PHY2048- Physics I

2023

Welcome to PHY2048 – Physics I

This course is part of the STEM core, a set of six critical and foundational courses consisting of mathematics, chemistry, physics, programming, and STEM applications. These courses build the skills and conceptual understanding you need to succeed in all degree programs. Data show that completing these courses in your freshman (first) year is the ticket to a high-powered STEM degree and an on-time graduation.

The STEM core courses, while not the same, share a similar feel and similar course policies. Moreover, the courses strive to set consistent expectations of what it means to take responsibility for your own learning and how to do university-level work. The courses are designed to be fair and reasonable. They are challenging, but they will set you up for success in your chosen degree program.

As a sign of the importance Florida Poly places on these courses, key department chairs and faculty have come together to form a ***Freshman Council*** that collectively manages course standards and delivery. We recognize the enormous impact these courses have on your future academic success. Please note the various resources that are available if you find yourself struggling in any way. Make these courses a priority!

Academic Integrity

All students are expected to adhere to the highest standards of academic integrity. Violations of academic integrity include actions such as cheating, plagiarism, use of unauthorized resources, illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. It is critical that students take a professional approach to their academic work. The faculty and administration take academic integrity very seriously. Suspected violations will be fully investigated, possibly resulting in an academic integrity hearing and sanctions against the accused student if found in violation. Sanctions range from receiving a zero on the exam or assignment, to expulsion from the university. Repeat offenders are subject to more severe sanctions and penalties. Do not compromise your integrity for a perceived short-term gain. More information about Florida Poly's academic integrity policies and procedures can be found here:https://floridapoly.edu/wp-content/uploads/2017/07/FPU-5.005-Academic-Integrity-7.29.14.pdf#search=academic%20integrity

Instructor Information

Instructor: xxxxxxx
Email: xxxxxx@floridapoly.edu
Office Hours: xxxxxx xxxxxxx

Course Information

Course Number and Title: PHY2048 – Physics I
Meeting time: xxxxxxxxxxxxxx

Credit Hours: 3
Current Academic Term: Fall 2023

Course Description: This is the first of a two-semester sequence of physics for technology and engineering. The course covers Newtonian mechanics and includes motion, vectors, Newton's laws, work and conservation of energy, systems of particles, collisions, equilibrium, oscillations, thermodynamics, and waves.

Gordon Rule (6A-10.030): No

Prerequisites: N/A

- Course Pre-Requisites: High-School Physics, PHY 2020 or equiv. MAC2311– Analytic Geometry and Calculus I.
- Course Co-Requisite or Pre-requisite: MAC 2312 – Analytic Geometry and Calculus 2
- Course Co-Requisite: PHY 2048L – Physics 1 Laboratory
- **Communication/Computation Skills Requirement (6A-10.030)**: N

- **Required Texts:** Physics for Scientists and Engineers: A Strategic Approach by Randall D. Knight, 4th Edition, ISBN 9780136780632.
- **Recommended Text**: University Physics Volume 1 by OpenStax, https://openstax.org/details/books/university-physics-volume-1
  - **Equipment and Materials**: (e.g. supplies and software)- Scientific calculator (graphing ability NOT necessary), University CANVAS LMS system & University e-mail system, Instructor Lectures, Videos, Notes and Handouts

- **Course Objectives**: Upon successful completion of this course, you should be able to:
  Define motion, work, energy, power, momentum, equilibrium, and oscillations.
  Develop skills for converting from one-unit system to other unit system.
  Demonstrate the ability to derive units from known formulae.
  Solve problems systematically using Physics laws and principles.

