UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: September 1993
REVISED COURSE IMPLEMENTATION DATE: September 2018
COURSE TO BE REVIEWED: (six years after UEC approval) February 2024
Course outline form version: 09/15/14

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

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

Course Code and Number: PHYS 105	**Number of Credits:** 5 Course credit policy (105)
Course Full Title: Heat, Waves and Optics **Course Short Title (if title exceeds 30 characters):**	
Faculty: Faculty of Science	**Department (or program if no department):** Physics

Calendar Description:

An introductory non-calculus physics course covering electric circuits, waves, geometric and wave optics, and thermodynamics.

Prerequisites (or NONE):	(One of [Principles of Mathematics 12, Pre-Calculus 12, MATH 095, MATH 096, or MATH 110] and one of [Physics 11, PHYS 083, or PHYS 100]) or (one of Physics 12, PHYS 093, PHYS 101, or PHYS 111).
Corequisites (if applicable, or NONE):	NONE
Pre/corequisites (if applicable, or NONE):	NONE

Equivalent Courses (cannot be taken for additional credit)

Former course code/number: **PHYS 102**

Cross-listed with:

Equivalent course(s):

Note: Equivalent course(s) should be included in the calendar description by way of a note that students with credit for the equivalent course(s) cannot take this course for further credit.

Transfer Credit

Transfer credit already exists: ☒ Yes ☐ No

Transfer credit requested (OReg to submit to BCCAT):
☐ Yes ☐ No (if yes, fill in transfer credit form)

Resubmit revised outline for articulation: ☐ Yes ☐ No

To find out how this course transfers, see **bctransferguide.ca**.

Total Hours: 120

Typical structure of instructional hours:

Lecture hours	75
Seminars/tutorials/workshops	
Laboratory hours	45
Field experience hours	
Experiential (practicum, internship, etc.)	
Online learning activities	
Other contact hours:	
Total	**120**

Special Topics

Will the course be offered with different topics?
☐ Yes ☒ No

If yes, different lettered courses may be taken for credit:
☐ No ☐ Yes, repeat(s) ☐ Yes, no limit

Note: The specific topic will be recorded when offered.

Maximum enrolment (for information only): 36

Expected frequency of course offerings (every semester, annually, every other year, etc.): Annually

Department / Program Head or Director: Jeff Chizma	**Date approved:**	May 12, 2017
Faculty Council approval	**Date approved:**	May 26, 2017
Campus-Wide Consultation (CWC)	**Date of posting:**	September 15, 2017
Dean/Associate VP: Lucy Lee	**Date approved:**	May 26, 2017
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	February 23, 2018

Learning Outcomes

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

- Analyze circuits consisting of multiple resistive elements in series and parallel.
- Use graphical and mathematical representations to describe simple harmonic motion
- Apply the superposition principle to determine the resulting wave shapes from interfering waves in systems that involve sound waves, light waves or waves on a string.
- Solve sound and light problems that involve concepts such as intensity and the Doppler shift.
- Use geometric optics to solve problems consisting of the reflection and/or refraction of light.
- Analyze systems consisting of lenses in combination including eye glasses and microscopes.
- Identify which of the three processes of heat exchange are dominant in a given physical situation; calculate rate of heat transfer.
- Solve calorimetric problems involving temperature changes and phase changes.
- Analyze situations using the laws of thermodynamics.
- Analyze devices which convert heat into work (heat engines) or use work to remove heat from a system (refrigerators and air conditioners).

Prior Learning Assessment and Recognition (PLAR)

☒ Yes ☐ No, PLAR cannot be awarded for this course because

Typical Instructional Methods (guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion)

Lecture, demonstration, small group practice, discussion, and laboratory.

Grading system: Letter Grades: ☒ Credit/No Credit: ☐ Labs to be scheduled independent of lecture hours: Yes ☐ No ☐

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

Typical Text(s) and Resource Materials (if more space is required, download Supplemental Texts and Resource Materials form)

	Author (surname, initials)	Title (article, book, journal, etc.)	Current ed.	Publisher	Year
1.	Urone & Hinrichs	College Physics		☒ OpenStax/Rice University	
2.	Cutnell & Johnson	Physics (10th Edition)	☒	Wiley	2015
3.	Knight, Jones and Field	College Physics: A Strategic Approach (3rd Edition)	☒	Pearson	2014
4.	Walker	Physics (5th Edition)	☒	Pearson	2016

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

Fully-equipped physics lab.

Typical Evaluation Methods and Weighting

Final exam:	45%	Assignments:	15 %	Midterm exam:	25%	Practicum:	%
Quizzes/tests:		Lab work:	15 %	Field experience:	%	Total:	100%

Details (if necessary):

Typical Course Content and Topics

Weeks 1 & 2	Electric Current and Direct-Current Circuits
Week 3	Oscillations About Equilibrium
Week 4	Waves and Sound
Week 5	Electromagnetic Waves
Weeks 6 & 7	Geometrical Optics
Week 8	Optical Instruments
Week 9	Physical Optics: Interference and Diffraction
Week 10 & 11	Temperature and Heat
Week 12	Phase and Phase Changes
Week 13	The Laws of Thermodynamics

Laboratory Experiments

Experiment 1	Introduction to the Lab
Experiment 2	Ohm's Law
Experiment 3	Resistors in Series and Parallel
Experiment 4	Standing Waves on a Wire
Experiment 5	Standing Waves in an Air Column
Experiment 6	Thin Lenses
Experiment 7	Interference and Diffraction
Experiment 8	Grating Spectrometer
Experiment 9	Specific Heat of a Metal and Heat of Fusion of Water
Experiment 10	Electrical Equivalent of Heat