COLLEGE OF THE DESERT

Course Code PH-003A

Course Outline of Record

1. Course Code: PH-003A
2. a. Long Course Title: Engineering Physics
   b. Short Course Title: ENGINEER PHYSICS
3. a. Catalog Course Description:
   This is the first semester of the three-semester calculus-based physics sequence for scientists and engineers including those entering the computer fields. Topics include mechanics, wave motion, and sound.
   b. Class Schedule Course Description:
   This is the first semester of the three-semester calculus-based physics sequence for scientists and engineers including those entering the computer fields. Topics include mechanics, wave motion, and sound.
   c. Semester Cycle (*if applicable*): *N/A*
   d. Name of Approved Program(s):
   - PHYSICS AS Degree and Transfer Preparation
4. Total Units: 4.00 Total Semester Hrs: 108.00
   Lecture Units: 3 Semester Lecture Hrs: 54.00
   Lab Units: 1 Semester Lab Hrs: 54.00
   Class Size Maximum: 24 Allow Audit: No
   Repeatability No Repeats Allowed
   Justification 0
5. Prerequisite or Corequisite Courses or Advisories:
   Course with requisite(s) and/or advisory is required to complete Content Review Matrix (CCForm1-A)
   Prerequisite: MATH 001A
   Advisory: ENG 001A
6. Textbooks, Required Reading or Software: *(List in APA or MLA format.)*
   a. Young, R., Freedman, G. (2011). *University Physics with Modern Physics* (13/e). Addison-Wesley. ISBN: 0321696867
   College Level: Yes
   Flesch-Kincaid reading level: 14
   b. MacIntire, D.. Physics 4A Laboratory Manual. COD Bookstore , 09-01-2014.
7. Entrance Skills: *Before entering the course students must be able:*
   a.

   Interpret the derivative as the slope of a tangent line and use this interpretation to approximate the derivative function graphically.

   - MATH 001A - Interpret the derivative as the slope of a tangent line and use this interpretation to approximate the derivative function graphically.

   b.

   Compute derivatives analytically using product, quotient, chain rules, or implicit differentiation

   - MATH 001A - Compute derivatives analytically using product, quotient, chain rules, or implicit differentiation.

   c.

Use derivatives to solve rate of change problems, answer optimization questions and graph functions.

- MATH 001A - Use derivatives to solve rate of change problems, answer optimization questions and graph functions.

d.
Compute antiderivatives of elementary functions

- MATH 001A - Compute antiderivatives of elementary functions.

e.

Solve motion problems using antiderivatives and initial values.

- MATH 001A - Solve motion problems using antiderivatives and initial values.

f.

Apply first and second derivatives to find relative extrema and points of inflection..

- MATH 001A - Apply first and second derivatives to find relative extrema and points of inflection..

g.
Develop an intuitive understanding of the limit through the use of tables, graphs, and formulas

- MATH 001A - Develop an intuitive understanding of the limit through the use of tables, graphs and formulas.

h.
Find, read, analyze, evaluate, interpret, and synthesize outside sources, including online information

- ENG 001A - Find, read, analyze, evaluate, interpret, and synthesize outside sources, including online information.

i.
Incorporate complex sentence-structure and variety of word choice.

- ENG 001A - Incorporate complex sentence-structure and variety of word choice.

j.
Write thesis statements, topic sentences, and ideas in an organized way in multi-page essays

- ENG 001A - Write thesis statements, topic sentences, and ideas in an organized way in multi-page essays.

k.
Read, analyze, and interpret varied texts (i.e. literature, digital forms, visual)

- ENG 001A - Read, analyze, and interpret varied texts (i.e. literature, digital forms, visual).

