Physics (PHYS) 205

Physics for Scientists and Engineers II (Revision 1)

Status:	Replaced with new revision, see the **course listing** for the current revision
Delivery mode:	**Individualized study online** with **eText**, and a **Home Lab**. You can order the **Laboratory Kit** online. PHYS 205 has a **lab exemption** This course is charged a **lab fee**
Credits:	3
Area of study:	Science
Prerequisites:	**PHYS 204** (or **PHYS 200** and **MATH 265**) or equivalent.
Precluded:	None
Challenge:	PHYS 205 is not available for challenge.
Faculty:	**Faculty of Science and Technology**
Notes:	**Detailed Syllabus and Assessment (PDF)**

Overview

PHYS 205 is an introductory calculus-based physics course recommended for science, engineering, and pre-med students. The course covers the principles of electricity and magnetism and includes a hands-on laboratory component. In addition to a standard e-textbook, the course material includes a well-written Study Guide designed for independent study. Video material is also provided for each unit and lab experiment.

Outline

PHYS 205 consists of the following twelve units, divided into two parts.

Part I Electricity

- Unit 1: Electric Fields
- Unit 2: Gauss's Law
- Unit 3: Electric Potential
- Unit 4: Capacitance and Dielectrics
- Unit 5: Current and Resistance
- Unit 6: Direct Current Circuits

Part II Magnetism

- Unit 7: Magnetic Fields
- Unit 8: Sources of the Magnetic Field
- Unit 9: Faraday's Law
- Unit 10: Inductance
- Unit 11: Alternating Currents
- Unit 12: Electromagnetic Waves

Home Lab Component

PHYS 205 includes a compulsory lab component that requires the student to perform six hands-on lab experiments in a place of her/his choice. Essential tools and equipment can be borrowed from the Athabasca University **Science Lab**

, packaged in the Home Lab Kit. The student is expected to provide some additional common household materials. The *PHYS 205 Lab Manual* explains the following experiments.

- Experiment 1: Coulomb's Law
- Experiment 2: Ohm's Law and Resistivity
- Experiment 3: RC Circuit
- Experiment 4: Magnetic Field of a Solenoid
- Experiment 5: Electric Motor
- Experiment 6: Lab Project

Evaluation is based on written lab reports, with the option to produce short (5-minute) video presentations for certain experiments.

Request the lab kit online

The student may qualify for partial or full transfer of lab credit obtained for equivalent lab work at another institution. (See relevant **AU policy and procedure** .)

Learning outcomes

Upon successful completion of this course, you should be able to

- use Coulomb's law and vector calculus to compute electric forces and fields due to static point charges and simple charge distributions.
- apply Gauss's law to calculate and map the electric fields for symmetric charge distributions.
- define electric potential and electric potential energy and use calculus to solve relevant problems.
- explain the concepts of electric current, voltage, resistance and capacitance, along with Ohm's law, and use them to solve problems involving simple DC circuits.
- outline the Biot-Savart and Ampère's laws and use vector calculus to describe the magnetic fields generated by simple current distributions.
- describe and calculate the forces experienced by electric currents and moving point charges in an external magnetic field.

- define Faraday's and Lenz's laws and solve problems involving induced electromotive forces.
- explain inductance and analyze circuits involving resistors, capacitors and inductors when connected across AC sources.
- describe Maxwell's equations and solve problems involving electromagnetic radiation, including polarization, intensity and transported energy.
- demonstrate skills related to performing simple experiments in electricity and magnetism, including experimental setup, data acquisition, data analysis and communication of scientific results.

Evaluation

The final grade in PHYS 205 is based on the marks achieved in two assignments, six lab reports, and two examinations. To pass the course, the student must achieve at least 50% on the final examination and on the lab component, and an overall course grade of at least **D (50 percent)** . The following chart summarizes the evaluation activities and the credit weight associated with each.

Activity	**Weight**
Assignments (10% each)	20%
Lab Reports	20%
Midterm Online Exam	20%
Final Online Exam	40%
Total	**100%**

The **midterm and final examinations** for this course must be requested in advance and written under the supervision of an AU-approved exam invigilator. Invigilators include either ProctorU or an approved in-person invigilation centre that can accommodate online exams. Students are responsible for payment of any invigilation fees. Information on exam request deadlines, invigilators, and other exam-related questions, can be found at the **Exams and grades** section of the Calendar.

To learn more about assignments and examinations, please refer to Athabasca University's **online Calendar** .

Materials

Serway, Raymond A. and Jewett, John W. Jr., *Physics for Scientists and Engineers*, 9th ed. Belmont, CA: Brooks-Cole, 2014. (eText)

eText

Registration in this course includes an electronic textbook. For more information on **electronic textbooks** , please refer to our **eText Initiative site** .

Other Resources

The Athabasca University online course resources include a Study Guide and Lab Manual, as well as Logger Pro Software.

Home Lab Kit to be borrowed from the AU Science Lab.

Important links

- **Academic advising**
- **Program planning**
- **Request assistance**
- **Support services**
- **Introduction Video**

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