EEL 3472C

ELECTROMAGNETIC FIELDS AND APPLICATIONS I (FUNDAMENTALS OF ELECTROMAGNETIC FIELDS)

Fall 2020

Instructor: Dr. Vladimir A. Rakov, NEB 553
Tel. 392-4242
E-mail: rakov@ece.ufl.edu

This course is presently scheduled to be 100%, including Lectures, Office Hours, and Lab, online (taught via Zoom)

Lectures (via Zoom): MWF, 5th period (11:45 am–12:35 pm)

Rakov's Office Hours: M, W, F, 12:40-2:00 p.m. (via Zoom)

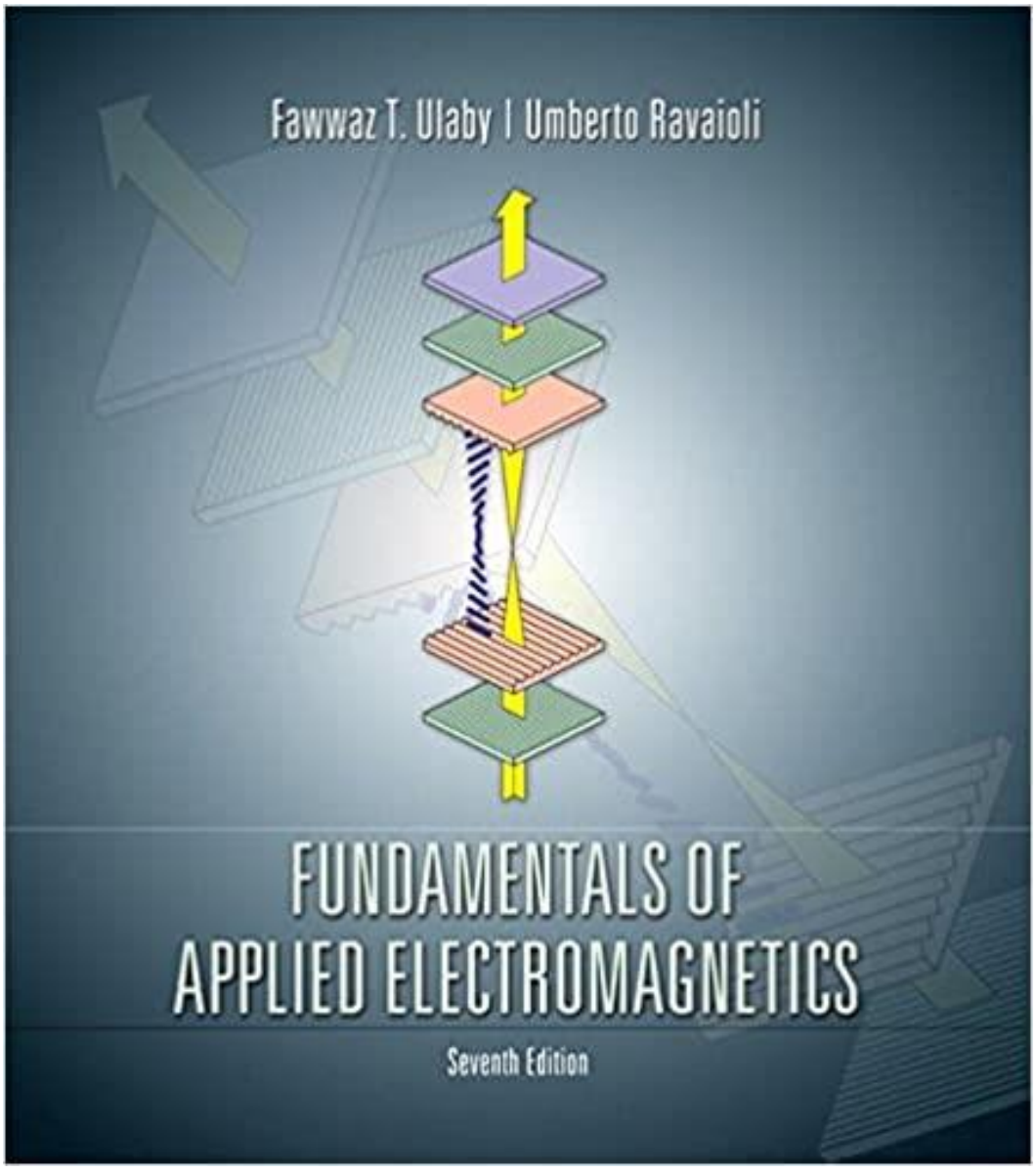
Teaching Assistant: Ziqin Ding
Tel. 352-792-7643
E-mail: jesse_threon@hotmail.com

