UNIVERSITY OF THE FRASER VALLEY

**ORIGINAL COURSE IMPLEMENTATION DATE:** January 2007
**REVISED COURSE IMPLEMENTATION DATE:** January 2021
**COURSE TO BE REVIEWED** (six years after UEC approval)**:** October 2026
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.**

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|---|---|
| **Course Code and Number:** PHYS 483 | **Number of Credits:** 3 Course credit policy (105) |

**Course Full Title:** Modern Physics Laboratory II
**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.)*

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| **Faculty:** Faculty of Applied and Technical Studies | **Department (or program if no department):** Physics |

**Calendar Description:**

A continuation of PHYS 382 with different, more difficult projects and sets of experiments. Through in-depth laboratory work students expand their understanding of physics and continue to develop their laboratory, analysis, and communication skills.

Note: Students who have completed PHYS 382 must present a lab book or write-ups at the beginning of the course to show the experiments previously completed.

Note: Students with credit for PHYS 383 cannot take this course for further credit.

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| **Prerequisites (or NONE):** | PHYS 382. |
| **Corequisites (if applicable, or NONE):** | NONE |
| **Pre/corequisites (if applicable, or NONE):** | One or more of PHYS 312, PHYS 321, PHYS 351, PHYS 402, PHYS 410, PHSY 455, PHYS 457, or PHYS 458 are strongly recommended. |

**Antirequisite Courses** *(Cannot be taken for additional credit.)*
Former course code/number: **PHYS 383**
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**

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| Lecture/seminar hours | |
| Tutorials/workshops | |
| Supervised laboratory hours | 45 |
| Experiential (field experience, practicum, internship, etc.) | |
| Supervised online activities | |
| Other contact hours: Seminar/Presentation | 5 |
| **Total hours** | **50** |

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):** 24

**Expected Frequency of Course Offerings:**
Dependent on student demand *(Every semester, Fall only, annually, etc.)*

| | | |
|---|---|---|
| **Department / Program Head or Director:** Norm Taylor | **Date approved:** | December 1, 2019 |
| **Faculty Council approval** | **Date approved:** | January 10, 2020 |
| **Dean/Associate VP:** John English | **Date approved:** | January 10, 2020 |
| **Campus-Wide Consultation (CWC)** | **Date of posting:** | February 21, 2020 |
| **Undergraduate Education Committee (UEC) approval** | **Date of meeting:** | October 2, 2020 |

**Learning Outcomes:**

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

1. Demonstrate that a theoretical claim is only as good as the supporting experimental results.
2. Develop experimental procedures to answer scientific questions.
3. Use several standard measuring devices found in most graduate physics labs.
4. Test whether the theory outlined in other courses can be experimentally confirmed.
5. Complete some simple research projects.
6. Utilize advanced physics lab and presentation skills.
7. Further exhibit the technical communication and presentation skills used in industry and academic research, up to writing and presenting a paper that is essentially of publication quality.
8. Demonstrate familiarity with the theory, apparatus, procedure and results of several experiments from the list in the course content section (below).

**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.)*

1. The student may do a selection of experiments from a suggested list related to a specific course like PHYS410 (History of Physics), PHYS 402 (Optics), PHYS 321 (Advanced Mechanics), PHYS 312 (Intermediate Electromagnetism) or PHYS 351 (Quantum Mechanics) or they may choose from a list of suggested experiments, which will cover a wide cross section of the standard physics disciplines: mechanics, electricity, magnetism, optics, thermodynamics, solid state physics, etc.
2. The students will work individually, and will present lab reports and/or presentations for each of his or her experiments.

**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.** | | | | | |
| **2.** | | | | | |
| **3.** | | | ☐ | | |
| **4.** | | | ☐ | | |
| **5.** | | | ☐ | | |

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

**Typical Evaluation Methods and Weighting**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Final exam: | % | Assignments: | % | Field experience: | % | Portfolio: | % |
| Midterm exam: | % | Project: | 50% | Practicum: | % | Other: Seminar | 20% |
| Quizzes/tests: | % | Lab work: (reports) | 30% | Shop work: | % | Total: | 100% |

**Details (if necessary):**

1. The majority of marks earned (80%) in this course will be derived from the accumulated grades assigned to the individual laboratory reports on monthly and final projects.
2. The students will be required to give a seminar in which they will discuss the theory and present their results from their final project. This seminar will be worth 20% of the final grade assigned.

**Typical Course Content and Topics**

Optics Group:

1. Geometric optics (visible light or microwave optics)
2. Interference and diffraction (single and double slit)
3. Grating and/or prism Spectrometer
4. Michelson interferometer and the index of refraction of air
5. Fabry-Perot interferometer
6. Speed of light (two procedures – rotating mirror and coaxial cable)
7. Fresnel lenses
8. Zeeman effect
9. Thin film interference
10. Analysis of mirage optics demo

Advanced Mechanics Group:

1. Determine the numerical value for the Gravitational constant G. (Cavendish apparatus)
2. Measuring the acceleration due to gravity. (Kater's pendulum)
3. Mechanical equivalent of heat
4. Angular momentum
5. Gyroscopic precession and nutation
6. Measuring the rolling friction and air friction on an automobile as a function of its speed
7. Measuring the lift to drag ratio on various shaped bodies in a laminar airflow situation
8. Terminal velocity of a balloon and bubbles

Electromagnetism Group:
1. Plotting of magnetic fields (3D) – Helmholtz coils
2. Ferromagnetism (hysteresis)
3. Impedance of loudspeakers
4. Current balance
5. Coils and spinning magnets
6. Hall effect

20th Century Physics Group:
1.Black body radiation
2. Millikan oil drop experiment
3. Photoelectric effect
4. Michelson/Morley
5. Radiation – physics and probability
6. Franck-Hertz experiment
7. Electron spin resonance
8. Measurement of heat loss from various residences using an infrared camera

Historical Group:
1. Millikan oil drop experiment
2. Photoelectric effect
3. Michelson/Morley
4. Curvature of the Earth
5. Geometric parallax
6. Galilean experiments (rolling bodies, speed of light, etc.)
7. Galilean astronomy (telescope, observations, calculations, etc.)
8. Foucault's pendulum
9. Gas laws (Boyle's law, Charles law)

Other Experiments:
1. Expansion and thermal conductivity of metals
2. Viscous flow through tubes
3. Doppler effect

Individual Research Projects