Engineering Science (E SC)

E SC 400H Electromagnetic Fields (3) Irrotational and solenoidal fields, potentials, vector and scalar field and wave equations, harmonic and wave functions in various coordinates, radiation.

E SC 400H Electromagnetic Fields (3)

E SC 400H is a required senior-level course for students pursuing a bachelor's of Engineering Science. At the conclusion of this course, students will be able to:
1. Apply the basic principles of electrostatics, such as Coulomb's Law, electric field intensity, electric flux density, Gauss's Law, the concepts of divergence and gradient, and potential functions to solve basic and applied problems.
2. To compute resistance and capacitance for a variety of geometric configurations.
3. They will apply the basic principles of steady magnetic fields, such as the Biot-Savart Law, Amper6s Circuital Law, magnetic flux and flux density, Stoke's Theorem and the concept of the curl and Maxwell's equations for static electric and steady magnetic fields to solve basic and applied problems.
4. Compute self and mutual inductance for a variety of geometric configurations.
5. Understand the necessary modifications of Maxwell's equations for time varying fields including Faraday's Law and the concept of displacement current and apply these to solve basic and applied problems.
6. Understand the solutions of the reduced wave equation, for time-harmonic excitations, for plane wave propagation in both perfect and lossy dielectrics, the concepts of skip depth and wave polarization, plane wave reflection at planar boundaries, Snell's Law, Brewster's angle, and the concept of standing wave ratio and apply these to solve basic and applied problems.
7. Understand the basic principles of waves on transmission lines and apply these to solve basic and applied problems.

Topics include: Vector Analysis; Coulomb's Law and Electric Field Intensity; Electric Flux Density, Gauss's Law, and Divergence; Energy and Potential; Conductors, Dielectrics, and Capacitance; Poisson's and Laplace's Equations; the Steady Magnetic Field; Magnetic Forces, Materials, and Inductance; time-Varying Fields and Maxwell's Equations; the Uniform Plane Wave; Waves at Boundaries and in Dispersive Media. A typical course assessment includes homework assignments, mid-semester examinations and a final examination. The course is offered, in a lecture format, each spring at the University Park Campus. A typical enrollment is 25-30 students. This course is not a prerequisite for other courses.

General Education: None
Diversity: None
Bachelor of Arts: None
Effective: Fall 2003
Prerequisite: **E E 210(/bulletins/bluebook/university_course_descriptions.cfm?letter=E&courselong=E_E|210|latest)**, **MATH 250(/bulletins/bluebook/university_course_descriptions.cfm?letter=E&courselong=MATH|250|latest)**

Note : Class size, frequency of offering, and evaluation methods will vary by location and instructor. For these details check the specific course syllabus.