# OFFICIAL COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.

<table>
<thead>
<tr>
<th>FACULTY/DEPARTMENT:</th>
<th>PHYS 322</th>
<th>Faculty of Science, Health &amp; Human Services/Physics</th>
</tr>
</thead>
<tbody>
<tr>
<td>COURSE NAME/NUMBER</td>
<td>3</td>
<td>Advanced Electromagnetism</td>
</tr>
<tr>
<td>FORMER COURSE NUMBER</td>
<td></td>
<td></td>
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<tr>
<td>UCFV CREDITS</td>
<td>3</td>
<td></td>
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## CALENDAR DESCRIPTION:

This course reviews and deepens the concepts discussed in PHYS 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:

PHYS 222

## COREQUISITES:

Co- or prerequisite PHYS 381, PHYS 382 or 383 (Advanced Electricity & Magnetism Group of experiments) strongly recommended

## SYNONYMOUS COURSE(S)

(a) Replaces: n/a

(b) Cannot take: n/a for further credit.

## SERVICE COURSE TO:

(Deptartment/Program)

## TRAINING DAY-BASED INSTRUCTION

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

## AUTHORIZATION SIGNATURES:

Course Designer(s): Tim Cooper; revised Derek Hamnett

Chairperson: Gillian Mimmack (Curriculum Committee)

Department Head: Norm Taylor

Dean: Jackie Snodgrass

UPAC Approval in Principle Date:       UPAC Final Approval Date: May 26, 2006
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.

Students should be aware that, as per departmental policy: All instructors teaching physics courses will be expected to cover all of the material in the course content section in the official course outlines.

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:
Please see the Physics PLAR policy on the department's webpage.

TEXTBOOKS, REFERENCES, MATERIALS:
[Textbook selection varies by instructor. An example of texts for this course might be:]

TEXT: Introduction to Electrodynamics, Griffiths, Prentice Hall

REFERENCES:  
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.