



CAMOSUN COLLEGE
School of Arts & Science
Department of Physics & Astronomy

PHYS-210-X02AB
Electricity and Magnetism
Fall 2019

COURSE OUTLINE

The course description is available on the web @ <http://camosun.ca/learn/calendar/current/web/phys.html>

Ω Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.

1. Instructor Information

| | |
|------------------|---|
| (a) Instructor | Dr. Julie Alexander |
| (b) Office hours | M, T, F – 1:30 – 2:30; F 12:30 – 1:30 |
| (c) Location | Tech 220 |
| (d) Phone | 250-370-4437 Alternative: |
| (e) E-mail | Jalex@camosun.bc.ca |
| (f) Website | https://www.juliealexander.ca |

2. Intended Learning Outcomes

Upon completion of this course students 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. 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.
9. Observe record, organize and display data in tables, graphs or charts.
10. Analyze linear graphs (determine area, slope, intercept, etc.).
11. Observe and record sources of error and estimate/compute uncertainty in results.
12. Interpret meaning of experimental results in the context of the experimental objectives.
13. Write scientific reports in an acceptable, traditional format.

3. Required Materials

- (a) University Physics with Modern Physics, By Young and Freedman, 14th edition
- (b) Physics 210 lab manual, nonprogrammable calculator
- (c) Mastering Physics license

4. Course Content and Schedule

PHYSICS 210 LABS

The lab schedule is on the class schedule. Labs are due on the next scheduled lab period.

COURSE CONTENT AND SCHEDULE

See attached Excel sheets for a detailed class schedule

COURSE CONTENT

Chapter 21 – Electric Charge and Electric Field, Chapter 22 – Gauss's Law, Chapter 23 – Electric Potential, Chapter 24 – Capacitance and Dielectrics, Chapter 25 – Current and Resistance, Chapter 26 – Direct Current Circuits, Chapter 27 – Magnetic Field and Magnetic Forces, 28 – Sources of Magnetic Field Chapter 29 – Electromagnetic Induction

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 Series and parallel circuits
- 5.2 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

9. **Maxwell's Equations**

5. Basis of Student Assessment (Weighting)

The mark distribution for this course is as follows:

| | |
|--------------------------|------------|
| Final Exam | 50% |
| 2 midterms | 25% |
| Lab Reports | 10% |
| <u>Mastering Physics</u> | <u>15%</u> |
| | 100% |

TERM TESTS

There will be two 1 hour term tests. Term dates have been entered into the Engineering Bridge Google calendar and are:

- Test #1 Tuesday, Oct. 1, 2019
- Test #2 Tuesday, Nov. 19, 2019

There will also be tutorial quizzes, see schedule for dates.

PHYSICS DEPARTMENT GUIDELINES REGARDING TESTING AND GRADING:

- The final exam will cover the entire course and will be 3 hours long. As stated in the current college calendar, "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.
- Students must write quizzes, tests, midterm tests, etc., on the date and time assigned by the instructor. Missed exams normally receive a zero grade. Instructors are not required to provide make-up tests. At their discretion, instructors may waive a test in exceptional circumstances such as medical issues or a documented illness.
- Any outstanding homework or labs must be submitted prior to the last day of classes, and will be graded according to the late policy outlined by the instructor.
- Refer to your instructor's information page for any additional policies regarding testing and grade calculation.

PHYSICS DEPARTMENT GUIDELINES REGARDING LABS:

- Students must obtain an overall grade of 50% or higher in the laboratory component of the course order to obtain credit for the course.
- Attendance is mandatory & you may be required to "sign in" at the beginning of each lab period. 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.

- Unless otherwise stated by your instructor late penalties are as follows: For overdue labs (or assignments), a late penalty of 1 mark per day (10%) will be assessed for the first five days following the due date. After this date a complete report is still required and earns a maximum mark of 50%.
- At the discretion of the instructor, a student who is repeating this Physics course with a laboratory grade of 70% or higher may apply for lab exemption.

6. Grading System

- Standard Grading System (GPA)
- Competency Based Grading System

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

8. College Supports, Services and Policies



Immediate, Urgent, or Emergency Support

If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @ <http://camosun.ca/about/mental-health/emergency.html> or <http://camosun.ca/services/sexual-violence/get-support.html#urgent>

College Services

Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at <http://camosun.ca/>

College Policies

Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at <http://camosun.ca/about/policies/>. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

A. GRADING SYSTEMS <http://camosun.ca/about/policies/index.html>

The following two grading systems are used at Camosun College:

1. 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 | | 1 |
| 0-49 | F | Minimum level has not been achieved. | 0 |

2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

| Grade | Description |
|-------|---|
| COM | The student has met the goals, criteria, or competencies established for this course, practicum or field placement. |
| DST | The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement. |
| NC | The student has not met the goals, criteria or competencies established for this course, practicum or field placement. |

B. 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 at <http://camosun.ca/about/policies/index.html> for information on conversion to final grades, and for additional information on student record and transcript notations.

| Temporary Grade | Description |
|-----------------|---|
| I | <i>Incomplete:</i> 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 | <i>In progress:</i> A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course. |
| CW | <i>Compulsory Withdrawal:</i> 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. |