TA Office Hours: Thursday, 3:00-4:00 p.m. (via Zoom)

Lab Instructor: Dr. Daniel Kotovsky,
E-mail: dakotovsky@ufl.edu

Course Website:
http://www.rakov.ece.ufl.edu/teaching/3472.html

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



Book Website:
www.pearsonhighered.com/ulaby

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V.A. Rakov, Electromagnetic Fields and Applications I, Course Packet (**Lecture Slides**), available at **http://www.rakov.ece.ufl.edu/teaching/3472.html**

Time Table is subject to change, depending on the COVID-19 situation

Course Section	Number of Lectures	HA Given	HW Due	Chapter(s) in Text (Ulaby)
Introduction	1	-	-	1
1. Transmission Lines	7	09/21	09/23	2
2. Review of Vector Analysis	5	10/05	10/07	3
3. Electrostatics	7	10/19	10/21	4
4. Magnetostatics	5	11/02	11/04	5
5. Time-Varying Fields	8	11/20	11/23	6, 5.7, 7.5
6. Electromagnetic Waves	6	12/07	12/09	7, 8
Review	1	-	-	1-8
Final Exam (**format to be announced later**) Group 18C	-	-	12/18 (12:30-2:30 p.m.)	1-8

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Home assignments (take-home tests) will be both posted on the Course Website (http://www.rakov.ece.ufl.edu/teaching/3472/homeworks.html) under "Homework" and on Canvas Assignment for each of the **six major sections of the course (Transmission lines, Vector analysis, Electrostatics, Magnetostatics, Time-varying fields, and Electromagnetic waves)**. Homework is to be submitted via Canvas (from Assignment) and will be restricted from submission after **11:45 a.m.** on the due date. Homework is graded by TA, and each homework accounts for 10% of the overall grade for the course so that all six homeworks account for **60%** of the overall grade. Solutions of home assignment problems are posted both on the Course website under "Solutions" and Canvas Files after the homework due date. Grades are also posted under "Grades" and Canvas Files. Graded homeworks can be requested from TA via E-mail (jesse_threon@hotmail.com).

Final exam (**format to be announced later**) 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. Final exams are not returned to students.

Overall grade for the course is computed as follows:

G = 0.1(HW1+HW2+...+HW6) + 0.2F + 0.2L, where HW are homework grades, F is the Final Exam grade, and L is the Lab grade

Conversion of percent grade to letter grade:

Percent	Grade	Grade Points
≥90	A	4.00
≥86.67	A-	3.67
≥83.33	B+	3.33
≥80	B	3.00
≥76.67	B-	2.67
≥73.33	C+	2.33
≥70	C	2.00
≥66.67	C-	1.67
≥63.33	D+	1.33
≥60	D	1.00
≥56.67	D-	0.67
<56.67	E	0.00

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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 - 5 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 law
- Magnetic field boundary conditions

5. TIME-VARYING FIELDS - 8 lectures
- Continuity equation
- Displacement current
- Faraday's law
- Inductance
- Boundary condition on the tangential electric field
- Maxwell's equations
- Skin effect; surface impedance

6. ELECTROMAGNETIC WAVES - 6 lectures
- Free space wave equation
- Characteristics of plane waves
- Polarization
- Poynting's theorem
- Reflection at normal incidence

REVIEW – 1 lecture