

EEL 3472C

ELECTROMAGNETIC FIELDS AND APPLICATIONS I

Spring 2019

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Office Hours: M, W, F, 3:00-4:00 p.m., NEB 553

Teaching

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Office Hours: TBA

4 credits, M,W,F, 7th period (1:55 – 2:45 p.m.)

Room: LAR 330

Lab: NEB 211 (Castrense Nigrelli)

Website:

<http://www.rakov.ece.ufl.edu/teaching/3472.html>

EEL 3472C Electromagnetic Fields and Applications I

Spring 2019

Text: F.T. Ulaby and U. Ravaioli, Fundamentals of Applied Electromagnetics, 7th edition, Pearson, 2015

V.A. Rakov, Electromagnetic Fields and Applications I, Course Packet, available at

<http://www.rakov.ece.ufl.edu/teaching/3472.html>

Course Section	Number of Lectures	HW Due	Test	Chapter(s) in Text (Ulaby)
Introduction	1	-	-	1
1. Transmission Lines	7	TBA	TBA	2
2. Review of Vector Analysis	4	TBA	TBA	3
3. Electrostatics	7	TBA	TBA	4
4. Magnetostatics	5	TBA	TBA	5
5. Time-Varying Fields	8	TBA	TBA	6, 5.7, 7.5
6. Electromagnetic Waves	5	TBA	-	7, 8
Review	1	-	-	1-8
Final Exam, Group TBA (LAR 330)	-	-	TBA	1-8

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INTRODUCTION - 1 lecture

1. TRANSMISSION LINES - 7 lectures

- Transmission line equations (lossless line)
- Sinusoidal waves
- Characteristic impedance
- Reflection and transmission; standing wave
- Attenuation and dispersion (lossy lines)
- Non-sinusoidal waves (bounce diagram)

2. REVIEW OF VECTOR ANALYSIS - 4 lectures

- Vector addition and subtraction
- Dot and cross products
- Line and surface integrals
- Introduction to differential operators
- Cartesian, cylindrical, and spherical coordinates

3. ELECTROSTATICS - 7 lectures

- Coulomb's law and electric field intensity
- The source equation; divergence

- Gauss' law
- Ohm's law
- Electrostatic energy and potential; gradient
- Capacitors
- Boundary condition on the normal electric field
- Laplace's and Poisson's equations; Laplacian
- Method of images

4. MAGNETOSTATICS - 5 lectures

- Biot-Savart law
- Curl
- Magnetic vector potential
- Ampere's circuital law
- Magnetic field boundary conditions

5. TIME-VARYING FIELDS - 8 lectures

- Continuity equation
- Displacement current
- Faraday's law
- Boundary condition on the tangential electric field
- Inductance
- Maxwell's equations
- Skin effect; surface impedance

6. ELECTROMAGNETIC WAVES - 5 lectures

- Free space wave equation
- Characteristics of plane waves
- Polarization
- Poynting's theorem
- Reflection at normal incidence

REVIEW – 1 lecture

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Tests are given for the **first five major sections** of the course (Transmission lines, Vector analysis, Electrostatics, Magnetostatics, and Time-varying fields). Tests are graded by TA, and each test accounts for **10%** of the overall grade for the course so that all five tests account for **50%** of the overall grade. Tests are not returned to students. You will have one week after posting the grades to discuss your grade with TA.

Home assignments are given for each of the **six major sections of the course (the five indicated above plus Electromagnetic waves)**. Home work turned in after **2:00 p.m.** on the due date is not accepted. Home work is graded by TA, and each assignment accounts for **3%** of the overall grade for the course so that all six home works account for **18%** of the overall grade. Solutions of home assignment problems are posted on the course website after the home assignment due date. Home works are returned to students.

Final exam is **comprehensive** and accounts for **20%** of the overall grade for the course. The final exam is graded by TA and reviewed by the instructor. Problems on the final exam are of the same level of difficulty as those on the home assignments and tests. Exams are not returned to students.

$G = 0.1(T1 + T2 + T3 + T4 + T5) + 0.03(HA1 + HA2 + \dots + HA6) + \underline{0.12L} + 0.2F$, where L is the Lab grade

$\geq 90\% \rightarrow \mathbf{A}$; $\geq 86.67\% \rightarrow \mathbf{A-}$; $\geq 83.33\% \rightarrow \mathbf{B+}$; $\geq 80\% \rightarrow \mathbf{B}$;

$\geq 76.67\% \rightarrow \mathbf{B-}$; $\geq 73.33\% \rightarrow \mathbf{C+}$; $\geq 70\% \rightarrow \mathbf{C}$; $\geq 66.67\% \rightarrow \mathbf{C-}$;

$\geq 63.33\% \rightarrow \mathbf{D+}$; $\geq 60\% \rightarrow \mathbf{D}$; $\geq 56.67\% \rightarrow \mathbf{D-}$; $< 56.67\% \rightarrow \mathbf{E}$