Course web page: Blackboard

Class meets TTh 9:30-11:00 in ENS 116                                      Unique No. 15750

Professor: Hao Ling                                                    Office Hrs: T 11:00-1:00
Office: ENS 622                                                      Th 11:00-12:30
Phone: 471-1710                                                    all other times by appointment
e-mail: ling@ece.utexas.edu

Text: There will be no required text in this course. The lecture materials will be delivered in class and made available on the web. It is therefore very important that you always attend class.


Prerequisites: EE 325 with a grade of at least C.

Grading: 2 75-min. tests 48%
       Homework (~11) 17%
       3-hour final 35%

Course Objectives: We shall examine the fundamental solutions of time-varying Maxwell's equations and apply them to design antennas and understand radio wave propagation phenomena in modern communication and radar systems. Three major topics will be covered: 1) fundamentals of electromagnetic radiation with application to antenna theory and design, 2) electromagnetic wave propagation, scattering and diffraction, with application to understanding wireless communication channels, and 3) numerical and asymptotic methods for simulating complex electromagnetic wave interactions in real-world scenarios.
Course Outline:

1. Introduction and Review (2 lectures)
   Electromagnetic spectrum, Maxwell's equations, constitutive relations,
   Poynting’s theorem, time-harmonic fields

2. Plane Wave Propagation (7 lectures)
   Plane wave solution, dispersion relation, polarization, waves in materials,
   boundary conditions, reflection and transmission at media interfaces, Fresnel
   coefficients, Brewster's angle, total internal reflection

3. Antenna Theory and Design (11 lectures)
   Radiation from sources, antenna parameters, wire antennas, aperture theory,
   horns and reflector antennas, phased arrays, Friis transmission formula,
   receiving properties of antennas, impact of antenna performance in
   communication links, radar principles

4. Numerical and Asymptotic Methods for Wave Propagation and Scattering
   (6 lectures)
   Finite difference time-domain method, absorbing boundary condition, stability
   condition, geometrical optics, diffraction from knife edges, propagation channel
   characteristics for satellite and terrestrial communications

Homework Policies:

- Homework will usually be assigned on Tuesday and due the following Tuesday by
  2:00 pm in ENS 622.

- Solution will be posted on the course web page.

- HW#10 is a numerical assignment to solve Maxwell’s equations on the computer.
  For this assignment, you will need access to one of the following software: matlab,
  mathcad, C, Fortran or Basic compiler.

- The lowest homework score will be dropped in computing the final grade. The grade
  for the numerical homework (HW#10) will NOT be dropped, however.

- No late homework will be accepted. No excuses.

- Show relevant steps and circle your final answer.

- You should and must do your own work. Copying other people's work or letting
  others copy your work is considered as scholastics dishonesty and will not be
  tolerated under any circumstances.
Exams:

- There will be 2 in-class exams and 1 comprehensive final.

  Tentative Test Dates:    Test 1  10/13
                         Test 2  11/22

  Final Exam:            Thursday, Dec. 15, 9-12 am.

- You are expected to be present for every test. No make-up exams will be given.

- Additional office hours will be scheduled before each exam.

- Cheating will be dealt with in as severe a manner as possible. The minimum penalty for cheating is an 'F' in EE325K.