UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: June 1993
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.

Course Code and Number: PHYS 382	**Number of Credits:** 3 Course credit policy (105)

Course Full Title: Modern Physics Laboratory I
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:

Students will be required to do a selection of experiments from a list spanning the many topics in physics: mechanics, optics, solid state physics, thermodynamics, electromagnetism, electronics, nuclear physics, etc., or an approved project in an area of interest to them.

Prerequisites (or NONE):	PHYS 221, PHYS 225, or PHYS 232.
Corequisites (if applicable, or NONE):	
Pre/corequisites (if applicable, or NONE):	One of PHYS 312, PHYS 321, PHYS 351, PHYS 402, PHYS 410, PHYS 455, PHYS 457, or PHYS 458 is encouraged.

Antirequisite Courses *(Cannot be taken for additional credit.)*
Former course code/number:
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	
Tutorials/workshops	
Supervised laboratory hours	45
Experiential (field experience, practicum, internship, etc.)	
Supervised online activities	
Other contact hours: 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): 20

Expected Frequency of Course Offerings:
Once every two or three years *(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 data.
2. Form and answer their questions experimentally.
3. Use several standard measuring devices found in most modern physics labs.
4. Measure and to check if the classroom theory is reproducible in the lab.
5. Complete some simple research projects.
6. Exhibit lab and presentation skills suitable for publishable documents and conference presentations.
7. Show the technical communication and presentation skills used in industry and academic research.
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. At the beginning, all students will be required to do a few specific experiments, usually two, requiring two weeks each. (Topics will likely be absorption of radiation, Millikan's experiment or photoelectric effect.) The remaining experiments will be chosen from a suggested list which will cover a wide cross section of the standard physics disciplines: mechanics, electricity, magnetism, optics, thermodynamics, solid state physics, electronics, etc. (Again, usually two experiments requiring one month each.)
2. The students may work individually, but preferably in groups.

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.	None				
2.					
3.			☐		

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:	15%	Practicum:	%	Seminar/Presentation:	10%
Quizzes/tests:	%	Lab work: (reports)	75%	Shop work:	%	Total:	100%

Details (if necessary):

1. The majority of marks earned (75%) in this course will be derived from the accumulated grades assigned to the individual laboratory reports.
2. The students will be required to give a presentation/seminar in which they will discuss their project. This project and seminar will be worth 25% 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 & 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
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)~~ *(awaiting repairs)*
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 laminar airflow
8. Terminal velocity of a balloon and bubbles

Advanced E&M Group:

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

20th Century Physics Group:

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

Historical Group: (PHYS 410)

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
4. Etc.

Individual Research Projects