UNIVERSITY COLLEGE of the FRASER VALLEY



COURSE IMPLEMENTATION DATE: June 1993
COURSE REVISED IMPLEMENTATION DATE: September 2007
COURSE TO BE REVIEWED: May 2010
(Four years after UPAC final approval date) (MONTH YEAR)

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

| **PHYS 322** | | **3** |
|---|---|---|
| COURSE NAME/NUMBER | FORMER COURSE NUMBER | UCFV CREDITS |

**Advanced Electromagnetism**
COURSE DESCRIPTIVE TITLE

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

SERVICE COURSE TO: *(Department/Program)* *(Department/Program)*

TOTAL HOURS PER TERM: **75**
STRUCTURE OF HOURS:

| | | |
|---|---|---|
| Lectures: | **75** | Hrs |
| Seminar: | | Hrs |
| Laboratory: | | Hrs |
| Field Experience: | | Hrs |
| Student Directed Learning: | | Hrs |
| Other (Specify): | | Hrs |

TRAINING DAY-BASED INSTRUCTION
LENGTH OF COURSE:
HOURS PER DAY:

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

4. Conservation laws: Poynting theorem, conservation of momentum and angular momentum.

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.