for antennas and arrays	7.0	7.0						

Representative Assignments

problems involving apertures antennas and reflectors
problems involving horns, lens and terahetz focal plane arrays
problems involving analysis and design of printed arrays and frequency selective surfaces
problems involving measurement techniques
problems on antenna mutual coupling and array
problems involving beam steering and nulling;
problems on reconfigurable antennas; wideband arrays and metamaterial arrays
problems on design of printed antennas for wireless applications (cellular, WiMAX and GPS).
Numerical design project using computer codes and commercial tools.

Grades

Aspect	Percent
6-8 homework assignments	30%
midterm	20%
Design project on antennas and arrays	25%
Final	25%

Representative Textbooks and Other Course Materials

Title	Author
Antenna Theory: Analysis and Design	C. A. Balanis

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	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.

Course Contribution		College Outcome
**	c	An ability to design a system, component, or process to meet desired needs.
***	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 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.

Additional Notes or Comments

Updated abbreviation, prereqs, exclusions, goals and topics to conform to university format 3/29/12
Deleted Hansen text, corrected text typo, 4/3/12.

Changed exclusion to 815 instead of 711 May 7, 2012

Change transcript abbreviation to mathc title 8/27/12

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