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<br>**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.

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|---|---|
| **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 |