UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: September 1993
REVISED COURSE IMPLEMENTATION DATE: September 2019
COURSE TO BE REVIEWED (six years after UEC approval)**:** February 2024
Course outline form version: 05/18/2018

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:
(Transcripts only display 30 characters. Departments may recommend a short title if one is needed. If left blank, one will be assigned.)

Faculty: Faculty of Applied and Technical Studies	**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 093, 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

Antirequisite Courses *(Cannot be taken for additional credit.)*
Former course code/number: PHYS 102
Cross-listed with:
Dual-listed with:
Equivalent course(s):
(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 hours	75
Tutorials/workshops	
Supervised laboratory hours	45
Experiential (field experience, practicum, internship, etc.)	
Supervised online activities	
Other contact hours:	
Total hours	**120**

Labs to be scheduled independent of lecture hours: ☐ No ☒ Yes

Special Topics *(Double-click on boxes to select.)*
This course is offered with different topics:
☒ No ☐ Yes *(If yes, topic will be recorded when offered.)*

Independent Study
If offered as an Independent Study course, this course may be repeated for further credit: *(If yes, topic will be recorded.)*
☒ No ☐ Yes, repeat(s) ☐ Yes, no limit

Transfer Credit
Transfer credit already exists: *(See **bctransferguide.ca**.)*
☐ No ☒ Yes
Submit outline for (re)articulation:
☐ No ☐ Yes *(If yes, fill in transfer credit form.)*

Grading System
☒ Letter Grades ☐ Credit/No Credit

Maximum enrolment (for information only): 36

Expected Frequency of Course Offerings:
Annually *(Every semester, Fall only, annually, etc.)*

Department / Program Head or Director: Norm Taylor	**Date approved:**	September 10, 2018
Faculty Council approval	**Date approved:**	November 2, 2018
Dean/Associate VP: Dean of Science: Lucy Lee	**Date approved:**	November 2, 2018
Campus-Wide Consultation (CWC)	**Date of posting:**	November 30, 2018
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	December 14, 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, laboratory.

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	☐	Open Stax/Rice University	
2.	Cutnell & Johnson	Physics (10th Edition)	☒	Wiley	2015
3.	Knight, Jones and Field	College Physics: A Strategic Approach (3rd Edition)	☒	Pearson	2014
5.	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%	Field experience:	%	Portfolio:	%
Midterm exam:	25%	Lab work:	15%	Practicum:	%	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