Spring 2013 Overview:

Students will gain a solid foundation in formulating and solving electromagnetics problems computationally. Emphasis will be on three of the most popular computational electromagnetic techniques: the finite-difference time-domain (FDTD) method, the method of moments (MoM), and the finite element method (FEM). Student will complete a series of hand-written programming assignments. For students who already or may use commercially available electromagnetic software, this course will provide an understanding of the internal workings of such “black box” programs.


Additional Texts: (on reserve at the Marriott library)

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Office Hours: Wed. 1:25 – 2:45 or by appointment
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Prerequisites: ECE 3300 (Intro to EM) and ECE 3500 (Signals and Systems) or instructor approval.
Students will use a programming language of choice (MATLAB is highly recommended, but C/C++ or FORTRAN are also permitted).
General familiarity with one of these programming languages is required (code structure, do and if loops, etc.).

Lectures: Mondays 1:25 – 2:45 pm in MEB 2555
Attendance is mandatory.
ECE 5340 vs. 6340: The content of lectures is the same for both courses. However, ECE 6340 students will have some additional requirements, including generating more two-dimensional programs versus one-dimensional, extra required readings, and higher expectations for the final project.

Grading: Series of programming assignments (60%) – each student must carry out and turn in his or her own solutions (collaborations should be restricted to discussions only!). In-class quizzes (10%). Final project and video presentation (25%). Participation and attendance (5%).

NOTE: Each of the homework assignments MUST be submitted as a single PDF document to the TA that includes your figures along with the codes used to generate your results.

General Course Outline:
For more detailed course information, go to www.ece.utah.edu/~simpson/ECE5340_6340.html

(1) **Introduction to computational electromagnetics**
(2) **FDTD:**
   1-D scalar wave equation (Chpt. 2)
   1-D and 2-D Yee algorithm (Chpt. 3)
   Numerical dispersion and stability (Chpt. 4)
   Boundary conditions (ABC’s and PML’s) (Chpt. 6-7)
   Incident wave source conditions (Chpt. 5)
   Near-to-far-field transformation (NTFF) and DFT’s (Chpt. 8)
   Materials (Chpt. 9)
(3) **FEM:**
   1-D boundary-value problems
   Method of Weighted Residuals: The Galerkin Approach
   Imposition of boundary conditions
   Higher-order interpolation functions, nodal elements
   2-D boundary-value problems
   Vector elements
(4) **MOM**
   Green’s functions
   Time-harmonic integral equations
   Method of Weighted Residuals
   Basis / Expansion Functions
   Accuracy
   Computational considerations
   Integral equations for wire antennas
Teamwork: Teamwork is encouraged. You may help each other by studying together and exchanging ideas and possible approaches on the homeworks and final project. However, each student is required to write his/her own code, solve his/her own homework exercises, turn in an individual homework, and individual report on the final project.

College of Engineering Guidelines: Additional guidelines that govern all courses in the University of Utah College of Engineering are found here: http://www.coe.utah.edu/guidelines.pdf

Your comments and feedback are appreciated! Please drop a note in the homework box or talk to me in person about what I can do to help you in this course.

Cheating Policy: Just don't.

Here are some things that constitute cheating:

Copying someone else's homework solution. It is OK to study topics together, but each student should individually solve each homework problem on his/her own.

Copying someone else's code. It is OK to work together, but each student should write and comment their own code.

Copying someone else's code (such as off the web, out of another book, etc.). It is OK to seek and use reference material to help you understand a code or method. In the homework projects, you should write all of the code yourself. It is ok to reuse code if it is your own. In the final project, you may use code written by others (including commercial software packages). If you use a piece of code/software from any source other than your own creation, you MUST reference it, giving the other author full credit for that work.

What happens if you cheat? Under UofU policy (http://www.saff.utah.edu/code.html), you could receive an F in the class, be suspended from school, be fined, or be expelled from the university. So just don't cheat.

What happens if someone else cheats? Statistically, this could lower YOUR grade. Please tell the instructor or any other professor or TA (anonymously is fine) if you see instances of cheating in this or any other class. The ECE Department is committed to reducing instances of cheating in our labs and classes in order to provide the best possible education for all students.