PHYS 120 - General Physics 1 Course Outline

Approval Date: 04/09/2015
Effective Date: 01/15/2016

SECTION A

Unique ID Number	CCC000564138
Discipline(s)	Physical Sciences
Division	Science and Engineering
Subject Area	Physics
Subject Code	PHYS
Course Number	120
Course Title	General Physics 1
TOP Code/SAM Code	1902.00 - Physics, General / E - Non-Occupational
Rationale for adding this course to the curriculum	Restructure SLOs
Units	4
Cross List	*N/A*
Typical Course Weeks	
Total Instructional Hours	

Contact Hours	
Lecture	54.00
Lab	72.00
Activity	0.00
Work Experience	0.00
Outside of Class Hours	108.00

Total Contact Hours	126
Total Student Hours	234
Open Entry/Open Exit	No
Maximum Enrollment	
Grading Option	Letter Grade or P/NP
Distance Education Mode of Instruction	

SECTION B

General Education Information:

SECTION C

Course Description

Repeatability May be repeated 0 times

Catalog Description This algebra-based physics course covers mechanics, fluids, wave motion, and heat. Biological and medical applications are emphasized.

Schedule Description

SECTION D

Condition on Enrollment

1a. Prerequisite(s)

- MATH 106 and
- MATH 108

1b. Corequisite(s): *None*

1c. Recommended: *None*

1d. Limitation on Enrollment: *None*

SECTION E

Course Outline Information

1. Student Learning Outcomes:

A. Solve problems qualitatively and communicate reasoning using concepts from Newtonian mechanics, thermodynamics, and wave motion.
B. Solve quantitative problems while demonstrating a thorough understanding of the application of Newtonian mechanics, thermodynamics, and wave motion.
C. Implement laboratory experiment techniques correctly during the investigation of the lecture topics and express the results clearly in written laboratory reports.

2. Course Objectives: Upon completion of this course, the student will be able to:

A. Use the units of metric measurement and be able to convert from one unit to another.
B. Solve problems in kinematics using the concepts of velocity and acceleration. For example, predict the future trajectory of an object in two dimensions with uniform acceleration.
C. Use the trigonometric functions to solve vector problems.
D. Analyze force and motion using Newton's Laws of Motion. For example, analyze a physical situation with multiple constant forces acting on a point mass using Newtonian mechanics.
E. Draw free body diagrams to find unknown forces.
F. Use the concepts of centripetal force and Kepler's Laws of satellite motion to solve problems.
G. Use the conservation of energy and momentum in solving motion and collision problems.
H. Analyze a physical situation using concepts of work and energy.
I. Analyze torque, angular motion, and gyroscopic motion for static and dynamic extended systems.
J. Solve complex statics problems involving multiple forces.
K. Use the concepts of pressure, Archimedes principle and fluid flow in solving problems.
L. Analyze and solve problems in areas of simple harmonic motion and wave motion.
M. Calculate a Doppler shift in frequency.
N. Use the decibel to solve problems concerning the ear and hearing.
O. Solve perfect gas law and calorimetry problems.

P. Use the laws of thermodynamics to solve heat engine problems.
Q. Write a short essay on the processes of heat transfer.
R. Analyze real-world experimental data, including appropriate use of units and significant figures.
S. Relate the results of experimental data to the physical concepts discussed in the lecture portion of the class.
T.

3. Course Content

A. Introduction
    a. Science and creativity
    b. Physics and its relation to other fields
    c. Models, theories and laws
    d. Measurement and uncertainty
    e. Units, standards and the SI system
    f. Order of magnitude: rapid estimating
    g. Mathematics
B. Describing Motion: Kinematics in One Dimension
    a. Speed
    b. Changing units
    c. Reference frames and coordinate systems
    d. Average velocity and displacement
    e. Instantaneous velocity
    f. Vectors and scalars
    g. Acceleration
    h. Uniformly accelerated motion
    i. Falling bodies
C. Kinematics in Two or Three Dimensions: Vectors
    a. Addition of vectors-graphical methods
    b. Subtractions of vectors, and multiplication of a vector by a scalar
    c. Analytic method for adding vectors: components
    d. Relative velocity-vectors in problem solving
    e. Projectile motion
    f. Solving problems involving projectile motion
    g. Projectile motion is parabolic
D. Motion and Force: Dynamics
    a. Force
    b. Newton's first law of motion
    c. Mass
    d. Newton's second law of motion
    e. Weight-the force of gravity and the normal force
    f. Solving problems with Newton's laws: vector forces and free-body diagrams
    g. Problems involving friction, inclines
    h. Laws or definitions
    i. Problem solving - a general approach
E. Circular Motion: Gravitation
    a. Kinematics of uniform circular motion
    b. Dynamics of uniform circular motion
    c. Nonuniform circular motion
    d. Centrifugation
    e. Newton's law of universal gravitation

f. Gravity near the earth's surface; geophysical applications
g. Satellites and "weightlessness"
h. Kepler's laws and Newton's synthesis

F. Work and Energy
a. Work done by a constant force
b. Work done by a varying force
c. Kinetic energy and the work-energy principle
d. Potential energy
e. Conservative and non-conservative forces
f. Mechanical energy and its conservation
g. Problem solving using conservation of mechanical energy
h. Other forms of energy; energy transformations and the law of conservation of energy
i. Energy conservation with dissipative forces: solving problems

G. Linear Momentum
a. Momentum and its relation to force
b. Conservation of momentum
c. Collisions and impulse
d. Conservation of energy and momentum in collisions
e. Elastic collisions in one dimension-solving problems using energy and momentum conservation
f. Elastic collisions in two or three dimensions
g. Inelastic collisions
h. Center of mass
i. Center of mass and translational motion

