



Course Description

Physics A is designed to acquaint you with topics of physics, including motion and forces, conservation of energy and momentum, heat and thermodynamics. Class activities include discussion, problem solving, online lab simulations and other interactive activities, lab reports, and an exploration project.

Course Objectives

Motion and Forces:

1. Students know how to solve problems that involve constant speed and average speed.
2. Students know that when forces are balanced, no acceleration occurs; thus an object continues to move at a constant speed or stays at rest (Newton's first law).
3. Students know how to apply the law $F=ma$ to solve one-dimensional motion problems that involve constant forces (Newton's second law).
4. Students know that when one object exerts a force on a second object, the second object always exerts a force of equal magnitude and in the opposite direction (Newton's third law).
5. Students know the relationship between the universal law of gravitation and the effect of gravity on an object at the surface of Earth.
6. Students know applying a force to an object perpendicular to the direction of its motion causes the object to change direction but not speed (e.g., Earth's gravitational force causes a satellite in a circular orbit to change direction but not speed).
7. Students know circular motion requires the application of a constant force directed toward the center of the circle.
8. * Students know Newton's laws are not exact but provide very good approximations unless an object is moving close to the speed of light or is small enough that quantum effects are important.
9. * Students know how to solve two-dimensional trajectory problems.
10. * Students know how to resolve two-dimensional vectors into their components and calculate the magnitude and direction of a vector from its components.
11. * Students know how to solve two-dimensional problems involving balanced forces (statics).
12. * Students know how to solve problems in circular motion by using the formula for centripetal acceleration in the following form: $a=v^2/r$.
13. * Students know how to solve problems involving the forces between two electric charges at a distance (Coulomb's law) or the forces between two masses at a distance (universal gravitation).

Conservation of Energy and Momentum



1. Students know how to calculate kinetic energy by using the formula $E=(1/2)mv^2$.
2. Students know how to calculate changes in gravitational potential energy near Earth by using the formula (change in potential energy) =mgh (h is the change in the elevation).
3. Students know how to solve problems involving conservation of energy in simple systems, such as falling objects.
4. Students know how to calculate momentum as the product mv.
5. Students know momentum is a separately conserved quantity different from energy.
6. Students know an unbalanced force on an object produces a change in its momentum.
7. Students know how to solve problems involving elastic and inelastic collisions in one dimension by using the principles of conservation of momentum and energy.
8. * Students know how to solve problems involving conservation of energy in simple systems with various sources of potential energy, such as capacitors and springs.

Heat and Thermodynamics

1. Students know heat flow and work are two forms of energy transfer between systems.
2. Students know that the work done by a heat engine that is working in a cycle is the difference between the heat flow into the engine at high temperature and the heat flow out at a lower temperature (first law of thermodynamics) and that this is an example of the law of conservation of energy.
3. Students know the internal energy of an object includes the energy of random motion of the object's atoms and molecules, often referred to as thermal energy. The greater the temperature of the object, the greater the energy of motion of the atoms and molecules that make up the object.
4. Students know that most processes tend to decrease the order of a system over time and that energy levels are eventually distributed uniformly.
5. Students know that entropy is a quantity that measures the order or disorder of a system and that this quantity is larger for a more disordered system.
6. * Students know the statement "Entropy tends to increase" is a law of statistical probability that governs all closed systems (second law of thermodynamics).
7. * Students know how to solve problems involving heat flow, work, and efficiency in a heat engine and know that all real engines lose some heat to their surroundings.

