COURSE INFORMATION

DEPARTMENT: NATURAL SCIENCE

DATE: June 1993

Physics 322
Advanced Electromagnetism

NAME & NUMBER OF COURSE
DESCRIPTIVE TITLE
UCFV CREDIT

3

CATALOGUE 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.

COURSE PREREQUISITES: Physics 222

COURSE COREQUISITES: None

HOURS PER TERM
FOR EACH STUDENT
Lecture 60 hrs
Laboratory hrs
Seminar hrs
Field Experience hrs

Student Directed Learning hrs
Other - specify: hrs

TOTAL 60 HRS

UCFV CREDIT
TRANSFER X

UCFV CREDIT
NON-CREDIT

TRANSFER STATUS (Equivalent, Unassigned, Other Details)

UBC TBD

SFU TBD

UVIC TBD

Other

Tim Cooper
COURSE DESIGNER

J.D. TUNSTALL Ph.D.
DEAN OF ACADEMIC STUDIES
TEXTBOOKS, REFERENCES, MATERIALS  (List reading resources elsewhere)

TEXT:  Electromagnetic Fields & Waves, Lorrain, Corson & Lorrain


                      2.  Introduction to Electrodynamics, Griffiths, Prentice Hall.

OBJECTIVES:

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.

STUDENT EVALUATION PROCEDURE:

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Assignments</td>
<td>25%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>30%</td>
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<tr>
<td>Final Exam</td>
<td>45%</td>
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COURSE CONTENT

1. Electrostatic fields in a vacuum: Coulomb's Law, potential, conductors and insulators, Gauss' Law and its applications, electric dipoles and multipoles, energy and mechanical forces in an electric field.

2. Dielectric materials: polarization, external and internal electric fields, electric displacement, susceptibility and dielectric constant. Simple boundary value problems involving dielectrics.


4. Basic concepts of special relativity, the Lorentz transformation, transformation of velocity, acceleration, mass, four-vectors, the four-momentum, transformation of an electric charge density and of an electric current, the four-current density.

5. Electric and magnetic fields of moving charges, field of a charge with constant velocity, transformation of electric and magnetic fields and potentials, Maxwell's equations.

6. The vector potential, Biot-Savart law. Calculations of the vector potential and magnetic induction from currents, Ampère's law.

7. The Lorentz force, Faraday's Law. Maxwell's equations compared in integral and differential form, e/m waves, impedance of media, energy densities, Umov-Poynting vector.

8. Reflection/Refraction, Snell's law, Brewster angle, waves at a boundary, transmission and reflection. Radiation pressure. Course finishes with Chapter 32 of text.