COLLEGE OF THE DESERT

Course Code PH-011

Course Outline of Record

1. Course Code: PH-011
2. a. Long Course Title: Statics
   b. Short Course Title: STATICS
3. a. Catalog Course Description:
   This course is an introduction to the analysis of forces on engineering structures in equilibrium. Vector analysis is utilized to study two- and three-dimensional frames, machines and trusses. Principles of friction, centroids, center of gravity, and moment of inertia for areas and masses are applied to analyze complex real-world problems. (Equivalent to ENGR-011.)
   b. Class Schedule Course Description:
   This course is designed for physics transfer students. Students in the course will learn how to analyze simple static mechanical structures and systems.
   c. Semester Cycle (*if applicable*): This course is taught every fall
   d. Name of Approved Program(s):
   - ENGINEERING AS Degree and Transfer Preparation
4. Total Units: 3.00 Total Semester Hrs: 54.00
   Lecture Units: 3 Semester Lecture Hrs: 54.00
   Lab Units: 0 Semester Lab Hrs: 0
   Class Size Maximum: 35 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 001B and
   Prerequisite: PH 003A
6. Textbooks, Required Reading or Software: *(List in APA or MLA format.)*
   a. Beer, F. and Johnston, E. (2016). *Vector Mechanics for Engineers* (11th /e). Boston McGraw Hill Higher Education.. ISBN: 0073398242
   College Level: Yes
   Flesch-Kincaid reading level: 13.5
7. Entrance Skills: *Before entering the course students must be able:*
   a. Construct antiderivatives graphically and numerically (using 2nd form of the Fundamental Theorem of Calculus.
   - MATH 001B - Construct antiderivatives graphically and numerically (using 2nd form of the Fundamental Theorem of Calculus).

   b. Find antiderivatives analytically using substitution, by parts, integral tables, and partial fractions and use them to find a definite integral by the 1st form of the fundamental Theorem of Calculus.
   - MATH 001B - Find antiderivatives analytically using substitution, by parts, integral tables, and partial fractions and use them to find a definite integral by the 1st form of the Fundamental Theorem of Calculus.

   c. Approximate the definite integral numerically using midpoint, trapezoid, and Simpson's rule, and do error analysis of these approximations.
   - MATH 001B - Approximate the definite integral numerically using midpoint, trapezoid and Simpson's rule and perform error analysis of these approximations.

   d. Apply definite integrals to solve problems in geometry, science, probability, and social science.
   - MATH 001B - Apply definite integrals to solve problems in geometry, science, probability, and social science.

e. Solve first order separable differential equations.
- MATH 001B - Solve first order separable differential equations.

f. Model exponential growth and decay with appropriate differential equations.
- MATH 001B - Model exponential growth and decay with appropriate differential equations.

g. 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.
- PH 003A - 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.

h. Use vectors in different coordinate systems and understand the properties of vectors and unit vector notation.
- PH 003A - Use vectors in different coordinate systems, and understand the properties of vectors and unit vector notation.

i. Use Newton's laws and solve problems in inertial frames and understand effects of friction.
- PH 003A - Use Newton’s laws and solve problems with both forces in inertial frames and understand effects of friction.

j. 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.
- PH 003A - 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.

k. Understand the relationship between conservative forces and potential energy and conservation of energy in general.
- PH 003A - Understand the relationship between conservative forces and potential energy and conservation of energy in general.

l. Apply the vector product in calculating torque and understand rotational kinematics and angular momentum including rotational collisions.
- PH 003A - Apply the vector product in calculating torque and understand rotational kinematics and angular momentum including rotational collisions.

m. Describe and solve many types of harmonic motion problems including springs and pendulums, look at damped and driven oscillation problems numerically.
- PH 003A - Describe and solve many types of harmonic motion problems including springs and pendulums, look at damped and driven oscillation problems numerically.