Course Outline

Unit	Topics	Assignments/Activities
1	Science Basics: An Introduction to Physics	Diagnostic Exam Presentation: Introduction to Physics Lecture: Introduction to Physics



Unit	Topics	Assignments/Activities
		Presentation: History of Physics Assignment: Key Terms Key Terms Quiz Unit 1 Quiz Begin Project
2	Mechanics	Lecture: Linear Motion Assignment Reading Assignment Key Terms Key Terms Quiz Linear Motion Quiz Lecture: Projectile Motion Assignment Reading Assignment Key Terms Key Terms Quiz Projectile Motion Quiz Lecture: Newton's First Law Assignment



Unit	Topics	Assignments/Activities
		Reading Assignment Key Terms Key Terms Quiz Newton's First Law Quiz Lecture: Newton's Third Law Assignment Reading Assignment Key Terms Key Terms Quiz Newton's Third Law Quiz Lecture: Newton's Second Law Assignment Reading Assignment Key Terms Key Terms Quiz Newton's Second Law Quiz Discussion Lab: Golf Range, Water Balloons, Vector Calculator, Skater's Away!, and Balloon Jet Project
3	Mechanics (Continued)	Lecture: Momentum Assignment Reading Assignment



Unit	Topics	Assignments/Activities
		Key Terms Key Terms Quiz Momentum Quiz Lecture: Energy Assignment Reading Assignment Key Terms Key Terms Quiz Energy Quiz Discussion Labs: Astronaut Toss, Air Track, 2 Dimensional Collisions Project
4	Mechanics (Continued)	Lecture: Circular Motion Assignment Reading Assignment Key Terms Key Terms Quiz Circular Motion Quiz Lecture: Center of Gravity Assignment Reading Assignment Key Terms Key Terms Quiz



Unit	Topics	Assignments/Activities
		Center of Gravity Quiz Lecture: Rotational Mechanics Assignment Reading Assignment Key Terms Key Terms Quiz Rotational Mechanics Quiz Discussion Labs: Rotational Mechanics Midterm
5	Mechanics (Continued)	Lecture: Universal Gravitation Assignment Reading Assignment Key Terms Key Terms Quiz Universal Gravitation Quiz Lecture: Gravitational Interactions Assignment Reading Assignment Key Terms Key Terms Quiz Gravitational Interactions Quiz Lecture: Satellite Motion



Unit	Topics	Assignments/Activities
		Assignment Reading Assignment Key Terms Key Terms Quiz Satellite Motion Quiz Lecture: Special Relativity—Space and Time Assignment Reading Assignment Key Terms Key Terms Quiz Special Relativity Quiz Lecture: Special Relativity—Length, Momentum, and Engery Assignment Reading Assignment Key Terms Key Terms Quiz Special Relativity Quiz Discussion Labs: Special Relativity Project
6	Properties of Matter	Lecture: Atomic Nature of Matter Assignment Reading Assignment



Unit	Topics	Assignments/Activities
		Key Terms Key Terms Quiz Atomic Nature of Matter Quiz Lecture: Solids Assignment Reading Assignment Key Terms Key Terms Quiz Solids Quiz Lecture: Liquids Assignment Reading Assignment Key Terms Key Terms Quiz Liquids Quiz Lecture: Gases Assignment Reading Assignment Key Terms Key Terms Quiz Gases Quiz Discussion



Unit	Topics	Assignments/Activities
		Labs: Descartes' Diver, Make a Barometer, Hot Air Balloon, Bernoulli Levitator, PingPong Project
7	Heat	Lecture: Temperature, Heat, and Expansion Assignment Reading Assignment Key Terms Key Terms Quiz Temperature, Heat, and Expansion Quiz Lecture: Heat Transfer Assignment Reading Assignment Key Terms Key Terms Quiz Heat Transfer Quiz Lecture: Change of Phase Assignment Reading Assignment Key Terms Key Terms Quiz Change of Phase Quiz Lecture: Thermodynamics Assignment



Unit	Topics	Assignments/Activities
		Reading Assignment Key Terms Key Terms Quiz Thermodynamics Quiz Discussion Labs: Oh Nuts! Calories Count, Cold Stuff, Convection Current, Give and Take
8	Review	Lecture: Review Units 1-7 Discussion Exploration: Project Presentation Final Exam

