UNIVERSITY COLLEGE OF THE FRASER VALLEY

COURSE INFORMATION

DEPARTMENT: NATURAL SCIENCES **DATE:** 1993-06-17

NAME & NUMBER OF COURSE	DESCRIPTIVE TITLE	UCFV CREDIT
PHYSICS 222	Electricity, Magnetism & Circuits	4

CATALOGUE DESCRIPTION:

A study of steady state and time varying electric and magnetic fields, elements of DC and AC currents, complex vector representation of sinusoidal quantities, electric and magnetic properties of solids, culminating in Maxwell's Equations. Experiments in voltage; current, flux, fields,and impedance measurements; RC, RL, and RLC circuits. The course will be presented using lectures and laboratory experiments.

A study of gradient, divergence, and curl in orthogonal curvilinear coordinates will permit the student to better understand the concepts being studied.

COURSE PREREQUISITES: Physics 221

COURSE COREQUISITES: Math 212 and Math 213 or Math 214

HOURS PER TERM FOR EACH STUDENT					
	Lecture	60	hrs	Student Directed Learning	12 hrs
	Laboratory	30	hrs	OTHER - specify:	
	Seminar		hrs	Exams (done in lab periods)	3 hrs
	Field Experience		hrs	TOTAL	105 HRS

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

TRANSFER STATUS (Equivalent, Unassigned, Other Details)

UBC	PHYS 215 (3) & UBC PHYS (1)
SFU	PHYS 221 (3) & PHYS (1); UCFV PHYS 221 & 222 = SFU PHYS 211(3), PHYS 221(3), PHYS 233(2), exemption PHYS 234(0)
UVIC	PHYS 216 (1.5)
OLA	PHYS (3)

GEORGE McGUIRE
COURSE DESIGNER

J.D. TUNSTALL, Ph.D.
DEAN OF ACADEMIC STUDIES

PHYSICS 222
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COURSES FOR WHICH THIS IS A PREREQUISITE:	RELATED COURSES
Any 3rd year level physics course	

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

TEXTS: Sadiku M., Elements of Electromagnetics, Holt, Rinehart, Winston - 1989

REFERENCES:

1. Winch, *Electricity and Magnetism*, Prentice-Hall
2. Melissinos and Lobkowicz, *Physics for Scientists and Engineers*, Saunders
3. Morris, N., *Electrical Circuits and Systems*, Prentice-Hall, 1973
4. Driscoll, F., *Analysis of Electric Circuits*, Prentice-Hall, 1973
5. Kip, A., *Fundamentals of Electricity and Magnetism*, McGraw-Hill, 1969

OBJECTIVES:

If successful in this course, students should be able to:

1. understand the fundamental concepts and laws involved in electricity and magnetism and learn how to apply theory to solve related problems;
2. have some knowledge and understanding of basic principles being studied as applied in various instruments and machines which are encountered in everyday life;
3. apply the classroom learning in the laboratory;
4. feel confident about taking further courses in physics or engineering.

METHODS:

This course will be presented using lectures and laboratory experiments. Audio-visual aids will be used where appropriate. Close coordination will be maintained between laboratory and classroom work whenever possible.

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STUDENT EVALUATION PROCEDURE:

Assignments	20%
Mid-term and in-term exams	25%
Laboratory Work	15%
Final examination	40%

COURSE CONTENT:

Electrostatics: electric fields, Gauss' Law

Electric Potential: work and potential energy, conservative fields, potential energy in electric field, potential difference, absolute potential, superposition principle applied to potential

Mathematical Physics: use of gradient, divergence, and curl in orthogonal curvilinear coordinate systems

Capacitance: systems of capacitors, electrostatic stored energy, use of capacitors in AC and DC circuits

Dielectrics: introduction to polarization, dipole moment per unit volume, electric displacement vector, permittivity, susceptibility, dielectric constant, stored energy in a dielectric medium

Current and Circuits: resistance and conductivity, current density, combinations of resistors, circuit analysis using Kirchhoff's Rules, Norton's and Thevenin's theorem

Magnetic Fields: properties of a B field, Ampere's Law, Biot-Savart Law, magnetic flux, torque on a current loop, forces on isolated charges, curl, Hall Effect

Induction: Faraday's Law, Lenz' Law, induced electric fields, motional emf, stored energy in a magnetic field, mutual inductance, self inductance

Magnetism in Matter: magnetic contribution of matter, the three magnetic vectors (H, B, and M), paramagnetism, diamagnetism, ferromagnetism

Alternating Current: complex representation of AC circuits, series and parallel RLC circuits, resonance, transient and steady state responses in AC circuits

Maxwell's Equations: electromagnetic waves, wave equation, determination of the speed of light from Maxwell's Equations, displacement current, propagation of energy and momentum by electromagnetic waves, Poynting vector

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LABORATORY EXPERIMENTS:

1. Plotting Electrostatic Fields
2. Millikan Experiment (2 periods)
3. Diodes
4. Magnetic Moment (2 periods)
5. Simple AC Circuits
6. Damped Harmonic Motion
7. Forced LRC Circuits