H. Rotational Motion
a. Angular quantities
b. Kinematic equations for uniformly accelerated rotational motion
c. Torque
d. Rotational dynamics; torque and rotational inertia
e. Rotational kinetic energy
f. Angular momentum and its conservation

I. Bodies in Equilibrium: Elasticity and Fracture
a. Statics-the study of forces in equilibrium
b. The conditions for equilibrium
c. Solving statics problems
d. Applications to muscles and joints
e. Stability and balance
f. Elasticity; stress and strain
g. Fracture
h. Spanning a space: arches and domes

J. Fluids
a. Density and specific gravity
b. Pressure in fluids
c. Atmospheric pressure and gauge pressure
d. Pascal's principle
e. Measurement of pressure; gauges and the barometer
f. Buoyancy and Archimedes' principle
g. Fluids in motion; flow rate and the equation of continuity
h. Bernoulli's equation
i. Applications of Bernoulli's principle

j. Viscosity
k. Flow in tubes: Poiseuille's equation, blood flow, Reynolds number
l. Object moving in a fluid; sedimentation and drag
m. Surface tension and capillarity
n. Pumps; the heart and blood pressure

K. Vibrations and Waves
a. Simple harmonic motion
b. Energy in the simple harmonic oscillator
c. Vertical spring derivations
d. The reference circle: the period and sinusoidal nature of SHM
e. The simple pendulum
f. Damped harmonic motion
g. Forced vibrations; resonance
h. Wave motion
i. Types of waves
j. Energy transported by waves
k. Reflection and interference of waves
l. Standing waves; resonance
m. Refraction and diffraction

L. Sound
a. Characteristics of sound
b. Intensity of sound
c. Intensity related to amplitude and pressure amplitude
d. The ear and its response; loudness
e. Sources of sound: vibrating strings and air columns
f. Quality of sound, and noise
g. Interference of sound waves; beats
h. Doppler effect
i. Shock waves and the sonic boom
j. Applications; ultrasound and medical imaging

M. Temperatures and Kinetic Theory
a. Atoms
b. Temperature
c. Thermal equilibrium and the zeroth law of thermodynamics
d. Thermal expansion
e. Thermal stresses
f. The gas laws and absolute temperature
g. The ideal gas law
h. Problem solving with the ideal gas law
i. Ideal gas law in terms of molecules: Avogadro's number
j. Kinetic theory and the molecular interpretation of temperature
k. Distribution of molecular speeds
l. Real gases and changes of phase
m. Vapor pressure and humidity
n. Diffusion

N. Heat
a. Heat as energy transfer
b. Distinction between temperature, heat, and internal energy
c. Internal energy of an ideal gas
d. Specific heat
e. Calorimetry-solving problems

f. Latent heat, and problem solving
g. Heat transfer: conduction
h. Heat transfer: convection
i. Heat transfer: radiation

O. The Laws of Thermodynamics
a. The first law of thermodynamics
b. First law of thermodynamics applied to some simple systems
c. Human metabolism and the first law
d. The second law of thermodynamics-introduction
e. Heat engines
f. Refrigerators, air conditioners, and heat pumps
g. Entropy and the second law of thermodynamics
h. Order to disorder
i. Unavailability of energy; heat death
j. Evolution and growth; "time's arrow"
k.

4. Methods of Instruction:

Activity:
Discussion:
Experiments:
Lab:
Lecture:

5. Methods of Evaluation: Describe the general types of evaluations for this course and provide at least two, specific examples.

Typical classroom assessment techniques

Exams/Tests -- Exams include symbolic, numerical, conceptual, and short paragraph questions.
Quizzes -- Similar to exams
Research Projects -- Research projects may be used as a part of laboratory.
Oral Presentation -- Oral presentation of laboratory results is one possible format.
Projects -- Completion of weekly lab is required. Results include data, graphing, and explanation of processes and concepts used.
Group Projects -- Laboratory is a group activity. Problem solving assignments may also be completed as group work.
Class Participation -- Example problems worked in class may count toward a class participation grade.
Home Work -- Numerical, symbolic, and conceptual homework will be assigned in addition to written laboratory reports.
Lab Activities -- Lab includes data collection, analysis, and discussion. Results are summarized in the lab report.
Final Exam -- The final exam is comprehensive and similar in content to the midterms.

Letter Grade or P/NP

6. Assignments: State the general types of assignments for this course under the following categories and provide at least two specific examples for each section.

A. Reading Assignments
-Daily reading assignments in the two texts listed are required
B. Writing Assignments

- Daily reading assignments in the two texts listed above are required.
- Chapter problem assignments in "Physics" are required weekly.
- Written laboratory reports are required every week.

C. Other Assignments
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7. Required Materials

A. EXAMPLES of typical college-level textbooks (for degree-applicable courses) or other print materials.

Book #1:

Author:	Walker, James
Title:	Physics
Publisher:	Addison-Wesley
Date of Publication:	2013
Edition:	4th

Book #2:

Author:	Douglas Giancoli
Title:	Physics
Publisher:	Prentice Hall
Date of Publication:	2013
Edition:	7th

Book #3:

Author:	Cutnell, J., K. Johnson
Title:	Physics
Publisher:	John Wiley and Sons
Date of Publication:	2012
Edition:	9th

Manual #1:

Author:	Wilson, Jerry
Title:	Physics Laboratory Experiments 8th edition
Publisher:	Cengage Learning
Date of Publication:	01-03-2014

Manual #2:

Author:	Wilson, Jerry
Title:	Physics Laboratory Experiments Napa Valley College Edition
Publisher:	Heath
Date of Publication:	01-01-1994

B. Other required materials/supplies.