8. Course Content and Scope:

Lecture:

1. Mechanics
    1. Measurement and Units
    2. Motion in ID and Vectors
    3. Motion in 2D
    4. Forces and Newton’s Laws
    5. Circular Motion
    6. Work and Energy
    7. Momentum and Collisions
    8. Rotational Kinematics
    9. Torques and Angular Momentum
    10. Elasticity and Simple Harmonic Motion
2. Mechanical Waves
    1. Wave Motio
    2. Sound Waves
    3. Superposition and Standing Waves

Lab: *(if the "Lab Hours" is greater than zero this is required)*

1. Mechanics
    1. Measurement and Units
    2. Motion in ID and Vectors
    3. Motion in 2D
    4. Forces and Newton’s Laws
    5. Circular Motion
    6. Work and Energy
    7. Momentum and Collisions
    8. Rotational Kinematics
    9. Torques and Angular Momentum
    10. Elasticity and Simple Harmonic Motion
2. Mechanical Waves
    1. Wave Motio
    2. Sound Waves
    3. Superposition and Standing Waves

9. Course Student Learning Outcomes:
    1. Discuss the history of physics and its impact on human history.
    2. Use multiple representations (words, graphs, drawings, equations) to describe the motion of objects.
    3. Identify the various forces acting on an object and analyze the resulting motion of the object using the laws of mechanics and gravity and appropriate mathematical techniques.
    4. Describe the physics of oscillatory motion and waves; demonstrate analysis, problem solving skills and techniques to analyze oscillatory and wave phenomena.
    5. Using the scientific method of inquiry and appropriate experimental techniques in a laboratory setting, set up basic physics experiments; acquire, record, and analyze data, and draw conclusions from the data.

10. Course Objectives: *Upon completion of this course, students will be able to:*
    a. Understand the standards of measurement used in physics, including length mass and time and their units including unit analysis, conversion and order of magnitude calculations.
    b. Define displacement, velocity and speed and relate velocity, acceleration and position for objects moving in one dimension with attention to the topic of freely falling bodies.
    c. Use vectors in different coordinate systems, and understand the properties of vectors and unit vector notation.
    d. Understand motion in two dimensions including projectile motion and uniform circular motion and the relationship between tangential and radial acceleration and relative velocity and relative acceleration.
    e. Use Newton’s laws and solve problems with both forces in inertial frames and understand effects of friction.
    f. Apply kinematics and Newton’s laws to circular motion and non-inertial frames, understand the effects of air resistance and

be introduced to the uses of numerical methods for non-analytical solutions.
g. Solve problems involving work done by constant and varying forces, define the scalar product in the context of work, use the work energy theorem and power.
h. Understand the relationship between conservative forces and potential energy and conservation of energy in general.
i. Quantitatively predict the outcome of an elastic or inelastic collision in two dimensions and understand how to calculate the center of mass of a system of particles.
j. Understand the relationships between angular velocity, acceleration and their linear equivalents in the context of the rotation of a rigid object about a fixed axis including calculations of energy, moments of inertia and torque.
k. Apply the vector product in calculating torque and understand rotational kinematics and angular momentum including rotational collisions.
l. Understand the elastic properties of solids with special attention to the engineering applications of this topic.
m. Understand the limitations of gravity as constant acceleration and determine keepers law and the motion of planets, and calculate satellite motion.
n. Describe and solve many types of harmonic motion problems including springs and pendulums, look at damped and driven oscillation problems numerically.
o. Relate mechanical waves and sound waves to harmonic oscillators and understand interference and diffraction problems.
p. Understand the specific problems of pressure waves and know how to determine the speed and intensity of these waves including using the Doppler effect.
q. Describe sinusoidal waves in air, strings and plates and discuss resonance and beats.

11. Methods of Instruction: *(Integration: Elements should validate parallel course outline elements)*
    a. Activity
    b. Collaborative/Team
    c. Demonstration, Repetition/Practice
    d. Discussion
    e. Individualized Study
    f. Laboratory
    g. Lecture
    h. Participation
    i. Technology-based instruction

12. Assignments: *(List samples of specific activities/assignments students are expected to complete both in and outside of class.)*
    In Class Hours: 108.00
    Outside Class Hours: 108.00
    a. In-class Assignments
        1. Students develop critical thinking skills through class participation and discussion of course topics.
    b. Out-of-class Assignments
        1. Do all reading assignments (text, study guides)
        2. Complete assigned homework assignments.
        3. Submit completed weekly supervised laboratory assignments in thesis format.

