UNIVERSITY COLLEGE OF THE FRASER VALLEY

COURSE INFORMATION

DEPARTMENT: NATURAL SCIENCE **DATE:** June 1993

Physics 322	Advanced Electromagnetism	3
NAME & NUMBER OF COURSE	**DESCRIPTIVE TITLE**	**UCFV CREDIT**

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	Student Directed Learning	hrs
	Laboratory	hrs	Other - specify:	
	Seminar	hrs		hrs
	Field Experience	hrs	TOTAL	60 HRS

UCFV CREDIT TRANSFER [x] **UCFV CREDIT NON-TRANSFER** [ ] **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

Physics 322
NAME & NUMBER OF COURSE

COURSES FOR WHICH THIS IS A PREREQUISITE:	RELATED COURSES

TEXTBOOKS, REFERENCES, MATERIALS **(List reading resources elsewhere)**

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

REFERENCES:
1. **Foundations of Electromagnetic Theory, J. Reitz and F. Milford. Addison-Wesley.**
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:

Assignments	**25%**
Midterm Exam	**30%**
Final Exam	**45%**

Physics 322
NAME & NUMBER OF COURSE

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.**

3. **Solutions to Laplace's and Poisson's equations: continuity at an interface, images, problems with rectangular, spherical and cylindrical symmetries.**

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, impedence 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.**