

SAMPLE SYLLABUS

This syllabus is to be used as a guideline only. The information provided is a summary of topics to be covered in the class. Information contained in this document such as assignments, grading scales, due dates, office hours, required books and materials may be from a previous semester and are subject to change. Please refer to your instructor for the most recent version of the syllabus.

ABET Course Syllabus EEE241

1. **Course: EEE 241 Fundamentals of Electromagnetics**
2. **Credits and Contact Hours:** 3 Credit Hours (lecture), Topics: Engineering
3. **Course Coordinator:** ECEE Undergraduate Committee
4. **Textbook:** Cheng, *Field and Wave Electromagnetics*.
Supplemental materials: None
5. **Specific course information**
 - a. **Catalog description:** Vector analysis, differential operators, Fourier analysis, scalar, vector fields, electro/magneto statics, time-varying fields, boundary value problems, dielectric, magnetic materials, Maxwell's equations.
 - b. **Prerequisites or co-requisites:** EEE 202; MAT 267, 274 (or 275); PHY 131, 132.
 - c. **Required/elective/selected elective:** Required
6. **Specific goals for the course**

Students can apply fundamental electromagnetic theory to the solution of practical problems.

 - a. **Outcomes of instruction:**
 - i. Students understand the application of Vector Differential and Integral operators to Electromagnetic Theory.
 - ii. Students understand the fundamentals of Electrostatics
 - iii. Students understand the fundamentals of Magnetostatics
 - iv. Students understand the characteristics of materials and their interactions with electric and magnetic fields
 - v. Students recognize Maxwell's equations
 - b. **Outcomes of Criterion 3 addressed by the course:**

(1) advanced mathematics, vector differential calculus and understanding solutions of differential equations. Class also involves some modeling and general problem solving methodologies.

(1,2,6) modern software tools such as MATLAB and MathCAD are utilized.
7. **Brief list of topics to be covered**
 1. Coordinate Systems and Vector Fields (1 week)
 2. Vector differential and integral operators (1/2 week)
 3. The Electrostatics of the D-field (1/2 week)
 4. First alternative to Gauss' Law for non-symmetric charge distributions: Linear superposition of solutions already obtained (1 week)
 5. Second alternative to Gauss' Law: Integration over sources to calculate the D-field of symmetric and non symmetric charge distributions (1 week)
 6. Third alternative to Gauss' Law: The potential function (1 week)
 7. Boundary value problems I: Method of Images (1 week)
 8. Boundary Value Problems II: Laplace's equation. (incl. Fourier Series Solution.) (1 week)
 9. Capacitance (1/2 week)
 10. Real (complex) materials: Dispersive permittivity (1/2 week)
 11. The electromagnetic field of a moving charge and the concepts of Current and Magnetic field (1/2 week)
 12. Maxwell's first Curl Equation aka Ampere's law (1/2 week)
 13. Using Ampere's Law in integral form to obtain the magnetic fields of highly symmetric current distributions (1 week)

14. Second alternative to Ampere's Law, integration over current elements (1 week)
15. Third alternative to Ampere's law, the vector potential (1/2 week)
16. Force and energy in the magnetic field (1/2 week)
17. Inductance (1 week)
18. Maxwell's second Curl equation aka Faraday's Law (incl. EMI) (1 week)
19. Recap of Maxwell's equations (1 week)

Computer Usage: Students use MATLAB or MathCAD to develop and visualize solutions to moderately complicated field problems.

Laboratory Experiments: None.

Course Contribution to Engineering Science and Design: This is a core course required of all EE majors. Electricity and magnetism is a necessary foundation for all subsequent courses in circuits, power, electromagnetics, and solid-state electronics.

Person preparing this description and date of preparation: K. Tsakalis, June, 2021.