13. Methods of Evaluating Student Progress: *The student will demonstrate proficiency by:*
    - Written homework
    - Laboratory projects
    - Computational/problem solving evaluations
    - Mid-term and final evaluations
    - Student participation/contribution

14. Methods of Evaluating: Additional Assessment Information:

a. Periodic examinations: essay; practical parts and short answer. b. A comprehensive final. c. Laboratory examinations. d. Weekly laboratory assignments. e. Weekly homework assignments

15. Need/Purpose/Rationale -- *All courses must meet one or more CCC missions.*

IGETC Area 5: Physical and Biological Sciences (mark all that apply)

A: Physical Science with Lab

A: Physical Science without Lab

A: Physical Science, Lab only

CSU GE Area B: Physical and its Life Forms(mark all that apply)

B1 - Physical Science

B3 - Laboratory Sciences

PO-GE C1-Natural Sciences

Explain concepts and theories related to physical, chemical, and biological natural phenomena.

Apply the scientific process and its use and limitations in the solution of problems.

Draw a connection between natural sciences and their own lives.

Make critical judgments about the validity of scientific evidence and the applicability of scientific theories.

Demonstrate knowledge of the use of technology in scientific investigation and human endeavors, and the advantages and disadvantage of that technology.

Use college-level mathematical concepts and methods to understand, analyze, and explain issues in quantitative terms.

IO - Scientific Inquiry

Identify components of the scientific method.

Collect and analyze data. Skills of data collection include an understanding of the notion of hypothesis testing and specific methods of inquiry such as experimentation and systematic observation.

Predict outcomes utilizing scientific inquiry: using evidence and assertions determine which conclusions logically follow from a body of quantitative and qualitative data.

Analyze quantitative and qualitative information to make decisions, judgments, and pose questions.

Recognize the utility of the scientific method and its application to real life situations and natural phenomena.

16. Comparable Transfer Course

University System	Campus	Course Number	Course Title	Catalog Year
CSU	CSU San Bernardino	221	GENERAL PHYSICS I	2008-2009
UC	UC Riverside	40A	General Physics	2008-2009

17. Special Materials and/or Equipment Required of Students:

18. Materials Fees: ☐ Required Material?

Material or Item	Cost Per Unit	Total Cost

19. Provide Reasons for the Substantial Modifications or New Course:

TMC

20. a. Cross-Listed Course *(Enter Course Code)*: *N/A*
    b. Replacement Course *(Enter original Course Code)*: PH-004A

21. Grading Method *(choose one)*: Letter Grade Only

22. MIS Course Data Elements
    a. Course Control Number [CB00]: CCC000559805
    b. T.O.P. Code [CB03]: 190200.00 - Physics, General

c. Credit Status [CB04]: D - Credit - Degree Applicable
d. Course Transfer Status [CB05]: A = Transfer to UC, CSU
e. Basic Skills Status [CB08]: 2N = Not basic skills course
f. Vocational Status [CB09]: Not Occupational
g. Course Classification [CB11]: Y - Credit Course
h. Special Class Status [CB13]: N - Not Special
i. Course CAN Code [CB14]: *N/A*
j. Course Prior to College Level [CB21]: Y = Not Applicable
k. Course Noncredit Category [CB22]: Y - Not Applicable
l. Funding Agency Category [CB23]: Y = Not Applicable
m. Program Status [CB24]: 1 = Program Applicable

Name of Approved Program *(if program-applicable)*: *N/A*
Attach listings of Degree and/or Certificate Programs showing this course as a required or a restricted elective.)

23. Enrollment - Estimate Enrollment
First Year: 75
Third Year: 100

24. Resources - Faculty - Discipline and Other Qualifications:
a. Sufficient Faculty Resources: Yes
b. If No, list number of FTE needed to offer this course: *N/A*

25. Additional Equipment and/or Supplies Needed and Source of Funding.
N/A

26. Additional Construction or Modification of Existing Classroom Space Needed. *(Explain:)*
N/A

27. FOR NEW OR SUBSTANTIALLY MODIFIED COURSES
Library and/or Learning Resources Present in the Collection are Sufficient to Meet the Need of the Students Enrolled in the Course: Yes

28. Originator Doug MacIntire Origination Date 10/15/14