University of Massachusetts Global A private nonprofit affiliate

Course Number, Title and Credits

PHYU 103 - Fundamentals of Physics I (With Lab) - 4 credits

Course Description

This course introduces the fundamental principles of Newtonian mechanics and fluid physics. Topics include one- and two-dimensional kinematics, Newton's Laws of Motion, work and energy, momentum and collisions, rotational motion, torque, angular momentum, and fluid mechanics. Students will apply physical principles and vector analysis to solve real-world problems and conduct experiments to investigate phenomena, collect and analyze data, and verify fundamental physics concepts.

Course Learning Outcomes

By the end of this course, students should be able to:

1. Apply kinematic principles and vector analysis to solve problems involving motion in one and two dimensions, including projectile motion.
2. Solve dynamics problems by identifying forces, constructing free-body diagrams, and applying Newton's Laws of Motion.
3. Utilize the concepts of work, energy, and momentum to analyze physical systems, including collisions and conservation laws.
4. Analyze rotational motion using angular kinematics, torque, rotational inertia, and the conservation of angular momentum.
5. Apply fluid principles, including Pascal's, Archimedes', and Bernoulli's principles, to solve problems involving pressure, buoyancy, and fluid flow.
6. Conduct experiments to investigate physical phenomena, collect and analyze data, and verify fundamental physics principles.

Required Textbooks

College Physics 2e from OpenStax College

Go to https://openstax.org/subjects and click on green colored College Physics 2e to download the e-book.

Letter Grade/Percentage Equivalents

Grades are determined on a straight-scale basis using the following scales.					
A	94% to 100%	A-	90% to 93%	B+	87% to 89%
B	84% to 86%	B-	80% to 83%	C+	77% to 79%
C	74% to 76%	C-	70% to 73%	D+	67% to 69%
D	64% to 66%	D-	60% to 63%	F	59% and below

Methods of Evaluation for Determining Grades

Assignment Detail for Course:

Assignments	**Possible Points**
Tests	300
Homework	100
Labs	120
Final Exam	200
Total Points Possible in Course	**720**

Lab Description

Lab 1: Kinematics. In this experiment, students will study the effect of angle, mass, surface friction and radii on the rolling of a disk down an incline. Students will collect the velocity-time data and analyze data to see if the motion has constant acceleration.

Lab 2: Determine coefficient of friction on an inclined plane. In this experiment, students are going to perform the experiment at home and hope students can gain the experience of determining coefficient of friction of any surface. Students will increase the angle of slope until a coin starts to slip on the slope. That angle is associated with the coefficient of friction.

Lab 3: Momentum and collision. In this experiment, students will use a simulator to study two different collisions (elastic vs inelastic collision). Students are asked to answer a series of questions in

differentiating two different collisions using data.

Week by Week Outline for Course (Tentative):

Week	Topics&Assignments
Week 1	a. Units and significant figures b. Motion in one dimension i. Average vs. instantaneous speed ii. Velocity iii. Uniform Acceleration iv. Free-fall c. Graphing motion i. Position, velocity, and acceleration vs. time graphs d. Vectors i. Trigonometric representations of vectors ii. Coordinate systems and Vector components iii. Projectile motion **Test 1**
Week 2	a. Motion and Force i. Newton's first law ii. Identifying forces: friction, normal, tension, etc.. iii. Free-body diagrams iv. Newtons Second Law v. Applying Newton's Second Law in 1 and 2D vi. Newton's Third Law b. Equilibrium i. Static and dynamic equilibrium c. Dynamics and Newton's Second Law d. Mass vs. weight and weightlessness

	e. Inclined planes f. Friction and drag g. Pulley systems **Lab 1** **Test 2**
Week 3	a. Momentum and Impulse i. Conservation of momentum ii. Impulse-momentum Theorem iii. Inelastic collisions vs elastic collisions b. Work and Energy i. Work and power ii. Kinetic energy iii. Gravitational potential energy iv. Elastic potential energy v. Work-energy theorem vi. Conservation of energy **Lab 2** **Test 3**
Week 4	a. Rotational motion i. Uniform circular motion ii. Centripetal forces and accelerations iii. Angular displacement, velocity, and acceleration b. Torque i. Gravitational torque and center of gravity c. Rotational dynamics i. Moment of inertia ii. Newton’s second law for rotational motion **Lab 3**

Week 5	Fluids i. Pressure ii. Buoyancy iii. Fluid dynamics iv. Pascal Principle v. Archimedes Principle vi. Bernoulli Principle **Final Exam**

Attendance Policy

Requirements for student attendance and participation will be defined by each instructor based on the following policy:

- Monday of the first week of the session is the first day of class.
- Regular attendance/engagement is expected for student success. Online engagement is evident through posting to a discussion board, blog, completing assignments including journal entries, or taking quizzes and exams. If regular attendance/engagement are not evident, the student's grade may be adversely affected. If a student misses more than one week of engagement in an online class, the student may, at the discretion of the instructor, fail the course.
- Students in courses with required synchronous class sessions are expected to remain for the full duration. If a student misses more than one required synchronous online class, the student may, at the discretion of the instructor, fail the course.
- Students must submit an academically-related assignment through the Learning Management System (LMS) before the end of Week 2 (i.e., a quiz, test, course content-related Discussion Board post, or other course content-related assignment). Introduction posts do not count as an academically-related assignment. If a student does not submit an academically-related assignment, the student will be administratively dropped from the course. Students administratively dropped for non-attendance/participation will not be reinstated in the course. In infrequent cases, students in certain classes may be exempt from the requirement to submit an academically-related assignment before the end of Week 2; students may consult with their instructor for further information.
- Students should consider withdrawing from a course if they will be unable to participate each week. Instructors may, but are not obligated to, accommodate students under extraordinary circumstances, but the student must request accommodation and provide requested supporting documentation.
- Schools and programs may have different attendance policies. Refer to school and program

specific information for additional attendance policies.

Academic Integrity

The University of Massachusetts Global is an academic community based on the principles of honesty, trust, fairness, respect and responsibility. Academic integrity is a core University value, which ensures respect for the academic reputation of the University, its students, faculty and staff, and the degrees it confers. The University expects that students will conduct themselves in an honest and ethical manner and respect the intellectual work of others.

Submitting to faculty work completed by the use of any artificial intelligence tool without permission and/or when prohibited by class policy. When faculty require the use of technology, including artificial intelligence, as a part of an assignment for the course, there is no violation. Students are reminded to consult syllabi, assignment sheets/rubrics, program documents and their faculty. Use of artificial intelligence, when permitted, must be correctly cited in the assignment.

The UMass Global online library provides resources to support research, proper citation styles, and the safe and responsible use of generative artificial intelligence or Gen AI.

- The Academic Integrity and Plagiarism Avoidance page provides guidance to help students better understand academic integrity and includes tips on how to avoid plagiarism.
- The Citing Sources page offers guidance on how to properly cite using APA, MLA, and Chicago styles.
- The Artificial Intelligence Resource Guide for Students provides advice for understanding and appropriately using generative artificial intelligence tools such as ChatGPT and Bard.

UMass Global's Office of Accessible Education

Students who require disability-related services or accommodations to access their educational experience can register with the Office of Accessible Education (OAE). The Office of Accessible Education (OAE) is committed to ensuring equal educational access and opportunity for all members of our academic community. Students will be provided equitable and reasonable accommodations and services that are in compliance with Section 504 of the Federal Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990 (ADA)/Americans with Disabilities Act Amendments Act of 2008 (ADAA). Registration with OAE is on a voluntary, self-identifying basis. Please visit the Office of Accessible Education (OAE) website for more information about how to register for services, eligibility requirements, and information about potential academic accommodations and services.

Our university is committed to ensuring equal access for all students. Let us know about any accessibility barriers you encounter using any of our online systems or websites by submitting a Feedback or Accessibility Concern Submission Form. We'll do our best to improve things and get you the information you need.

UMass Global’s CARES Team

The CARES team is a campus-wide team of appointed staff and faculty responsible for identifying, assessing, and responding to concerns and/or disruptive behaviors by students, faculty/staff, and community members who struggle academically, emotionally, or psychologically, or who present a risk to the health or safety of the university or its members.

Individuals may refer themselves or other community members of concern by emailing cares@umassglobal.edu or by filling out a referral form here. The CARES Team provides short term assessment, intervention, support, and recommendations of resources to those referred and engaged in the process.

UMass Global's Title IX Statement

The University of Massachusetts Global strives to maintain and foster a climate that promotes respect and human dignity. Sexual misconduct and relationship violence in any form is antithetical to the university’s mission and core values, violates university policies, and may also violate federal and state law. The office of Title IX is primarily concerned for students' safety and well-being and is tasked with investigating all reports of sexual misconduct experienced by our community members. Title IX prohibits sex-based and gender-based discrimination and harassment, which includes discrimination based on pregnancy and/or pregnancy-related complications, parental status, and marital status. Students expecting or experiencing pregnancy-related complications, that may require educational accommodations, should contact the University’s Title IX Coordinator and/or the Office of Accessible Education.

The University and Title IX’s prohibition of sex discrimination also covers sexual harassment, sexual violence, and any other form of sexual misconduct. We offer options and resources to all students affected by these issues and are committed to providing a fair, thorough, and prompt investigation and adjudication process. If you or someone you know has been impacted by sexual assault, dating, and domestic violence, stalking, or sexual exploitation, please visit the University's Title IX Resource Page to access additional resources and information.

UMass Global's staff and faculty are tasked with reporting any possible sex or gender-based discrimination or Title IX violations to the University’s Title IX Coordinator at civilrightscomplaints@umassglobal.edu.

Click on this Link to our University Title IX Policy