## OFFICIAL COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use. Shaded headings are subject to change at the discretion of the department and the material will vary - see course syllabus available from instructor.

### FACULTY/DEPARTMENT:
**Physics 322**  
Faculty of Science, Health & Human Services/Physics

<table>
<thead>
<tr>
<th>COURSE NAME/NUMBER</th>
<th>FORMER COURSE NUMBER</th>
<th>UCFV CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Electromagnetism</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

### CALENDAR DESCRIPTION:

This course reviews and deepens the concepts discussed in Physics 112 & 222. Maxwell's equations are examined from several perspectives and the link between them and special relativity is explored. The propagation, reflection, transmission, refraction and polarization of e/m waves is explored. An introduction to the classical theory of radiation is also presented.

### PREREQUISITES:
Physics 222

### COREQUISITES:
Co- or prerequisite Physics 381

### SYNOMYMOUS COURSE(S)

<table>
<thead>
<tr>
<th>Replaces:</th>
<th>n/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannot take:</td>
<td>n/a</td>
</tr>
</tbody>
</table>

### SERVICE COURSE TO:

<table>
<thead>
<tr>
<th>(Course #)</th>
<th>(Department/Program)</th>
</tr>
</thead>
</table>

### TOTAL HOURS PER TERM:
75

### TRAINING DAY-BASED INSTRUCTION

<table>
<thead>
<tr>
<th>STRUCTURE OF HOURS</th>
<th>HOURS PER DAY:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures: 75 Hrs</td>
<td></td>
</tr>
<tr>
<td>Seminar: Hrs</td>
<td></td>
</tr>
<tr>
<td>Laboratory: Hrs</td>
<td></td>
</tr>
<tr>
<td>Field Experience: Hrs</td>
<td></td>
</tr>
<tr>
<td>Student Directed Learning: Hrs</td>
<td></td>
</tr>
<tr>
<td>Other (Specify): Hrs</td>
<td></td>
</tr>
</tbody>
</table>

### MAXIMUM ENROLLMENT:
24

### EXPECTED FREQUENCY OF COURSE OFFERINGS:
Once every two years

### WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)
- Yes
- No

### WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)
- Yes
- No

### TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:
- Yes
- No

### COURSE IMPLEMENTATION DATE:
June 1993

### COURSE REVISED IMPLEMENTATION DATE:
September 2006

### COURSE TO BE REVIEWED:
November 2009

### COURSE TO BE REVIEWED: (MONTH YEAR)

### AUTHORIZATION SIGNATURES:

<table>
<thead>
<tr>
<th>Course Designer(s):</th>
<th>Chairperson:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tim Cooper; revised Derek Hamett</td>
<td>Gillian Mimmack (Curriculum Committee)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Department Head:</th>
<th>Dean:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norm Taylor</td>
<td>Jackie Snodgrass</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UPAC Approval in Principle Date:</th>
<th>UPAC Final Approval Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>December 14, 2005</td>
</tr>
</tbody>
</table>
LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:
1. To get the student solving Maxwell equations in various circumstances.
2. To show the intimate link between special relativity and the magnetic field.

METHODS:
Lecture, Demonstration, Computer simulations etc.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):
Credit can be awarded for this course through PLAR (Please check:)  ☒ Yes  ☐ No

METHODS OF OBTAINING PLAR:
Departmental Review and/or Course Challenge

TEXTBOOKS, REFERENCES, MATERIALS:
[Textbook selection varies by instructor. An example of texts for this course might be:]
TEXT: Introduction to Electrodynamics, Griffiths, Prentice Hall
2. Electromagnetic Fields & Waves, Lorrain, Corson & Lorrain

SUPPLIES / MATERIALS:

STUDENT EVALUATION:
[An example of student evaluation for this course might be:]
Assignments  25%
Midterm Exam    30%
Final Exam     45%

COURSE CONTENT:
[Course content varies by instructor. An example of course content might be:]
1. Review of vector analysis: vectors, vector derivatives and integrals, curvilinear coordinates
2. Review of electromagnetism: electrostatics, magnetostatics, electrodynamics, and Maxwell's equations with special emphasis on advanced solutions techniques such as separation of variables, method of images, and multipole expansions
3. Special relativity: Lorentz transformations, relativistic "paradoxes", four-vectors (velocity, acceleration, energy-momentum, current density), electric and magnetic field transformation laws.
5. Electromagnetic waves: wave equation, reflection, transmission, polarization, wave guides
6. Potentials and fields: scalar and vector potentials, gauge transformations, retarded potentials, Lienard-Wiechert potentials, electric and magnetic fields of a moving charge.
7. Radiation: electric and magnetic dipole radiation, radiation from a point charge.