UNIVERSITY OF THE FRASER VALLEY

ORIGINAL COURSE IMPLEMENTATION DATE: Fall 1997
REVISED COURSE IMPLEMENTATION DATE: September 2019
COURSE TO BE REVIEWED (six years after UEC approval)**:** March 2025
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 101	**Number of Credits:** 5 Course credit policy (105)

Course Full Title: Introductory General Physics: Mechanics and Fluids
Course Short Title: General Physics: Mech. & Fluids
(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:

This introductory non-calculus physics course covers Newtonian mechanics; motion, momentum and energy of particles, rigid rotating bodies, and fluids.

Note: PHYS 111 is the entry course for upper-level physics. Students with credit for PHYS 111 cannot take PHYS 101 for further credit.

Note: Because of the overlap in course material, MATH 111 students should take PHYS 111 instead of PHYS 101.

Prerequisites (or NONE):	One of the following: Physics 12, PHYS 093, or (one of [Principles of Mathematics 12, Pre-calculus 12, MATH 093, MATH 095, MATH 096] and one of [Physics 11, PHYS 083, or PHYS 100]).
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:
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	30
Experiential (field experience, practicum, internship, etc.)	
Supervised online activities	
Other contact hours:	
Total hours	**105**

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: Fall only
(Every semester, Fall only, annually, etc.)

Department / Program Head or Director: Norm Taylor	**Date approved:**	January 2019
Faculty Council approval	**Date approved:**	February 8, 2019
Dean/Associate VP: John English	**Date approved:**	February 8, 2019
Campus-Wide Consultation (CWC)	**Date of posting:**	March 22, 2019
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	March 29, 2019

Learning Outcomes:

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

1. Use vectors in conjunction with trigonometry to solve problems in projectile motion.
2. Investigate Newton's law through free body diagrams.
3. Calculate the vector gravitational force and potential energy from several point masses and spheres.
4. Apply Newton's Second Law to circular motion.
5. Compute escape velocity and the time periods of circular orbits.
6. Solve kinematic and dynamic problems with rotational motion in a plane.
7. Calculate moments of inertia, including the use of the parallel axis theorem.
8. Analyze problems using the concepts of conservation of energy and linear and angular momentum.
9. Solve problems in fluids using Archimedes' Principle, Pascal's Principle and the Bernoulli equation.
10. Perform fundamental laboratory experiments in simple linear and rotational mechanics, and interpret the data obtained.
11. Communicate these experimental results in a simple, standard lab report.
12. Estimate numerical values for different types of uncertainties in data, use these numbers to compute the experimental uncertainties in values, and then compare them to the theoretical values.

Prior Learning Assessment and Recognition (PLAR)

☒ Yes ☐ No, PLAR cannot be awarded for this course because

Please see the Physics PLAR policy on the department's webpage. If a student can show evidence of skill equivalent to the lab part of the course, we are willing to consider that plus successful completion of a final exam as equivalent to the course.

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion.)*

This course will be presented using lecture, tutorial periods, and laboratory experiments. Other aids will be used where appropriate. Problems will be assigned on a regular basis which are to be handed in and marked. Close coordination will be maintained between laboratory and classroom work whenever possible.

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 (online)	2012
	References:		☐		
2.	Cutnell & Johnson	Physics, 10th ed.	☒	Wiley	2014
3.	Serway & Vuille	College Physics	☒	Brooks-Cole	2014
4.			☐		

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

Scientific calculator

Typical Evaluation Methods and Weighting

Final exam:	40%	Assignments:	10%	Field experience:	%	Portfolio:	%
Midterm exam:	25%	Project:	%	Practicum:	%	Other:	%
Quizzes/tests:	10%	Lab work:	15%	Shop work:	%	Total:	100%

Details (if necessary):

Typical Course Content and Topics

Week 1-2: Mathematics Preliminaries

- Checking the units (Dimensional Analysis) Vectors
- Mathematics of directed quantities or vectors is part of the language of physical science
- Vector notation
- Well known geometry revisited with displacement vectors
- Force as a vector
- Coordinate systems are picked for convenience
- Component notation and trigonometry

Week 3: Motion

- Rate of change of displacement vector is velocity
- Acceleration is the rate of change of velocity vector

- One- and two-dimensional motion with constant acceleration

Week 4-5: Newton's Laws

- An isolated body has a constant velocity
- Inertia or mass is the resistance of a body to changes in velocity
- The sum of the external forces on a body give the product of the mass and acceleration of the body
- Weight is a force (W = mg)
- Reaction is equal and opposite to action
- Contact forces and friction
- Forces in various scenarios are analyzed with free body diagrams

Week 5-6: Statics Vanishing of Forces or Torques

- A force directed through a body's centre of mass causes the body to accelerate.
- An equal force directed obliquely causes acceleration and a rotation about the centre of mass. Such a force produces a torque which causes rotation.
- With the aid of free body diagrams and the vanishing of forces and torques, 2 and 3 simultaneous equations are found and solved

Week 7-8: Work and Energy

- Work is force through distance
- Kinetic Energy
- Gravitational Potential Energy
- Conservative forces and independence of path and potential energy
- Energy conservation
- Power is the rate at which work is done

Week 9: Momentum and Impulse

- Momentum–Impulse Conservation
- Collisions – elastic, inelastic, perfectly inelastic

Week 10: Circular Motion

- Analogy between linear and circular motion with angular and tangential quantities
- Centripetal acceleration
- Newton's Law of Universal Gravitation
- Free body diagrams for circular motion

Week 11-12: Rotational Motion in a Plane

- Analogy between linear and rotational dynamics: forces and torques, linear and angular momentum, mass and moment of inertia, translational and rotational kinetic energy

Week 12-13: Simple Harmonic Motion and Waves

- Equation for uniform circular motion is simple harmonic motion equation
- Solution by analogy for spring and pendulum
- Travelling wave solutions

Week 13-14: Fluids as Compressional Waves in Elastic Media

- Pressure
- Pascal's Principle
- Archimedes' Principle
- Continuity Equation
- Bernoulli's Equation