CAMOSUN COLLEGE	***School of Arts & Science*** ***PHYSICS DEPARTMENT*** **PHYS 210-001** **Electricity and Magnetism** **2008W**

COURSE OUTLINE

The Approved Course Description is available on the web @
\\nas1\CECP\Arts and Science\Courses\PHYS

Ω *Please note: this outline will be electronically stored for five (5) years only. It is strongly recommended students keep this outline for your records.*

1. Instructor Information

(a)	Instructor:	Ed Nelson		
(b)	Office Hours:	MTThF 11:30 – 12:20, W 12:30 – 1:20		
(c)	Location:	F314D		
(d)	Phone:	370-3515	Alternative Phone:	
(e)	Email:	nelson@camosun.bc.ca		
(f)	Website:			

2. Intended Learning Outcomes

(No changes are to be made to this section, unless the Approved Course Description has been forwarded through EDCO for approval.)

Upon completion of this course the student will be able to:

1. Provide and define the fundamental properties of the electric charge, solve technical problems associated with the electrostatic force (Coulomb force), the electric force field, Gauss's Law, the electric potential and potential difference, within a framework of distributed symmetric charge distributions, using calculus.
2. Define electric capacitance and solve technical problems associated with capacitors of various symmetries, capacitors in series and parallel combination, the microscopic effect of dielectric materials on capacitance and stored energy.
3. Define electric current, current density, and solve technical problems involving DC networks of resistors, batteries, and capacitors, Ohm's Law, Kirchhoff's Laws, and RC charging and decay circuits.
4. Define the magnetic field and magnetic flux, solve technical problems associated with the effect of static, non-uniform and uniform magnetic fields on moving charges and current-carrying wires, loops and the magnetic dipole.
5. Calculate the magnitude and direction of the magnetic field for symmetric current distributions using the Law of Biot-Savart and Ampere's Law, and state the limitations of Ampere's Law.
6. State Faraday's Law of Induction with Lenz's Law and use these equations to solve technical problems associated with induction.
7. Calculate inductance according to the fundamental definition, solve technical problems associated with LR circuits and coils, and calculate the stored energy in magnetic fields.

8. Solve technical problems involving electromagnetic oscillations and AC, including phasor diagrams, free, damped and forced oscillations, resonance, RMS current, voltage and power, LC oscillators, LRC circuits, and the transformer.
9. Quote the four Maxwell's equations, define all the terms, and demonstrate knowledge of the historical background leading to their development, with particular attention to the concept of the displacement current.

3. Required Materials

See Below

(a)	Texts	Physics for Scientists and Engineers, Serway and Jewett, 7th ed.
(b)	Other	PHYS 210 Lab Manual

4. Course Content and Schedule

(Can include: class hours, lab hours, out of class requirements and/or dates for quizzes, exams, lectures, labs, seminars, practicums, etc.)

Timetable: LEC MTWF 8:30 – 9:20 am; LAB Th 8:30 – 10:20 am

5. Basis of Student Assessment (Weighting)

(Should be linked directly to learning outcomes.)

See Below

(a)	Assignments	See Below
(b)	Quizzes	See Below
(c)	Exams	See Below
(d)	Other (eg, Attendance, Project, Group Work)	*See Below*

6. Grading System

(No changes are to be made to this section, unless the Approved Course Description has been forwarded through EDCO for approval.)

Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D	Minimum level of achievement for which credit is granted; a course with a "D" grade cannot be used as a prerequisite.	1
0-49	F	Minimum level has not been achieved.	0

Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy E-1.5 at **camosun.ca** for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	*In progress*: A temporary grade assigned for courses that, due to design may require a further enrollment in the same course. No more than two IP grades will be assigned for the same course. *(For these courses a final grade will be assigned to either the 3rd course attempt or at the point of course completion.)*
CW	*Compulsory Withdrawal:* A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

7. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College calendar, at Student Services or the College web site at camosun.ca.

STUDENT CONDUCT POLICY

There is a Student Conduct Policy **which includes plagiarism**.
It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, at Student Services and on the College web site in the Policy Section.

ADDITIONAL COMMENTS AS APPROPRIATE OR AS REQUIRED

Instructor: Ed Nelson
Office: Fisher 314D
Phone: (370) 3515
email: nelson@camosun.bc.ca

Office Hours: Please see posted office schedule outside F 314D. Consultation at more convenient times is always possible; if my office door is open, just come in.

Required Materials for this course:

1. Course Textbook: *Physics for Scientists and Engineers*, 5th or 6th Edition, Raymond A. Serway and John W. Jewett [Note: any good 1st year Physics textbook, such as Halliday, Resnick & Crane, Tipler, Ohanian, etc. will provide the same background material]
2. PHYS 210 Course Outline (provided) and information page
3. PHYS 210 Laboratory Manual
4. Laboratory Report Book/ Scientific Calculator/ Graph Paper/ Ruler

Evaluation:

1.	FINAL EXAM	50%	
2.	Midterm exams (3)	25%	(at equal intervals in the quarter)
3.	Laboratory reports	15%	
4.	Project	5%	
5.	Quizzes	5%	
		100%	

NOTE #1: A passing mark in the laboratory reports is required to obtain credit in PHYS 210
NOTE#2: To go on in other Physics/Engineering courses, an overall grade of C or better must be achieved.