Course Policies and Procedures

- This is an inquiry-based course. Students will generate knowledge through online readings, synchronous chats, and asynchronous discussions with students and their instructor, interactions with online tutorials, online and hands-on simulations, and virtual classroom voice chats.
- A semester project developed by each student will be used to demonstrate knowledge and understanding of the material in the course.
- The instructor will act as a guide, a facilitator, an events planner, and a resource advisor. He/she will always be available through e-mail.
- The student must actively construct and acquire knowledge by being intrinsically motivated to succeed. To succeed, students must participate and complete all readings and activities. This course requires the student's active participation.
- Both formal and informal assessment methods will be used in the course. Informal assessment will include an evaluation of the quality and timeliness of participation in class activities. Formal assessment may include multiple-choice quizzes, tests, discussion board participation, and written assignments. A final exam will be given at the end of the course.

Grading Policy



Students should plan to allocate at least 12-15 hours a unit on assigned readings, assignments, discussions (asynchronous and synchronous), quizzes, and exams. It is highly recommended that students organize themselves around the course schedule.

Grading Scale:

Letter Grade	Percentage Earned
A	95%+
A-	90% - 94.9%
B+	87% - 89.9%
B	84% - 86.9%
B-	80% - 83.9%
C+	77% - 79.9%
C	74% - 76.9%
C-	70% - 73.9%
D+	67% - 69.9%
D	64% - 66.9%
D -	60% - 63.9%
F	59% and lower

Textbook(s)

There is no required textbook for this course.

Student's Role and Responsibility

Expectations:

Students are expected to conduct themselves in a responsible manner that reflects sound ethics, honor, and good citizenship. It is the student's responsibility to maintain academic honesty and integrity and to manifest their commitment to the goals of NUVHS through their conduct and behavior. Students are expected to abide by all NUVHS policies and regulations. Any form of academic dishonesty, or inappropriate conduct by students or applicants may result in penalties ranging from warning to dismissal, as deemed appropriate by NUVHS.

Communication:

Throughout this course students will need to be in close contact with their instructor and fellow students. Students are expected to communicate via email and electronic discussion boards. Therefore, students should plan on checking email at least three times a unit and participate in the discussion boards during the units they are live.

Instructors strongly encourage and welcome open communication. Clear, consistent, and proactive communication will ensure a successful experience in this course. It is the student's responsibility to notify the instructor immediately if and when a personal situation occurs that affects his/her performance in this class. Being proactive with communication will result in a quick solution to any problems that may occur.

Technical Support is offered through Spectrum Pacific Learning Company (SPLC). Should a student need any technical assistance, he/she are to email the Help Desk as soon as possible at helpdesk@spectrumpacific.com or call 1-877-533-4733. SPLC will help resolve technical problems and walk through the solution with students. If a problem persists for more than 48 hours, the student must also notify their teacher and NUVHS.

ESLR's

NUVHS Expected Schoolwide Learning Results (ESLRs):

It is anticipated that NUVHS students will be:

Engaged Learners

1. Demonstrate self-directed learning skills such as time management, and personal responsibility through the completion of course requirements
2. Develop an understanding of their own preferred learning styles to enhance their overall academic potential
3. Incorporate effective and relevant internet and multimedia resources in their learning process to broaden their knowledge base

Critical Thinkers

1. Effectively analyze and articulate sound opinions on a variety of complex concepts
2. Illustrate a variety of problem-solving strategies that strengthen college preparation and workforce readiness
3. Formulate a framework for applying a variety of technology and internet-based research to enhance information literacy and collaborative thinking

Effective Communicators

1. Demonstrate awareness and sensitivity to tone and voice in multiple forms of communication
2. Express concepts and ideas in a variety of forms
3. Enhance communication skills through the use of media rich or other technology resources

Global Citizens

1. Appreciate the value of diversity
2. Understand the range of local and international issues facing today's global community
3. Demonstrate awareness of the importance of cultural sensitivity and social responsibility in the 21st century

Content Standards

Physics A is written to the content standards adopted by the California State Board of Education.



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