ORIGINAL COURSE IMPLEMENTATION DATE:	September 1993
REVISED COURSE IMPLEMENTATION DATE:	September 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 111

Number of Credits: 5 Course credit policy (105)

Course Full Title: Mechanics

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:

Intended for students who are planning to study engineering science or life sciences. Topics covered include vectors, kinematics, dynamics, work and energy, collisions, rotational kinematics, rotational dynamics, simple harmonic motion, and gravitation. The object is to understand the fundamental laws of mechanics, to learn how to apply the theory to solve related problems, and to develop a feeling for the order of magnitude of physical quantities and uncertainties in real experiments.

Note: Students with credit for this course cannot take PHYS 100 or PHYS 101 for further credit.

Note: MATH 112 or MATH 118 are corequisites for PHYS 112, although the Physics department will waive this requirement for students with an A in PHYS 111.

Prerequisites (or NONE):	One of: Physics 12, PHYS 093, or (prerequisites for MATH 111 and one of Physics 11, PHYS 083, or PHYS 100).
Pre/corequisites (if applicable, or NONE):	MATH 111 is highly recommended.

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number:

Cross-listed with:

Dual-listed with:

Equivalent course(s): **PHYS 100, PHYS 101**

(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 and Winter *(Every semester, Fall only, annually, etc.)*

Department / Program Head or Director: Norm Taylor	**Date approved:**	June 1, 2019
Faculty Council approval	**Date approved:**	November 1, 2019
Dean/Associate VP: John English	**Date approved:**	November 1, 2019
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. Solve problems involving forces, accelerations, and linear momentum by applying the fundamental laws of Newtonian mechanics.
2. Perform fundamental laboratory experiments in simple mechanics, interpret the data obtained, and report the results.
3. Estimate the order of magnitude of physical quantities in simple mechanics experiments using basic instrumentation.
4. Develop their ability to discern different types of uncertainties in data, and use these numbers to calculate the uncertainties in values in mechanics experiments.
5. Use vectors in conjunction with calculus to solve problems in mechanics.
6. Solve kinematic and dynamic problems with rotational motion, calculating moments of inertia from the definition and using the parallel axis theorem.
7. Calculate the vector gravitational force and potential energy from several point masses and spheres.
8. Apply conservation of energy and angular momentum to elliptical orbits and Newton's Second law to circular motion.
9. Calculate escape velocities from, and time periods of, circular orbits.

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.)*

This course will be presented using lectures and laboratory experiments. Audio-visual aids will be used where appropriate. Problems will be assigned on a regular basis, which are to be handed in and marked. Problems that require the use of calculus will be emphasized. Close coordination will be maintained between laboratory and classroom work. Computer-assisted learning programs may be used to increase the understanding of the concepts being studied.

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.	Young and Freedman	University Physics 15th edition	☒	Pearson	2019
2.	R. Hawkes et al.	Physics for Scientists and Engineers.	☒	Nelson	2019
3.	Halliday/Resnick/Walker	Fundamentals of Physics	☒	Wiley and Sons	
4.		Any first-year physics book that uses calculus and vectors	☐		
5.			☐		

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

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): Weighting of quiz vs Assignments will vary by instructor

Typical Course Content and Topics

- Introduction to course: relationship of lecture, tutorials, and laboratories; units and dimensional analysis
- Vectors: vector and scalar quantities, addition, resultant of several vectors, unit vector, dot and cross product
- Kinematics of a particle: speed and velocity, relative velocity, average velocity, acceleration, rectilinear motion with constant acceleration, projectiles
- Dynamics of a particle: Newton's laws of motion and applications, friction and motion on an incline
- Momentum: definition, linear momentum, conservation of momentum, impulse
- Work, energy, and power: work, kinetic energy, gravitational potential energy, elastic potential energy, equivalence of mass and energy, power
- Conservation of energy: collisions, types of collisions, conservation of total energy, mechanical energy
- Rotational kinematics: angular quantities, angular speed and velocity, angular acceleration, tangential quantities, radial acceleration, centripetal force
- Rotational dynamics: kinematics of pure rotation, centre of mass, torque and rotational inertia, angular momentum, conservation of angular momentum
- Gravitation: law of gravitation, gravitational force and weight, satellite motion, Kepler's laws
- Periodic motion: Hooke's law, simple harmonic motion, period, displacement, velocity and acceleration for SHM.