- **Course Learning Outcomes (CLO)**
  Demonstrate mathematical skills required to manipulate and solve physics equations.
  Apply physics concepts to solve problems based on real-world situations.
  Connect figures, diagrams, graphs, and data to underlying physics concepts.
  Connect physics concepts to each other and to the real-world

- **Metacognitive Learning Outcomes (MLO)**
  Decode the fundamental laws, theories, and principles central to Physics by describing how an example or practice problem illustrates a specific law, theory or principle in concept checks and conceptual test problems.
  Apply correct formula and equation for obtained/provided solution in numerical practice problem set, and concept-based text questions to predict a system's initial and final conditions.
  Compare and contrast figures, diagrams, graphs, texts, data, scientific formula, and solution strategies with respect to underlying Physics concepts.
  Evaluate a multi-step description of a problem to determine assumptions inherent in the unknown and known parameters, choose the correct formula in a given set, and systemic solving of a problem with appropriate significance.
  Infer the functioning of the Physics laws and principles from agreement between measured macroscopic values and predicted values of idealized systems through the demonstrations, calculations, and conceptual exercises and through interpretation of numerical problems.
  Construct the right formula for a numerical problem by deriving it from the first principles, successfully **synthesize** the solution to the problem based on the derived formula and use in a systematic manner.

- **Alignment with Program Outcomes**: Include alignment with General Education Competency; ABET Student Outcomes; or another professional standard, if applicable, e.g. This course supports General Education competency for scientific reasoning. Program Learning Outcomes and General Education Competencies may be found in the Academic Catalog (http://catalog.floridapoly.edu/). Additionally, outcomes may be aligned with level of difficulty per Bloom's taxonomy (see University's Institutional Effectiveness Manual for Academic programs).

SLO Table

Course Learning Outcome	**Learning Level (e.g. Bloom's, Anderson/ Krathwohl; Rogers/Hatfield (ABET Assessment Example)**	**Program Learning Outcome (ABET, GenEd, Other)**
Demonstrate mathematical skills required to manipulate and solve physics equations.	**Remember** Recognize Recall	1
Apply physics concepts to solve problems based on real-world situations.	**Apply and Analyze** Execute	1

	Implement Differentiate Organize	
Connect figures, diagrams, graphs, and data to underlying physics concepts.	**Understand** Interpret Compare Explain	3
Connect physics concepts to each other and to the real-world	**Evaluate** Check Critique	1, 4

Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to Academic Success Center success@floridapoly.edu or by email, library@floridapoly.edu.
- **ASC**: The Academic Success Center, located in the IST and at ASC East, provides a range of services. Students may direct questions to success@floridapoly.edu.

Subject Learning Goals

CHAPTER 1: Concepts of Motion [Sections 1.1-1.8]

1. To understand and use the basic ideas of the *particle model*.
2. To analyze the motion of an object by using *motion diagrams* as a tool.
3. To differentiate between the concepts of position, velocity, and acceleration.
4. To recognize the relationship between *v* and *a* when an object is speeding up, slowing down, or at a turning point.
5. To gain initial experience with graphical addition and subtraction of vectors.
6. To begin the process of learning to analyze problem statements and to translate the information into other representations.
7. To learn about position-versus-time graphs and the sign conventions for one-dimensional motion.
8. To understand the proper use of significant figures.

CHAPTER 2: Kinematics in One Dimension [Sections 2.1-2.6]

1. To differentiate clearly between the concepts of position, velocity, and acceleration.
2. The interpret kinematic graphs.
3. To translate kinematic information between verbal, pictorial, graphical, and algebraic representations.
4. To learn the basic ideas of calculus (differentiation and integration) and to utilize these ideas both symbolically and graphically.
5. To understand free-fall motion.
6. To begin the development of a robust problem-solving strategy.
7. To solve quantitative kinematics problems and to interpret the results.

CHAPTER 3: Vectors and Coordinate Systems [Sections 3.1-3.4]

1. To understand the basic properties of vectors.
2. To add and subtract vectors both graphically and using components.
3. To be able to decompose a vector into its components and to reassemble vector components into a magnitude and a direction.
4. To recognize and use the basic unit vectors.
5. To work with tilted coordinate systems.

