EE 525 – *Intro to Computational Electromagnetics*

Fall 2011

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Office hours: Mon. 2 - 3 p.m., Wed. 2 - 3 p.m., or by appointment

Meeting Time: The course will meet TR in Room 465 FPAT from 2:00 – 3:15 p.m.

EE525 URL: http://www.engr.uky.edu/~gedney/courses/ee525

Textbook: *The Method of Moments in Electromagnetics*, Walton C. Gibson, Chapman and Hall, CRC (**ISBN-10:** 1420061453).

Homeworks

Homeworks and will be assigned based on the lecture material and outside reading. The due date will vary with the length of each assignment. The homeworks and due dates will be posted on the course web page. All assignments are due at the *beginning* of the class period. You will be allowed one late assignment, which will be due the following class period. Otherwise, late assignments will not be accepted. Some homeworks will require computer simulations, which can be performed using mathematical software such as Matlab, MathCad, Maple, or Mathematica, or can be performed using a high-level programming language. Graphical results are expected to be computer generated and printed on a laser or ink-jet printer.

Computer Projects

There will be 5 computer projects assigned during the course of the semester, including a final project. The computer projects involve the development of computer programs. These programs must be written using a high-level language such as Matlab, FORTRAN, C, or C++. Each project requires a brief report succinctly describing the theory, the numerical technique, and validating results. The functional program should be emailed to the instructor prior to the class period the program is due. One late project will be allowed, which is due the following class period. Else, late programs will lose 10 % credit per day late.

The computer projects will be done individually. Students can consult with colleagues regarding there projects. However, their programs and reports must be their own work. Students must email a working version of their programs along with a test case to the instructor for each project. This is due by the class period the project is due.

Grading Scheme

	Homeworks	Computer Projects	Final Project
% of Final Grade	20 %	50 %	30 %

Grading Assignment will be based on your final grade for the course based on the quizzes, homeworks, midterm project and final exam, as outlined above. There will be no curving of grades. The letter grade assignment will then be calculated according to the table below.

Final Grade	Letter Grade
90-100 %	A
80-90 %	B
70-80 %	C
60-70 %	D
Below 60 %	E

Topical Outline

Week#	Lec#	Date	Section	Topic
1	1	8/25	Chap 1	Introduction to Computational Electromagnetics
2	2	8/30	3.4	Solution to Linear Systems of Equations – Direct Methods
	3	9/1	3.4	Pivoting, condition number, Errors
3	4	9/6	9.1	Numerical Integration
	5	9/8	9.2	Numerical Quadrature & Orthogonal Polynomials
4	6	9/13	2.1-2.2	Maxwell's Equations & Source/Field Relationships
	7	9/15	2.3-2.4	Vector Potentials & Green's Functions
5	8	9/20	2.6	Duality, The Equivalence Principal
	9	9/22	2.6	Equivalence Principal II
6	10	9/27	2.7	The Electric Field Integral Equation (EFIE) & Magnetic Field IE (MFIE)
	11	9/29	3.1, 3.2	The Method of Weighted Residuals (*a.k.a.* The Method of Moments) – a static example
7	12	10/4	5.1	TM-Wave Scattering by Conducting Cylinders (EFIE)
	13	10/6	3.3	Basis and Testing Functions
8	14	10/11	Notes	Analytical Solution: TM/TE-Wave Scattering by a Conductor Cylinder
	15	10/13	5.2.1	TE-Wave Scattering by Conducting Cylinders (MFIE)
9	16	10/18	5.1.3	TE-Wave Scattering by Conducting Cylinders (EFIE)
	17	10/20	5.1.4	TE-Wave Scattering by Conducting Cylinders (EFIE) II
10	19	10/25	Notes	Interpolation Error & Convergence
	18	10/27	4.1-4.2	Thin Wire Approximation and Excitations of thin-wires
12	20	11/1	4.3-4.4	Hallen's and Pocklington's Thin Wire Equations
	21	11/3	4.5	Method of Moment Solution of the Thin-Wire Equation
13	22	11/8		Evaluating the thin-wire kernel
	23	11/10	4.6	Applications of thin-wire approximations
14	24	11/15	7.1-7.2	3D Meshing and the Rao-Wilton-Glisson (RWG) basis for interpolating surface currents on triangles
	25	11/17	7.3	The EFIE for 3D conducting surfaces
16	26	11/22	7.3.2	Integrating singular kernels on a triangle
	40	11/24		**ThanksGiving** – No Class
17	27	11/29	7.3	The MoM solution of the 3D EFIE
	28	12/1	7.4	The MFIE for 3D geometries
18	29	12/6	7.4	The MoM solution of the 3D MFIE
	30	12/8		Applications of 3D modeing EFIE/MFIE/CFIE
		12/15		(Thursday) Final Presentation – 10:30 am