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.*
      Course addresses ABET Student Outcome(s): a, c, e
      - 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 eh 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).