ORIGINAL COURSE IMPLEMENTATION DATE: September 2026

REVISED COURSE IMPLEMENTATION DATE:

COURSE TO BE REVIEWED (six years after UEC approval)**:** November 2031

Course outline form version: 29/08/2024

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: PHYS 118	**Number of Credits: 5** Course credit policy (105)
Course Full Title: Waves, Optics, and Electromagnetism **Course Short Title:** Waves/Optics/Electromagnetism	
Faculty: Faculty of Applied and Technical Studies	**Department/School:** Physics

Calendar Description:

This calculus-based physics course is for students who are planning to continue their studies in physics or any of the other sciences. Topics covered include waves, optics, electric fields, circuits, magnetic fields, and some quantum theory. The laboratory portion of the course uses experiments to reinforce the theory covered in class.

Note: Students with credit for PHYS 112 cannot take this course for further credit.

Prerequisites (or NONE):	PHYS 111.
Corequisites (if applicable, or NONE):	
Pre/corequisites (if applicable, or NONE):	MATH 111. MATH 112 or MATH 118 strongly recommended.

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number:

Cross-listed with:

Equivalent course(s): **PHYS 112**

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar	75
Supervised laboratory hours (science lab)	45
Total hours	**120**

Scheduled Laboratory Hours

Labs to be scheduled independent of lecture hours: **Yes**

Course Details

Special Topics course: **No**

(If yes, the course will be offered under different letter designations representing different topics.)

Directed Study course: **No**

(See policy 207 for more information.)

Grading System: **Letter grades**

Delivery Mode: **May be offered in multiple delivery modes**

Expected frequency: **Annually**

Maximum enrolment (for information only)**: 36**

Prior Learning Assessment and Recognition (PLAR)

PLAR is available for this course.

Transfer Credit *(See **bctransferguide.ca**.)*

Transfer credit already exists: **No**

Submit outline for (re)articulation: **Yes**

(If yes, fill in transfer credit form.)

Department approval	**Date of meeting:**	April 11, 2025
Faculty Council approval	**Date of meeting:**	May 30, 2025
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	November 21, 2025

Learning Outcomes *(These should contribute to students' ability to meet program outcomes and thus Institutional Learning Outcomes.)*

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

1. Analyze problems in both acoustics and optics using the properties of waves.
2. Apply the laws of reflection and refraction to optical systems consisting of lenses and mirrors.
3. Solve problems in electrostatics using key concepts of electrical fields and electric potential.
4. Explain how magnetic fields are created and determine how charged particles interact with these fields.
5. Solve problems in quantum theory using the Planck and de Broglie hypotheses.
6. Participate in conversations highlighting the influence that past generations of scientists had on our current knowledge of the subject.

Recommended Evaluation Methods and Weighting *(Evaluation should align to learning outcomes.)*

Assignments:	10%	Quizzes/tests/midterm:	30%		%
Lab work:	20%	Final exam:	40%		%

Details:

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Typical lecture instruction methods consist of a combination of white/chalk board calculations along with some pre-prepared lecture slides. Teaching methods are gender agnostic, making the content accessible to everyone, and students are encouraged to share their perspectives respectfully. Storytelling will be integrated as a pedagogical tool to introduce new topics, allowing students to make connections between cultural knowledge and scientific principles. Hands-on learning in the labs will be emphasized, with experiments designed to promote discovery-based learning, reinforcing the idea that knowledge is built through experience and exploration. Group work will also be encouraged in preparation for quizzes and exams, fostering a community-based approach to learning that mirrors Indigenous values of collective knowledge-sharing and collaboration.

Texts and Resource Materials *(Include online resources and Indigenous knowledge sources. Open Educational Resources (OER) should be included whenever possible. If more space is required, use the Supplemental Texts and Resource Materials form.)*

	Type	Author or description	Title and publication/access details	Year
1.	OER	Open Stax	University Physics Vol 1-3	-
2.	Textbook	Young and Freedman	University Physics 15th Edition	2019
3.				
4.				
5.				

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

Scientific calculator.

Course Content and Topics

1. Waves: frequency, wavelength, and amplitude; the wave equation and its solutions; travelling and standing waves; transverse and longitudinal waves; acoustic waves and sound; intensity and level intensity; Doppler effect; superposition and interference.

2. Optics: laws of reflection and refraction; index of refraction; dispersion and prisms; thin lens equation; systems of lenses and mirrors; telescopes and microscopes; double slit interference and single slit diffraction; diffraction gratings.

3. Electromagnetism: Coulombs law; the electric field; the electric potential; Gauss's law; capacitors and resistors; circuits and Kirchhoff's laws; magnetic fields; Lorentz force law.

4. Quantum Theory: Planck's hypothesis and the quantization of light; matter waves and the de Broglie hypothesis; the wave—particle duality; particle in a box and energy quantization; the hydrogen atom and its energy levels; simple spectroscopy and the chemical elements; the time dependent Schrodinger equation.