CAMOSUN COLLEGE	***School of Arts & Science*** ***PHYSICS DEPARTMENT*** **PHYS 210-001** **Electricity and Magnetism** **Quarter 3 2009 (2009Q3)**

COURSE OUTLINE

The Approved Course Description is available on the web @ _____

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:	Julie Alexander		
(b)	Office Hours:			
(c)	Location:			
(d)	Phone:		Alternative Phone:	
(e)	Email:			
(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

(a) Texts — Physics for Scientists & Engineers with Modern Physics, *6th edition*, Serway, R.A., and Jewett, J.W.Jr.

(b) Other — Physics 210 Laboratory Manual
Graph paper (must be either 10 lines/inch or millimeter graph paper)

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.)

5. Basis of Student Assessment (Weighting)

(Should be linked directly to learning outcomes.)

The student must be successful (≥ 60%) in both the theory and laboratory assignments to pass the course. The approximate percentages used for the final grading are:

Quizzes	30%
Lab Work	20%
Final Exam (3 hours)	50%

Midterm tests may be discounted from the grading distribution (see above) if all term work, including term tests, labs, and assignments, has been completed and is 60% or higher. In this case, the final grade for the course may be based on a combination of the final exam (90%) and the lab mark (10%).

PHYSICS 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.

PHYSICS DEPARTMENT POLICIES REGARDING LABS:

1. All assigned laboratory exercises and reports must be completed and handed in prior to the date of the final exam with an overall grade of 60% in order to obtain credit for the course. A lab may be waived or made up at a later time only in the case of documented

illness or other extenuating circumstances. If you will be absent from a lab period due to illness it is your responsibility to notify your instructor.

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

6. Grading System

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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.

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***