



## ENGR350 Engineering EM

Spring 2014

### Bulletin Description:

ENGR 350: Introduction to Engineering Electromagnetics (3 units)  
Transmission lines. Vector Analysis. Static electric fields. Static magnetic fields

### Prerequisite:

A grade of C- or better in MATH 245 and PHYS 240

### Prerequisites by Topic:

- (1) Knowledge of electric circuit theory
- (2) Basic knowledge of vector algebra

### Textbook

Ulaby, Michielssen, Ravaioli, "Fundamentals of Applied Electromagnetics", 6E, Prentice Hall.

### References

Simon Ramo, John R. Whinnery, Theodore Van Duzer, "Fields and Waves in Communication Electronics" 3<sup>rd</sup> Edition, John Wiley, 1993  
David Pozar, "Microwave Engineering" 4th Edition, John Wiley 2010.

### Coordinator:

Hao Jiang, Assistant Professor of Electrical Engineering

### Instructor:

Hao Jiang, Ph.D.

Office: Sci 213C; Office Hours: W: 2-5 pm, or by appointment

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### Course Objectives<sup>1</sup>:

- (1) Introduce students to transmission lines and develop students' understanding of lossy, lossless, and distortionless transmission lines. [A.1, A.2, B.1]
- (2) Enable students to understand vector analysis calculations with gradient, divergence, curl and their application to electrostatic problems. [A.1, A.2, B.1]
- (3) Develop students' understanding of magnetostatics and boundary conditions. [A.1, A.2, B.1]

<sup>1</sup>Indices in brackets refer to educational objectives and outcomes of the School of Engineering.



## Topics:

1. Introduction (complex numbers, phasors, traveling waves, the electromagnetic spectrum).
2. Transmission lines (lumped-element model, transmission line equations, lossless and lossy transmission lines, input impedance, power flow, the Smith chart, terminations and impedance matching, transients on transmission lines).
3. Vector analysis (vector algebra, coordinate systems and transformations, vector calculus).
4. Electrostatics (electrostatic fields, electrostatic boundary value problems).
5. Magnetostatics (magnetostatic fields, magnetic forces, materials and devices).

## Professional Component:

Engineering Sciences: 100%  
Engineering Design: 0%

## Performance Criteria<sup>2</sup>:

### Objective 1

- 1.1 The students understand which line is lossless, which is lossy, and which is distortionless. [1, 2, 3]
- 1.2 Given two of the three parameters (characteristic impedance, load impedance, voltage reflection coefficient), the student determines the third parameter. [1, 2, 3]
- 1.3 The student determines the voltage reflection coefficient at the load, and the voltage reflection coefficient at the generator. [1, 2, 3]
- 1.4 The student finds the values of the maximums and minimums of the voltage and current on the line, and the locations of all maximums and minimums. [1, 2, 3]
- 1.5 The student determines the power delivered to the line and the power delivered to the load. [1, 2, 3]

### Objective 2

- 2.1 The student calculates gradient, divergence, and curl. [1, 2, 3]
- 2.2 Given the charge, the student determines the intensity of the electric field and the electric potential. [1, 2, 3]
- 2.3 The student is able to apply boundary conditions. Given the field in one medium, the student finds the field in the other medium. [1, 2, 3]

### Objective 3

- 3.1 The student finds the magnetic force and the magnetic torque. [1, 2, 3]
- 3.2 Given the current, the student finds the magnetic field and the magnetic vector potential. [1, 2, 3]



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3.3 The student is able to apply boundary conditions for magnetic fields. Given the field in one medium, the student finds the field in the other medium. [1, 2, 3]

<sup>2</sup> Numbers in brackets refer to evaluation methods used to assess student performance.

## Evaluation:

Item	Points	Comments
Attendance	6	Random attendance checking
Homework	8	Each homework assignment is 1 points; No late homework will be accepted;
Review	16	Each Review is 2 points Attendance counts 1 point; Performance counts 1 points
Mid Term 1	20	50 min
Mid Term 2	20	50 min
Final	30	2.5 hours

## Rules:

1. No late homework will be accepted.
2. There are more than 10 quiz, but the total score of the quiz will be capped as 20%
3. **If you miss 3 attendance (counted by homework and quiz) consecutively, YOU WILL BE DROPPED.**
4. The final result in the exam must be written in ink-pen with a circle or a box.
5. All exams are closed book. No electronic devices (cellular phones, iPad, etc.) allowed, except for a basic calculator.
6. No make-up exams and no incomplete grades without a serious and verifiable medical justification

Exam	Date	Time	Total of Grade
Mid Term 1	TBD	9:10-10:00	20%
Mid Term 2	TBD	9:10-10:00	20%
Final	5/21(Wed)	8:00-10:30	30%



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Table 3: The letter grade is based on the following table.

A	A-	B+	B	B-
>90%	85% ~ 89%	80% ~ 84%	75% ~ 79%	70% ~ 74%

C+	C	C-	D+	D	D-
65%~69%	60%~64%	55%~59%	50%~54%	45%~49%	40%~45%

## Disability Statement Policy

Students with disabilities who need reasonable accommodations are encouraged to contact the instructor. The Disability Programs and Resource Center (DPRC) is available to facilitate the reasonable accommodations process. The DPRC is located in the Student Service Building and can be reached by telephone (voice/TTY 415-338-2472) or by email ([dprc@sfsu.edu](mailto:dprc@sfsu.edu)). For more information, please check <http://www.sfsu.edu/~dprc>.

## Observance of Religious Holidays:

I will make reasonable accommodations for students to observe religious holidays when such observances require students to be absent from class activities. Please inform your absence ahead of the time so that I can make some arrangements.