School of Arts & Science **PHYSICS DEPARTMENT** **PHYS 210** **Electricity and Magnetism** **Quarter 3 2012**		

COURSE OUTLINE

The course description is online @ http://camosun.ca/learn/calendar/current/web/phys.html

Ω *Please note: the College electronically stores this outline for five (5) years only.*
*It is **strongly recommended** you keep a copy of this outline with your academic records.*
You will need this outline for any future application/s for transfer credit/s to other colleges/universities.

1. Instructor Information

(a)	Instructor:	Ed Nelson	
(b)	Office Hours:	9:30 – 10:30 MTWThF	
(c)	Location:	TECH 219	
(d)	Phone:	370 4711	Alternative Phone:
(e)	Email:	nelson@camosun.bc.ca	
(f)	Website:	online.camosun.ca	

2. Intended Learning Outcomes
(No changes are to be made to these Intended Learning Outcomes as approved by the Education Council of Camosun College.)

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.
10. Design and assemble novel experiments for original projects.
11. Observe, record, organize and display data in tables, graphs or charts.
12. Analyze linear graphs (determine area, slope, intercept, etc.).
13. Observe and record sources of error and estimate/compute uncertainty in results.
14. Interpret meaning of experimental results in the context of the experimental objectives.
15. Write scientific reports in an acceptable, traditional format.

3. Required Materials

(a) Texts: "Physics for Scientists and Engineers" R. A. Serway and J. W. Jewett, jr., 8th edition, Brooks-Cole (2010)

(b) Other: PHYS 210 Lab manual

4. Course Content and Schedule

MTWTh 10:30 – 11:20 am LECTURE
F 10:30 – 11:20 SEMINAR
F 2:30 – 4:20 LABORATORY

5. Basis of Student Assessment (Weighting)

(a) Weekly assignments   5%

(b) Quizzes   5%

(c) Midterm exams (4)   30%

(d) Laboratory Exercises   15%

(e) Final Exam   45%

6. Grading System

(No changes are to be made to this section unless the Approved Course Description has been forwarded through the Education Council of Camosun College 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 the College web site in the Policy Section.

ADDITIONAL COMMENTS AS APPROPRIATE OR AS REQUIRED

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**

      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**

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