Introduction to Physics 2 - PHYS 104

University Studies Program

Course Outline

COURSE IMPLEMENTATION DATE:	**Pre 1998**
OUTLINE EFFECTIVE DATE:	**September 2022**
COURSE OUTLINE REVIEW DATE:	**March 2027**

GENERAL COURSE DESCRIPTION:

This course builds on PHYS 103. Electric fields and electric potentials are calculated from a variety of continuous distributions of electric charge using Coulomb's Law and Gauss' Law. The principles of electrostatic equilibrium and dynamic equilibrium in conductors are used to discuss capacitors and resistors, and to calculate the effective capacitance or resistance for circuits. Kirchhoff's loop rules are used to analyze more sophisticated circuits. Magnetic fields are calculated from distributions of electric current using Ampère's law; and the force from a magnetic field on a current carrying wire or moving charge is calculated. Electromotive force is calculated using Faraday's law of induction, and is applied to generators, transformers and inductors. Maxwell's equations are introduced and used to explain electromagnetic waves. Special relativity is introduced.

Calculus is used throughout this course: including introductions to vector fields, line integrals, surface flux integrals, gradients, and differential equations.

Program Information: This course is required for majors in Math, Physics, Engineering and Chemistry. It is usable for Associate of Science and Arts.

Delivery: This course is delivered face-to-face.

COTR Credits: 3

Hours for this course: 90 hours

Typical Structure of Instructional Hours:

Instructional Activity	Duration
Lecture Hours	45
Seminars / Tutorials	
Laboratory / Studio Hours	45
Practicum / Field Experience Hours	
Other Contact Hours	
Total	90

Practicum Hours (if applicable):

Type of Practicum	Duration
On-the-job Experience	N/A
Formal Work Experience	N/A
Other	N/A
Total	

Course Outline Author or Contact:
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Signature

APPROVAL SIGNATURES:

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EDCO

Valid from: September 2022 – March 2027

Education Council Approval Date

COURSE PREREQUISITES AND TRANSFER CREDIT:

Prerequisites: PHYS 103; MATH 104 is a required course, either taken prior or concurrently

Corequisites: N/A

Flexible Assessment (FA):

Credit can be awarded for this course through FA ☑ Yes ☐ No

Learners may request formal recognition for prior learning at the College of the Rockies through one or more of the following processes: External Evaluation, Worksite Assessment, Demonstration, Standardized Test, Self-assessment, Interview, Products/Portfolio, Challenge Exam. Contact an Education Advisor for more information.

Transfer Credit: For transfer information within British Columbia, Alberta and other institutions, please visit http://www.cotr.bc.ca/Transfer

Students should also contact an academic advisor at the institution where they want transfer credit.

Prior Course Number: N/A

Textbooks and Required Resources:

Textbook selection varies by instructor and may change from year to year. At the Course Outline Effective Date the following textbooks were in use:

Halliday, David, Resnick, Robert, and Walker, Jearl. *Fundamentals of Physics.* 10th ed. Wiley, 2013.

Please see the instructor's syllabus or check COTR's online text calculator http://go.cotr.bc.ca/tuition/tCalc.asp for a complete list of the currently required textbooks.

LEARNING OUTCOMES:

Upon the successful completion of this course, students will be able to

- apply the concept of a vector field to electric and magnetic fields:
- calculate the electric field for a system of discrete or continuous static charges;
- describe the concept of flux and calculate the Electric or Magnetic flux through a specified surface with a high degree of symmetry;
- apply Gauss's law to calculate the electric field when there is a high degree of symmetry;
- use a line integral of the electric field to calculate the electric potential; use the gradient to find the electric field given the electric potential;
- derive capacitance and resistance and calculate effective capacitance or resistance arranged in series or parallel or more complicated configurations;
- use Kirchhoff's laws to calculate the currents in simple circuits with capacitors, resistors, and inductors;
- use Kirchhoff's laws to derive differential equations for RC, LR, and LC circuits, and then use integral calculus to model the behavior of the currents in these circuits;
- calculate the force on a moving electric charge or current configuration in a magnetic field;
- use the Biot-Savart law and Ampère's circuit law to calculate the magnetic field generated by current from straight wires, solenoids and tori;
- use Faraday's law of induction to calculate the EMF and inductance; and
- complete simple calculations in the special theory of relativity

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COURSE TOPICS:

- Coulomb's law and electric fields
- Flux, Gauss's Law and its relationship to the divergence theorem
- Electric potential as a line integral of the electric field; the electric field as the gradient of the electric potential
- Capacitance
- Current, resistance, circuits. Kirchhoff's laws
- Magnetic fields. The Biot-Savart law. Ampère's circuit law
- Induction and inductance. Faraday's law
- Maxwell's equations
- Modern physics÷ Special relativity

See instructor's syllabus for the detailed outline of weekly readings, activities and assignments.

EVALUATION AND ASSESSMENT:

Assignments	% Of total Grade
Labs	20%
Assignments/Quizzes	20%
Midterms	30%
Final Exam	30%
Total	100%

Please see the instructor syllabus for specific classroom policies related to this course, such as details of evaluation, penalties for late assignments, and use of electronic aids.

Note: Satisfactory completion of Laboratory is necessary to receive a grade in this course.

EXAM POLICY:

Students must attend all required scheduled exams that make up a final grade at the appointed time and place.

Individual instructors may accommodate for illness or personal crisis. Additional accommodation will not be made unless a written request is sent to and approved by the appropriate Department Head prior to the scheduled exam.

Any student who misses a scheduled exam without approval will be given a grade of "0" for the exam.

COURSE GRADE:

Course grades are assigned as follows:

Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Mark (Percent)	≥ 90	89-85	84-80	79-76	75-72	71-68	67-64	63-60	59-55	54-50	< 50

A grade of "D" grants credit, but may not be sufficient as a prerequisite for sequential courses.

ACADEMIC POLICIES:

See www.cotr.bc.ca/policies for general college policies related to course activities, including grade appeals, cheating and plagiarism.

COURSE CHANGES:

Information contained in course outlines is correct at the time of publication. Content of the courses is revised on an ongoing basis to ensure relevance to changing educational, employment, and marketing needs. The instructor will endeavour to provide notice of changes to students as soon as possible. The instructor reserves the right to add or delete material from courses.