Miami Dade College

GENERAL INFORMATION	
Course Prefix/Number: EGS2311	Course Title: **Engineering Mechanics – Statics (With Vectors)**
Number of Credits: 4 credits	
Degree Type	☐ B.A. ☐ B.S. ☐ B.A.S ☒ A.A. ☐ A.S. ☐ A.A.S. ☐ C.C.C. ☐ A.T.C. ☐ V.C.C
Date Submitted/Revised: 5/4/12	Effective Year/Term: 2012-2
☐ New Course Competency	☒ Revised Course Competency
Course Description (limit to 50 words or less): This is a foundation course in engineering mechanics. Students will learn the basic principles of statics covering resultants, equilibrium, trusses, frames, friction, centroids and moments of inertia with vector notation and calculus. The content prepares students for further study in engineering dynamics. Special fee. (3 hr. lecture; 2 hr. lab)	
Prerequisite(s): MAC2312, and PHY2048,	Corequisite(s):

Competencies:

Competency 1:
The student will demonstrate an understanding of vector mechanics and its applications by:

1. Defining vector quantities, distinguishing them from scalar quantities, and finding vector components.
2. Applying laws of parallelogram and triangle for adding two vectors/forces.
3. Applying the force polygon method for adding more than two forces.
4. vector cross products for finding the moment of a force about a point and finding the moment of a couple.
5. Using vector dot products for finding angles between two vectors.
6. Using triple vector products to find the moment of a force about a given axis.

Competency 2:
The student will demonstrate and understanding of graphical /engineering sketching skills by:

1. Adding two forces using the law of parallelogram.
2. Adding two forces using the law of triangles.
3. Adding more than two forces using the force polygon.
4. Drawing proportionate free-body diagrams for solving equilibrium problems.
5. Drawing proportionate shear force diagrams for beams and frames.
6. Drawing proportionate bending moment diagrams for beams and frames.

Competency 3:
The student will demonstrate and understanding of equivalent force systems by:

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1. Finding resultants of forces and moments acting at a point/on a rigid body.
2. Finding a single force and a single moment of multi-force systems.
3. Resolving a given force into a force-couple system at any other point.
4. Reducing a system of forces to one force and one couple/moment.

Competency 4:
The student will demonstrate and understanding on how to be able to solve statistical equilibrium problems in two and three (2-D and 3-D) dimensions by:

1. Finding reactions in two-force systems that are acting at a point/on a rigid body.
2. Finding reactions/unknown forces in three-force systems that are acting at a point/on a rigid body, using the force triangle concept.
3. Using appropriate numbers of unknowns at the support /connection for 2-D problems that include rollers/rockers/frictionless surfaces, cables and links, frictionless pins and hinges, rough surfaces and fixed supports.
4. Using appropriate numbers of unknowns at the support /connection for 3-D problems (balls//frictionless surfaces, rollers/wheels, rough surfaces, ball and sockets, universal joints, fixed supports, etc.).
5. Using three equations of equilibrium for 2-D problems.
6. Using six equations of equilibrium for 3-D problems.

Competency 5:
The student will demonstrate and understanding on how to be able to find the centers of gravity of 1-D, 2-D and 3-D objects subjected to distributed forces by:

1. Applying the concept of first moment by dividing 1-D, 2-D and 3-D objects of uniform thicknesses and single densities, into suitable simple geometries.
2. Applying the concept of first moment by dividing 1-D, 2-D and 3-D objects of non-uniform thicknesses and composite plates and wires into suitable simple geometries.
3. Using single (1-D and 2-D bodies) and double (2-D bodies) integration.
4. Using theorems of Pappus-Guldinus.
5. Using techniques of integration and dividing objects into simpler geometries for analyzing beams subjected to distributed loads (2-D loading).
6. Using techniques of integration and dividing objects into simpler geometries for analyzing submerged bodies (2-D loading).
7. Using single, double and triple integration for finding centroids of volumes. rged bodies (2-D loading).

Competency 6:
The student will demonstrate and understanding on how to be able to define and analyze statically determinate, rigid 2-D and 3-D trusses and statically determinate, rigid 2-D frames by:

1. Defining trusses, frames and machines in terms of force application.
2. Assessing determinacy and rigidity of given trusses and frames per structural criteria.
3. Distinguishing differences between trusses frames and machines though the presence/absence of multisource members.
4. Applying the method of joints for trusses.
5. Applying the method of sections for trusses.
6. Applying the concept of decoupling to 2-D frames.

Competency 7:
The student will demonstrate and understanding on how to be able to analyze statically determinate beams by:

1. Assessing shear forces and bending moments along beams.
2. Drawing shear force and bending moment diagrams for the analyzed beams.
3. Utilizing the relation(s) between load, shear and bending moment.
4. Finding the maximum shear force in the beam.
5. Finding the maximum bending moment in the beam.
6. Finding the point(s) of contraflecture.

Competency 8:
The student will demonstrate the ability to solve friction problems by:

1. Finding the coefficients of static friction.
2. Finding the coefficients of kinetic friction.
3. Finding the angles of static and kinetic friction.
4. Analyzing objects on a horizontal surface.
5. Analyzing objects on inclined surfaces.
6. Determining whether motion will occur under given conditions.
7. Analyzing problems involving multiple bodies.