UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: September 1997
REVISED COURSE IMPLEMENTATION DATE: September 2019
COURSE TO BE REVIEWED (six years after UEC approval)**:** January 2021
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 100	**Number of Credits:** 4 Course credit policy (105)

Course Full Title: Introductory Physics 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:

Covers kinematics and dynamics (Newton's laws), conservation of energy and momentum, wave motion, geometric optics, introductory special relativity, and nuclear reactions.

Note: PHYS 100 has been designed for students who have not taken Physics 11 but who have a strong background in mathematics. PHYS 100 is intended as a superior substitute for Physics 11 with regards to meeting prerequisites and satisfying program requirements.

Note: Students with credit for PHYS 083 cannot take this course for further credit.

Prerequisites (or NONE):	One of the following: (B or better in one of Principles of Mathematics 11 or Pre-calculus 11) or (C+ or better in MATH 085) or (one of Apprenticeship Math 12, Calculus 12, Principles of Mathematics 12, Pre-calculus 12, MATH 092, MATH 094, MATH 096, MATH 140, or COMP 138) or Upgrading and University Preparation Assessment. Note: One of MATH 093 or MATH 096 is recommended, if not taken previously. (*Prerequisites updated in 2019.)*
Corequisites (if applicable, or NONE):	

Antirequisite Courses *(Cannot be taken for additional credit.)*
Former course code/number:
Cross-listed with:
Dual-listed with:
Equivalent course(s): **PHYS 083**
(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	60
Tutorials/workshops	
Supervised laboratory hours	30
Experiential (field experience, practicum, internship, etc.)	
Supervised online activities	
Other contact hours:	
Total hours	**90**

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:**	October 2018
Faculty Council approval	**Date approved:**	November 2, 2018
Dean/Associate VP: John English	**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:

1. Explain what is meant by uniform motion, uniform accelerated motion, and free fall motion.
2. Apply one of the five constant acceleration motion equations to solve for one of the five parameters; displacement, initial and final velocity, time, or acceleration.
3. Analyze a distance versus time graph in order to determine instantaneous and average speed, or find the equation relating the distance and time.
4. Analyze a velocity versus time graph in order to determine instantaneous and average acceleration and displacement, or find the equation relating the velocity and time.
5. Apply the equations for accelerated motion to solve free fall problems.
6. Add vectors using a vector diagram, and apply it to determine the net force acting on an object.
7. Solve relative motion problems using vector diagrams.
8. Solve circular motion problems using the equation relating the centripetal acceleration, radius of a circle, and the object's velocity or period.
9. Explain the differences between mass and weight, and measure them both using the appropriate instruments (mass balance or spring balance).
10. Characterize the gravitational field; field strength and variations due to latitude and height above sea level.
11. Construct and interpret a free body diagram from the forces acting on the body.
12. Apply the appropriate equation to calculate the unknown variable using the equations for gravitational force between two objects, spring force, friction force, kinetic energy, potential energy, work, power, and momentum.
13. State and apply Universal Gravitation Law, Friction Law, Hooke's Law, Newton's three Laws, Conservation of Momentum Law, Conservation of Energy Law, and Refraction and Reflection Laws in solving problems and in explaining events from everyday life (motion, interaction of objects, free fall, rotation of the planets, etc.).
14. Identify and explain situations in which mechanical energy is conserved.
15. Describe the operating principle of simple machines.
16. Determine the resultant of two and more waves using the Principle of Superposition.
17. Use ray diagrams, wave-front sketches, and standing waves diagrams to explain the phenomena of reflection, refraction, diffraction, and interference, and how images are formed in lenses and mirrors.
18. Explain the operating principle of a simple telescope, simple camera, magnifying glass, and microscope, and explain eye defects using reflection and refraction.
19. Apply the appropriate equation to calculate the unknown variable in the magnification equation as it applies to mirrors and lenses.
20. State the two postulates of the special theory of relativity, explain the equivalence of energy and mass, and describe the relativistic effects of time dilation, length contraction, and mass increase.
21. Compare and contrast fusion and fission reactions, and describe the operating principles of a nuclear reactor, an atomic bomb, and the Sun.

Laboratory objectives:

After completing the experiments in PHYS 100, successful students should be able to:

1. Gather a complete and accurate record of the data, and then tabulate it for each experiment.
2. Estimate the level of accuracy of different types of measuring apparatus; rulers, meter sticks, spring and mass balances, ticker tape, and photogate timers for each experiment.
3. Estimate the magnitude of the errors in their measurements using the error analysis method for each experiment.
4. Summarize and discuss the final results, analyze the difficulties of the experiment, and offer suggestions for improvement for each experiment.
5. Measure and record data to construct correct Distance versus Time, Velocity versus Time, and Force versus Acceleration graphs for uniform and accelerated motions using a recording timer, ticker tape, and graph paper.
6. Analyze a distance versus time graph in order to determine instantaneous and average speed, or the equation relating the distance and time for the motion of an object on an inclined plane or a free falling object.
7. Analyze a velocity versus time graph in order to determine instantaneous and average acceleration for the motion of an object on an inclined plane or a free falling object.
8. Use one of two different methods (motion on an inclined plane or free fall motion) to determine the acceleration due to the gravity.
9. Verify the Friction law using Friction Force versus Normal Force graph for wood-wood contact surfaces or, alternatively, Hooke's Law using a Force versus Extension graph for a spring of negligible mass.
10. Verify Newton's second Law for a constant mass system using a Force versus Acceleration graph.
11. Test the Conservation of Energy Law for the motion of an object on an inclined plane or a free falling object using an Energy versus Position graph.
12. Test the Conservation of Momentum Law in one dimension for both elastic and inelastic collisions between two laboratory carts, using a time recording device (ticker tape timer or photogate timer).
13. Verify the Law of Reflection and Law of Refraction (Snell's Law) using ray boxes, mirrors, semi-circular lenses, and polar graph paper, and apply those laws in determining the physical variables characterizing mirrors and lenses.

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.	Touger, J.	Physics: Building Understanding	☐	John Wiley & Sons	2006
2.	Cutnell & Johnson	Physics	☐	John Wiley & Sons	2011
3.	Elert, G.	The Physics Hypertextbook (free at http://physics.info/)	☐	online	2014
4.	Nave, C.	http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html	☐	Georgia State	2014
5.			☐		

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

Typical Evaluation Methods and Weighting

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

Details (if necessary):

Typical Course Content and Topics

1. Introduction, Kinematics in one dimension
2. Kinematics in one dimension
3. Kinematics in one and two dimensions, Projectiles
4. Forces in one dimension (gravity, friction, springs)
5. Newton's Laws
6. Work, Energy, Power, Efficiency
7. Momentum, Impulse
8. Midterm
9. Waves (qualitative, quantitative)
10. Reflection, Interference, Diffraction, Refraction
11. Geometric Optics: Mirrors
12. Geometric Optics: Lenses
13. Modern Physics (relativity and nuclear energy)
14. Review/Catch-up

Laboratory Experiments

Lab 1 Introduction, Measurement & Graphing Exercises, Error Analysis and Math Review (2 wks)
Lab 2 Uniformly Accelerated Motion
Lab 3 Forces: Friction
Lab 4 Forces: Springs
Lab 5 Newton's 2nd Law of Motion
Lab 6 Conservation of Momentum
Lab 7 Conservation of Energy
Lab 8 Mirrors and Images
Lab 9 Refraction
Lab 10 Makeup lab