ECE 6010: Electromagnetic Field Theory I

Course Description
Maxwell's Equations; plane waves; field representations and solutions in unbounded space; waveguides and cavities; elements of Green's Functions; cylindrical and spherical waves; electromagnetic theorems.

Prior Course Number: ECE 719, 810, and 811
Transcript Abbreviation: EM Theory I
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Graduate
Student Ranks: Masters, Doctoral
Course Offerings: Autumn
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Prereq: 5010 (713), and 5011 or 613; or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.
Exclusions: Not open to students with credit for 719, 810, or 811.
Cross-Listings:
Course Rationale: Existing course.
The course is required for this unit's degrees, majors, and/or minors: No
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: Yes
Subject/CIP Code: 14.1001
Subsidy Level: Doctoral Course

Course Goals

| Learn some fundamental laws of electrodynamics based on Maxwell's equations. |
| Learn electrical properties of materials, solutions of the wave equation as plane waves in source free regions |
| Learn about wave polarization, and reflection/transmission of plane waves |
| Learn about modal solutions in waveguides and cavities |
| Learn about cylindrical and spherical waves in the context of canonical scattering problems |
| Learn about electromagnetic theorems such as duality, uniqueness, reciprocity, and conservation laws |

Course Topics
### Representative Assignments

- Homework
- Midterm exam
- Final Exam
- Term project with written report and oral presentation.

### Grades

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<th>Aspect</th>
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<td>Homework</td>
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<td>Midterm exam</td>
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<td>Final exam</td>
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<td>Term project</td>
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### Representative Textbooks and Other Course Materials

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<tr>
<th>Title</th>
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<tr>
<td><em>Advanced Engineering Electromagnetics</em></td>
<td>C. A. Balanis</td>
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### ABET-EAC Criterion 3 Outcomes

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<th>Course Contribution</th>
<th>College Outcome</th>
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<td>***</td>
<td>a  An ability to apply knowledge of mathematics, science, and engineering.</td>
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<td>b  An ability to design and conduct experiments, as well as to analyze and interpret data.</td>
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<td>Course Contribution</td>
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<td>An ability to design a system, component, or process to meet desired needs.</td>
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<td>An ability to function on multi-disciplinary teams.</td>
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**Additional Notes or Comments**

Updated abbreviation, prereqs, exclusiong, goals and topics to match university format.

**Prepared by:** Betty Lise Anderson