**ELCT 361 - Electromagnetics I**

CREDITS/CONTACT HOURS: Credits: 3, Contact Hours: 39

COORDINATOR: Dr. Mohammod Ali

TEXTBOOK:

SUPPLEMENTAL MATERIALS:
None.

CATALOG DATA:
Prerequisite: PHYS 212, MATH 241, ELCT 222. Three lectures per week each 50 minutes.
USC Bulletin Description: Basic concepts of electric and magnetic fields, including electrostatics, magnetostatics, and quasi-statics with computer applications.

REQUIRED/ELECTIVE:
Required

TOPICS COVERED:
- Vector Analysis (4 hrs)
- Coulomb’s Law and Electric Field Intensity (5 hrs)
- Electric Flux Density, Gauss’s Law, and Divergence (5.5 hrs)
- Energy and Potential (6.5 hrs)
- Current and Conductors (1.5 hrs)
- Dielectrics and Capacitance (2.5 hrs)
- Poisson’s and Laplace’s Equations (1.5 hrs)
- The Steady Magnetic Field (6.5 hrs)
- Magnetic Forces, Materials, and Inductance (4 hrs)
- Time Varying Fields and Maxwell’s Equations (2 hrs)

COURSE OUTCOMES:

The student will:
1. Demonstrate competency in understanding the symbols, units and dimensions used in electromagnetics (a, e)
2. Show ability in calculating, transforming, and converting vector quantities in spherical, cylindrical, and Cartesian coordinate systems. For instance, dot and cross products, gradient, divergence, curl, and the various electromagnetic theorems, such as the Divergence Theorem and Stokes Theorem (a, e)
3. Demonstrate ability to calculate electric and magnetic fields and potentials arising from static sources (charges and current distributions), and the forces acting on particles as a result of those fields (a, e)
4. Demonstrate understanding of the conditions of continuity at boundaries between media with differing permeability, permittivity and conductivity, and relate field quantities to circuit quantities such as capacitance, inductance, and resistance (a, e)

5. Understand the fundamentals of Maxwell’s equations, displacement current etc. (a, e)

6. Demonstrate an understanding of professional and ethical responsibility (f)

7. Demonstrate the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (h)

Relation of course outcomes to program outcomes

<table>
<thead>
<tr>
<th>Program Outcomes</th>
<th>Course Outcomes</th>
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<tbody>
<tr>
<td>an ability to apply knowledge of math, science and eng. (a)</td>
<td>H   H   H   H   H</td>
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<tr>
<td>an ability to identify, formulate, and solve engineering problems (e)</td>
<td>H   H   H   H   H</td>
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<tr>
<td>an understanding of professional and ethical responsibility (f)</td>
<td>M</td>
</tr>
<tr>
<td>the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (h)</td>
<td>M</td>
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**ASSESSMENT METHODS:**

1. Homeworks.
2. Written tests.
3. Written essay.