8. Course Content and Scope:

Lecture:

1. Vector operations including derivatives of vector functions.
2. Rectilinear Motion of particles
3. Curvilinear Motion of particles. Vector description of position, velocity, and acceleration using:
    1. Cartesian components
    2. Normal and tangential components.
4. Motion of particles relative to translating reference frames
5. Particle Dynamics
6. Planar kinematics of rigid bodies
7. Planar dynamics of rigid bodies

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

9. Course Student Learning Outcomes:

1.
Discuss the fundamental laws of mechanics; apply the laws of mechanics to analyze simple static structures

2.
Determine and simplify the forces and torques (moments) on objects

3.

Determine the internal forces on structural components and the external reaction forces for a structure in equilibrium

4.
Determine the center of mass, centroids, and first and second moments of an object in order to analyze the effects of distributed forces acting upon an object.

10. Course Objectives: *Upon completion of this course, students will be able to:*
    a. Define statics and how it differs from dynamics, know the statements of Newton's 3 laws, know the SI and English systems of units and how to convert from one to another, and know how to round numbers to specified significant figures.
    b. Define vectors using scalar and using vector approaches, know how to add vectors and obtain a resultant, and know how to find the angle between two vectors and find the components of a vector along different specified directions.
    c. Construct the free body diagram of a particle and a system and know how to find forces in systems composed of springs, cables and pulleys.
    d. Compute a moment created by a force, and know how to reduce a system of forces into a single force at a location.
    e. Determine the external reactions for a system in equilibrium and the internal forces for a system in equilibrium.
    f. Analyze simple trusses, beams, frames, and simple machines.
    g. Compute internal forces in beams, construct shear and bending moment diagrams of beams, determine forces in cables subjected to concentrated and uniform loads, and know how to account for dry friction.
    h. Determine the center of gravity, center of mass, and centroid.
    i. Determine the moment of Inertia for uniform and composite areas, find the moment of inertia for areas by integration

11. Methods of Instruction: *(Integration: Elements should validate parallel course outline elements)*
    a. Discussion
    b. Lecture
    c. Participation

12. Assignments: *(List samples of specific activities/assignments students are expected to complete both in and outside of class.)*
    In Class Hours: 54.00
    Outside Class Hours: 108.00
    a. In-class Assignments

Class discussion Problem solving and sharing

    b. Out-of-class Assignments

Reading assignments Homework assignments Maintain a comprehesive notebook documenting all course work

13. Methods of Evaluating Student Progress: *The student will demonstrate proficiency by:*
    - Written homework
      Weekly problem assignments
    - Guided/unguided journals
      Comprehensive notebook/journal documenting all work, including lecture notes, in-class activities, and homework assignments.
    - Group activity participation/observation
      Student design project will be assigned as a group activity requiring a significant amount of students interaction.
    - Mid-term and final evaluations
      Multiple exams and a comprehensive final exam
    - Student participation/contribution
      Class participation includes discussion of the application of lecture material, sharing of solutions of various problems, and progress reports of their team design project.

14. Methods of Evaluating: Additional Assessment Information:

15. Need/Purpose/Rationale -- *All courses must meet one or more CCC missions.*
PO-GE C1-Natural Sciences
Use college-level mathematical concepts and methods to understand, analyze, and explain issues in quantitative terms.
IO - Scientific Inquiry
Analyze quantitative and qualitative information to make decisions, judgments, and pose questions.
IO - Critical Thinking and Communication
Apply principles of logic to problem solve and reason with a fair and open mind.

16. Comparable Transfer Course

University System	Campus	Course Number	Course Title	Catalog Year

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:

update textbook and review entire outline

20. a. Cross-Listed Course *(Enter Course Code)*: ENGR-011
b. Replacement Course *(Enter original Course Code)*: *N/A*

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

22. MIS Course Data Elements
a. Course Control Number [CB00]: CCC000517133
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)*: ENGINEERING
Attach listings of Degree and/or Certificate Programs showing this course as a required or a restricted elective.)

23. Enrollment - Estimate Enrollment
First Year: 0
Third Year: 0

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 Carl Farmer Origination Date 02/08/18