CHAPTER 4: Kinematics in Two Dimensions [Sections 4.1-4.6]

1. To identify the acceleration vector for curvilinear motion.
2. To compute two-dimensional trajectories.
3. To understand projectile motion.
4. To understand relative motion.
5. To understand the kinematics of uniform circular motion.
6. To understand angular acceleration and the kinematics of nonuniform circular motion.

CHAPTER 5: Force and Motion [Sections 5.1-5.7]

1. To recognize what does and does not constitute a force.
2. To identify the specific forces acting on an object.
3. To draw an accurate free-body diagram of an object.
4. To begin the process of understanding the connection between force and motion.
5. To begin learning how to explain an observation on the basis of physical principles.

CHAPTER 6: Dynamics I: Motion Along a Line [Sections 6.1-6.6]

1. To draw and make effective use of free-body diagrams.
2. To recognize and solve simple equilibrium problems.
3. To distinguish mass, weight, and gravity.
4. To learn and use simple models of friction and drag.
5. To apply the full strategy for force and motion problems to problems in single-particle dynamics.

CHAPTER 7: Newton's Third Law [7.1-7.5]

1. To learn how two objects, interact.
2. To identify action/reaction pairs of forces.
3. To understand and use Newton's third law.
4. To understand how to use propulsion forces and tension forces.

CHAPTER 8: Dynamics II: Motion in a Plane [Sections 8.1-8.5]

1. To compute two-dimensional trajectories.
2. To understand the dynamics of uniform circular motion.
3. To learn the basic ideas of orbital motion.
4. To answer, "How does the water stay in the bucket?" and related questions.

CHAPTER 9: Work and Kinetic Energy [Sections 9.1-9.6]

1. To explicitly use systems-based thinking to develop a model of energy—what it is, how
2. it is transformed, and how it is transferred.
3. To introduce the concepts of work and kinetic energy.
4. To learn Hooke's law for springs and the new idea of a restoring force.
5. To introduce a model of thermal energy and dissipative forces.

CHAPTER 10: Interactions and Potential Energy [Sections 10.1-10.7]

1. To expand the basic energy model by introducing potential energy.
2. To learn to use and interpret energy bar charts and energy diagrams.
3. To develop a complete statement of the energy principle and to apply the energy principle to isolated systems in which energy is conserved.

CHAPTER 11: Impulse and Momentum [Sections 11.1-11.5]

1. To understand interactions from the new perspective of impulse and momentum.
2. To learn what is meant by an isolated system.
3. To apply conservation of momentum in simple situations.
4. To understand collisions and explosions.

CHAPTER 12: Rotation of a Rigid Body [Sections 12.1-12.11]

1. To extend the particle model to the rigid-body model.
2. To understand the equilibrium of an extended object.
3. To understand rotation about a fixed axis.
4. To understand rolling motion.
5. To introduce the vector description of rotational motion and angular momentum.

CHAPTER 16: Traveling Waves [Sections 16.1-16.3]

1. To use the wave model and understand how it differs from the particle model.
2. To visualize wave motion and develop intuition about waves.

Grading Scale

Grade	A	B+	B	B-	C+	C	D	F
Percentage	90%	87%	83%	80%	77%	70%	60%	< 60%
GPA	4.0	3.33	3.0	2.67	2.33	2.0	1.0	0.0

Assignment/Evaluation Methods

Homework	15%
Projects	05%
Quizzes (class activities)	10%*
Attendance/Participation (pre- and post- tests)	05% **
Exams	45%
Final Exam	20% ***

Total	100%

*The lowest quiz grade will be dropped. Makeup quizzes will not be given.
**Up to 3 unexcused absences are permitted. Each subsequent unexcused absences will result in a 1% penalty.
***The final exam grade **may** replace the lowest exam grade if it benefits the overall grade in the course. Note: All the 3 exams (including midterm exam) are required. The final will NOT replace a 0 from a missed exam.

