

1. *Course number and name*

ENGR 350: Introduction to Engineering Electromagnetics

2. *Credits and contact hours*

3 credit hours

3. *Instructor's or course coordinator's name*

Instructor: Dr. P. Y. Chen

Course coordinator: Hao Jiang, Associate Prof. in EE

4. *Text book, title, author, and year*

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

5. *Specific course information*

a. *brief description of the content of the course (catalog description)*

Transmission lines. Vector Analysis. Static electric fields. Static magnetic fields.

b. *prerequisites or co-requisites*

Grades of C- or better in MATH 245 and PHYS 240

c. *indicate whether a required, elective, or selected elective course in the program*

Required for Electrical Engineering and Computer Engineering

6. *Specific goals for the course*

a. *Specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.*

- Introduce students to transmission lines and develop students' understanding of lossy, lossless, and distortionless transmission lines.
- Enable students to understand vector analysis calculations with gradient, divergence, curl and their application to electrostatic problems.
- Develop students' understanding of magnetostatics and boundary conditions.

b. *Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.*

- The students understand which line is lossless, which is lossy, and which is distortionless.

- Given two of the three parameters (characteristic impedance, load impedance, voltage reflection coefficient), the student determines the third parameter.
- The student determines the voltage reflection coefficient at the load, and the voltage reflection coefficient at the generator.
- 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.
- The student determines the power delivered to the line and the power delivered to the load.
- The student calculates gradient, divergence, and curl.
- Given the charge, the student determines the intensity of the electric field and the electric potential.
- The student is able to apply boundary conditions. Given the field in one medium, the student finds the field in the other medium.
- The student finds \mathbf{e}_h magnetic force and the magnetic torque.
- Given the current, the student finds the magnetic field and the magnetic vector potential.
- 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.

7. *Brief list of topics to be covered*

- Introduction (complex numbers, phasors, traveling waves, the electromagnetic spectrum).
- 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).
- Vector analysis (vector algebra, coordinate systems and transformations, vector calculus).
- Electrostatics (electrostatic fields, electrostatic boundary value problems).

Magnetostatics (magnetostatic fields, magnetic forces, materials and devices).