FAQ about Physics 210

Is this going to be on the exam? I cannot tell you in advance what is going to be on any exam or quiz (but I will say that most of what you will encounter on exams will look a lot like assigned problems). *Everything in the course is testable material.*

What is going to be on the exam? I cannot tell you specifically what will be on any exam or quiz. The final exam and midterm exams will consist of three parts: word problems (answer in your own words), concept problems (a formula sheet/programmable calculator won't help you), and calculation problems. The midterm exams will test you on material covered since the previous exam. The final exam is cumulative.

Do we have to know this? Since you are responsible for learning all the material presented in this course, the answer is "yes" (unless I start rambling on in class about how I remotely rebooted all the computers in the UVic physics department, or how I single-handedly shut down the entire radio network for the City of Edmonton Fire Department).

How do I pass Physics 210? Your main objective should be to write an excellent final exam. Ask questions in class about anything that is not clear. Do at least 10 problems every week. Participate in class activities (they are designed to help you learn the material). Talk to your instructor about what works or doesn't work for you.

Is there a formula sheet? A formula page will be provided; however most students should have a graphing calculator which can store numerous formulae. This is not a course in memorization, so I do not expect you to remember a lot of algebraic results for specific problems. What you are expected to come away with in this course is an understanding of and skill in utilising only about half a dozen *major concepts*.

CAMOSUN COLLEGE

PHYSICS DEPARTMENT
COURSE OUTLINE

PHYS 210 ELECTRICITY AND MAGNETISM

A calculus-based course in electricity and magnetism. Topics include electrostatics; capacitance; dielectrics; electric circuits; magnetic fields; electromagnetic induction; Maxwell's equations.

OFFERED: Winter, Quarter 1

CREDIT:	4
IN-CLASS WORKLOAD:	4 lecture, 2 lab (Semester) 5 lecture, 2 lab (Quarter 1)

PREREQUISITES: ___ Physics 115 and Math 101or admission to the ENGBRIDGE program. *Math 235 or Math 250A recommended.*

REQUIRED MATERIALS:

Textbook: Physics for Scientists & Engineers with Modern Physics, 6th edition, Serway, R.A., and Jewett, J.W.Jr.

Physics 210 lab manual

Hardcover laboratory notebook

Graph paper (must be either 10 lines/inch or millimeter graph paper)

DEPARTMENT POLICIES REGARDING TESTING:

1. **The final exam will cover the entire course and will be 3 hours long. As stated in the current college calendar on page 39, "students are expected to write tests and final exams at the scheduled time and place." Exceptions will only be considered due to emergency circumstances as outlined in the calendar. Holidays or scheduled flights are not considered to be emergencies.**

2. **Instructors are not required to provide make-up tests. At their discretion, instructors may waive a test or provide a make-up test only in the event of documented illness or other extenuating circumstances.**

3. **Refer to your instructor's information page for any additional policies regarding testing and grade calculation.**

DEPARTMENT POLICIES REGARDING LABS:

1. **All assigned laboratory exercises and reports must be completed with an overall grade of 60% in order to obtain credit for this course. A lab may be waived or made up at a later time only in the case of documented illness or other extenuating circumstances.**

2. **At the discretion of the instructor, a student who is repeating this Physics course may apply for lab exemption.**

STUDY TIME

It is recommended that between 5 and 10 hours per week (or more for students with a weak background) be spent studying for this course outside of class time.

GRADING

The standard mark distribution for this course is as follows:

Final Exam	50%
Midterm	30%
Lab Reports and other work	20%
	100%

This distribution may be amended by the instructor (see your Instructor's Information sheet).

GRADE SCALE

Final letter grades are normally assigned as follows (subject to above conditions):

Percentage	Letter Grade

90 to 100	A+
85 to 89	A
80 to 84	A-
77 to 79	B+
73 to 76	B
70 to 72	B-
65 to 69	C+
60 to 64	C
50 to 59	D
0 to 49	F

OUTLINE:

1. **Electric charge**

    1.1 Electromagnetism as a fundamental force of nature
    1.2 Coulomb's law
    1.3 Conservation and quantization of charge

2. **The Electric Field**

    2.1 Electric field calculations for charge distributions of high symmetry
    2.2 Electric flux
    2.3 Gauss' law

3. **Electric Potential**

    3.1 Equipotential surfaces
    3.2 Calculation of potential due to charge distributions of high symmetry

4. **Capacitance**

    4.1 Combinations of capacitors
    4.2 Energy storage in capacitors
    4.3 Dielectrics

5. **Electrical circuits**

    5.1 Review
        5.1.1 Current
        5.1.2 Voltage
        5.1.3 Resistance
        5.1.4 Ohm's law
    5.2 Series and parallel circuits
    5.3 Kirchhoff's rules

6. **Magnetism**

    6.1 Force on a current-carrying conductor
    6.2 Torque on a current loop
    6.3 The magnetic dipole
    6.4 Magnetic flux

7. **Sources of Magnetic Fields**

   7.1 The Biot-Savart law
   7.2 Ampere's law
   7.3 Magnetic force on a current-carrying wire
   7.4 Solenoids and toroids

8. **Electromagnetic Induction**

   8.1 Faraday's law
   8.2 Lenz's law
   8.3 Eddy currents

9. **Inductance**

   9.1 Capacitors and inductance
   9.2 Inductance
   9.3 Self-inductance
   9.4 The LR circuit
   9.5 Stored energy in the magnetic field of an inductor

10. ***Electromagnetic oscillations and alternating current – Optional material***

   10.1 Damped LC oscillations
   10.2 Forced oscillations and resonance
   10.3 Series LCR circuit
   10.4 Impedance
   10.5 RMS currents
   10.6 Transformers

11. ***Introduction to Maxwell's equations – Optional material***

12. ***General magnetic properties of matter – Optional material***