Schedule of Topics by Week

Week	Chapters/Topics	Assignments
Week 1	Syllabus Concepts of Motion	**Pre-test (Online)**
Week 2	Kinematics in 1D	Homework Assignment
Week 3	Vectors and Coordinate Systems	Homework Assignment
Week 4	Kinematics in Two Dimensions Exam 1	Homework Assignment
Week 5	Force and Motion	Homework Assignment
Week 6	Newton's Third Law	Homework Assignment
Week 7	Dynamics I: Motion Along a Line	Homework Assignment
Week 8	Dynamics II: Motion in a Plane Exam 2)	Homework Assignment
Week 9	TBD	Homework Assignment
Week 10	Work and Kinetic Energy Interactions and Potential Energy	Homework Assignment
Week 11	Impulse and Momentum	Homework Assignment
Week 12	Rotational Motion of Rigid Bodies Exam 3	Homework Assignment
Week 13	Newton's Theory of Gravity	Homework Assignment
Week 14	Oscillations	Homework Assignment
Week 15	Extra topics (TBD) Final Review	Homework Assignment
Week 16	Reading Days	**Post-test (Online)**
Week 17	Final Exam	

Homework

Your homework all on canvas and will be ready by day 1. Each chapter has one homework on canvas, the homework format is similar to your exams. Part 1, 8 multiple choices, part 2, 4 short calculations, part 3, 3 multiple step calculations. You usually have up to 5 attempts to get the correct answer. Solutions become available right after the due date/time. Make sure to upload a detailed work for questions 9 through 15.

Also, for each chapter students should study the solved examples and attempt these problems

Chapter No.	Solved Examples from Textbook	Additional Problems from the Knight 4th ed.
CH 1 – Concepts of Motion	EX1: 1.1, 1.3, 1.5, 1.7, 1.9, 1.10	HW1: 1.24, 1.28, 1.54, 1.56, 1.58
CH 2 – Kinematics in 1D	EX2: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.10, 2.13, 2.15, 2.16	HW2: 2.3, 2.40, 2.42, 2.68, 2.70
CH 3 – Vectors and Coordinate Systems	EX3: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7	HW3: 3.4, 3.8, 3.16, 3.24, 3.32
CH 4 – Kinematics in 2D	EX4: 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 4.8, 4.9, 4.11, 4.12, 4.14	HW4: 4.6, 4.8, 4.18, 4.30, 4.32
CH 5 – Force and Motion	EX5: 5.1, 5.2, 5.3, 5.4, 5.5, 5.6	HW5: 5.6, 5.10, 5.12, 5.14, 5.34
CH 6 – Dynamics I: Motion Along a Line	EX6: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.10	HW6: 6.3, 6.8, 6.24, 6.28, 6.36

CH 7 – Newton's Third Law	EX7: 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.8,	HW7: 7.6, 7.8, 7.10, 7.12, 7.14, 7.23
CH 8 – Dynamics II: Motion in a Plane	EX8: 8.1, 8.2, 8.3, 8.4, 8.5,	HW8: 8.2, 8.6, 8.16, 8.18, 8.28, 8.36
CH 9 – Work and Kinetic Energy	EX9: 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 9.11, 9.12	HW10: 9.2, 9.26, 9.32, 9.36, 9.45
CH 10–Interactions and Potential Energy	EX 10: 10.1, 10.2, 10.3, 10.4, 10.5, 10.7, 10.8, 10.10	HW11: 10.5, 10.9, 10.18, 10.37, 10.42
CH 11 – Impulse and Momentum	EX9: 11.1, 11.2, 11.5, 11.6, 11.8, 11.9	HW9: 11.8, 11.14, 11.18, 11.26, 11.32, 11.48
CH 12 – Rotation of a Rigid Body	EX 12: 12.1, 12.2, 12.3, 12.4, 12.5, 12.7, 12.8, 12.9, 12.11, 12.15, 12.16, 12.17, 12.19	HW12: 12.6, 12.12, 12.22, 12.26, 12.32