PHY 151
COLLEGE PHYSICS I

COURSE DESCRIPTION:

Prerequisites: RED 090 or DRE 098, or satisfactory score on placement test and MAT 172 or MAT 175
Corequisites: None

This course uses algebra- and trigonometry-based mathematical models to introduce the fundamental concepts that describe the physical world. Topics include units and measurement, vectors, linear kinematics and dynamics, energy, power, momentum, fluid mechanics, and heat. Upon completion, students should be able to demonstrate an understanding of the principles involved and display analytical problem-solving ability for the topics covered.   Laboratory experiments, along with some computer-based labs and tutorials, consolidate the basic principles discussed in lectures. *This course has been approved to satisfy the Comprehensive Articulation Agreement for the general education core requirement in natural sciences/mathematics.* Course Hours Per Week: Class, 3. Lab, 2. Semester Hours Credit, 4.

COURSE OBJECTIVES:

Upon completion of this course, the student will demonstrate basic knowledge in the following:

a. Basic international units of physics.
b. Kinematics.
c. Dynamics.
d. Statics.
e. Momentum.
f. Energy.
g. Rotation.
h. Gravity.
i. Elasticity and vibration.
j. Wave motion.
k. Fluids.
l. Temperature and heat.
m. Thermal behavior of gases.
n. Heat applications.

OUTLINE OF INSTRUCTION:

I. Nature of physics
    A. Measurements in physics
    B. Structure of matter
    C. Density and specific gravity

II. Kinematics
     A. Types of motion
     B. Velocity
     C. Acceleration
     D. Vectors
     E. Projectiles

III. Dynamics
     A. Force
     B. Newton's laws of motion
     C. Weight and mass
     D. Application of Newton's second law of motion

IV. Statics
     A. Equilibrium
     B. Center of gravity
     C. Concurrent force problems
     D. Friction
     E. Torque
     F. Non-concurrent force problems

V. Momentum
     A. Definition of linear momentum
     B. Newton's second low-impulse
     C. Conservation of linear momentum
     D. Collisions
     E. Weightlessness and artificial gravity
     F. Inertial forces

VI. Energy
     A. Work
     B. Mechanical energy
     C. Conservation of energy
     D. Power, efficiency
     E. Energy changes in collisions

VII. Rotation
     A. Angular quantities
     B. Centripetal and centrifugal force
     C. Rotational inertia
     D. Conservation of angular momentum

VIII.   Gravity
A. Newton's law of gravitation
B. Gravitational field
C. Dynamics of planetary motions

IX. Elasticity and vibration
A. Hooke's law
B. Simple harmonic motion
C. Pendulums
D. Non-simple harmonic motion

X. Wave motion
A. Types of wave motion
B. Graphical representation
C. Periodic waves
D. Superposition principle
E. The Doppler effect
F. Interference
G. Resonance
H. Musical sounds and instruments

XI. Fluids
A. Pressure and its measurement
B. Pascal's principle
C. Archimedes' principle
D. Surface tension
E. Bernoulli's equation

XII. Temperature and heat
A. Definition of temperature
B. Thermal expansion
C. Internal energy
D. Specific heat
E. Phase change
F. Heat transfer

XIII.   Thermal behavior of gases
A. Ideal gases
B. The universal gas law
C. Avogadro's number
D. Vapor pressure and relative humidity
E. Molecular pressure
F. Specific heat of gases
G. Adiabatic gas law

XIV.   Heat applications
      A. The second law of thermodynamics
      B. Heat engines
      C. Available heat and heat pollution
      D. Heat pump and refrigerator

REQUIRED TEXTBOOK AND MATERIALS:

Giambattista, A., Richardson, B. M., & Richardson, R. C., Physics. 2nd ed. Boston, McGraw
    Hill Higher Education, 2010.

Programmable scientific calculator.

SUGGESTED REFERENCES, PERIODICALS, AND VISUAL AIDS:

Numerous supplementary texts, programmed materials, and audiovisual packages are available in
the Educational Resources Center. These materials may be utilized to reinforce the lecture and
lab material or to provide material for independent study by the student.

STATEMENT OF STUDENTS WITH DISABILITIES:

Students who require academic accommodations due to any physical, psychological, or learning
disability are encouraged to request assistance from a disability services counselor within the
first two weeks of class. Likewise, students who potentially require emergency medical
attention due to any chronic health condition are encouraged to disclose this information to a
disability services counselor within the first two weeks of class. Counselors can be contacted by
calling 919-536-7207, ext. 1413 or by visiting the Student Development Office in the Phail
Wynn Jr. Student Services Center, room 1209.