Syllabus
ECE 5324/6324 – Spring 2020
Antenna Theory and Design
3.0 Credits

Pre-requisites:	ECE 3300
Time:	Tue/Thur 3:40 PM-5:00 PM
Location:	WEB L114
Instructor:	Professor David Schurig
Email:	david.schurig@utah.edu
Office Location & Hours:	MEB 2274, TBD
GE requirement:	no

Course Objectives
In this course, students will obtain:
1. Understanding of antenna fundamentals
2. Ability to design, and analyze the performance of, common antenna types.
3. Understand when to use analytical versus numerical techniques.

Catalog Course Description
General theory of conduction current antennas; linear antennas including dipoles and monopoles; antenna equivalent impedance; design of AM, FM, TV and shortwave broadcast antennas of one or more elements including ground and mutual impedance effects; matching techniques including lumped, shunt, and series elements, transmission lines and conjugate matching; receiving antennas; antennas used for mobile communication systems and their radiation characteristics; antenna arrays and their design; wave propagation including propagation via ionosphere or troposphere; loop antennas and Yagi-Uda arrays; antenna synthesis for specified radiation patterns. UHF and microwave antennas including corner reflector antennas, helical antennas, theory of aperture antennas including rectangular and circular apertures; broadband log-periodic antennas; microstrip antennas and phased arrays including applications for wireless communication systems; slot antennas, turnstile, horn and parabolic radiators; considerations for radar antennas and communication links. Antenna ranges and measurement techniques. Laboratory demonstrations of radiation patterns of portable wireless antennas with and without the model of the head. Visits to various antenna installations in the Salt Lake valley by groups of three students.

Required Texts
Antenna Theory and Design (3rd Edition), by Warren L Stutzman and Gary A. Thiele.

Teaching and Learning Methods
Class meeting time will used for deriving core concepts (in real time on the board), working through problems, and occasionally exploring interactive demonstrations developed in Mathematica. Students are encouraged to bring laptop computers to class to interact with the downloadable demonstrations while in class. The majority of learning will occur as students work out the assigned problem sets. Because some time will be spent working out problems in class, students will be expected to read and understand some material without the benefit of lecture.

Pre-requisites
The prerequisite for this course is ECE3300 or equivalent course that gives a fairly thorough introduction to electromagnetics and Maxwell's Equations (such as PHYS 3220 or 4420).

Grading Policy (Evaluation Methods & Criteria)
Grades will be based on: assigned problem sets and the project (~25%), and three exams (~25% x 3). The three exams will take place in class, and will be "open book" - any printed resource or online material may be used. Students must not work together on exams.

There will be six problem sets. Please consider the importance of aesthetics and clarity when submitting your work. Typeset solutions will be greatly appreciated. Also, work the problems analytically to a reasonable conclusion before plugging in the numbers. Computational systems, such as MATLAB or Mathematica are recommended for numerical, or symbolic, evaluation. (Calculators are not really useful for reliable evaluation and debugging of complex evaluations.) Students may work together on the problem set assignments, but every student must be able to explain their submitted work.

Tentative Schedule

Introduction	Chapter 1	1 lectures
Antenna Fundamentals	Chapter 2	5 lectures
Simple Radiating Systems	Chapter 3	2 lectures
February 6, Exam 1		
Simple Radiating Systems (continued)	Chapter 3	1 lecture
System Applications for Antennas	Chapter 4	2 lectures
Wire Antennas	Chapter 6	2 lectures
Broadband Antennas	Chapter 7	3 lectures
March 19, Exam 2		
Array Antennas	Chapter 8	3 lectures
Low Profile Antennas and Personal Communication Antennas	Chapter 11	3 lectures
Terminal and Base Station Antennas for Wireless Applications	Chapter 12	2 lectures
April 29, Exam 3		

Academic Integrity
Students may work together on projects, but every student must be able to explain their submitted work. Students are expected to exhibit integrity in their conduct and are subject to the University of Utah Code of Student Rights and Responsibilities (http://www.regulations.utah.edu/academics/6-400.html).

Americans with Disabilities Act (ADA) Statement
The Americans with Disabilities Act. The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581--5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services. (http://disability.utah.edu)

Addressing Sexual Misconduct
Title IX makes it clear that violence and harassment based on sex and gender (which Includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801−581−7066. For support and confidential consultation, contact the Center for Student Wellness, SSB 328, 801-581-7776. To report to the police, contact the Department of Public Safety, 801−585−2677(COPS).

Wellness Statement
Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness -(https://wellness.utah.edu)

Campus Safety
The University of Utah values the safety of all campus community members. To report suspicious activity, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.