**ESSEX COUNTY COLLEGE**

**Engineering Technologies and Computer Sciences Division**

**ENR 211 – Engineering Mechanics I – Statics**

**Course Outline**

**Course Number & Name:**  ENR 211 Engineering Mechanics I – Statics

**Credit Hours:**  3.0 **Contact Hours:**  3.0 **Lecture:** 3.0 **Lab:**  N/A **Other:**  N/A

**Prerequisites**:  Grades of “C” or better in MTH 121 and PHY 103

**Co-requisites:** None **Concurrent Courses:** None

**Course Outline Revision Date:**  Fall 2010

**Course Description**: This is a course in calculus-based statics.  Topics covered include elementary vector algebra, scalar and vector products as applied to two and three-dimensional force systems, equilibrium, friction, second moments, and virtual work. Extensive use is made of the free body diagram approach and vector analysis.

**Course Goals:** Upon successful completion of this course, students should be able to do the following:

1. analyze force vectors by using appropriate coordinate systems and units;

2. draw free body diagrams and develop equilibrium equations to solve mechanics problems; and

3. apply the concepts and principles of rigid-body mechanics including structure analysis, internal forces, and frictions to solve engineering problems.

**Measurable Course Performance Objectives (MPOs)**: Upon successful completion of this course, students should specifically be able to do the following:

1. Analyze force vectors by using appropriate coordinate systems and units:

* 1. *express forces in Cartesian vector form;*
  2. *resolve forces into components in Cartesian, polar, cylindrical, or spherical coordinate systems as appropriate;*
  3. *determine resultant forces using the parallelogram law and vector addition;*
  4. *express force components along a line using position vectors and dot products;*
  5. *determine moments of forces by using cross products;*
  6. *simplify force and couple systems;* and
  7. *simplify distributed load systems*

**Measurable Course Performance Objectives (MPOs)** (continued):

2. Draw free body diagrams and develop equilibrium equations to solve mechanics problems:

2.1 *determine collinear, parallel, coplanar, and concurrent forces;*

2.2 *determine types of supports and the supporting forces for the structure;*

2.3 *draw free body diagrams for particles, rigid bodies, and structures;*

2.4 *develop equilibrium equations for rigid bodies;* and

2.5 *solve for unknown forces in mechanics problems*

1. Apply the concepts and principles of rigid-body mechanics including structure analysis, internal forces, and frictions to solve engineering problems:
   1. *determine the forces in the members of a truss by using the method of joints and the method of sections;*
   2. *analyze the forces acting on the members of frames and machines composed of pin-connected members;*
   3. *determine the internal loadings in a member by using the method of sections;*
   4. *develop equations to describe the internal shear and moment throughout a member;*
   5. *analyze the equilibrium of rigid bodies subjected to dry friction;* and
   6. *determine the location of the center of gravity and centroid for a system of discrete particles and for a body of arbitrary shape*

**Methods of Instruction**: Instruction will consist of lectures including demonstrations, discussions, and solutions to engineering problems.

**Outcomes Assessment:** Selected homework, quiz, test, and exam questions are blueprinted to course objectives. Data is collected and analyzed to determine the level of student performance on these assessment instruments in regards to meeting course objectives. The results of this data analysis are used to guide necessary pedagogical and/or curricular revisions.

**Course Requirements:** All students are required to:

1. Maintain regular attendance and participate in classroom discussions.

2. Read all assigned textbook pages.

3. Complete homework assignments on time.

4. Take all quizzes, tests and exams as scheduled.

**Methods of Evaluation:** Final course grades will be computed as follows:

**% of**

**Grading Components final course grade**

* **Homework, quizzes and class participation**  **10 – 30%**

A perusal of homework and quiz questions and analysis of class discussion will indicate the extent to which students master course objectives.

* **3 or more Tests** (dates specified by the instructor) **30 – 50%**

Tests will show evidence of the extent to which students meet course objectives, including but not limited to identifying and applying concepts, analyzing and solving problems, estimating and interpreting results and stating appropriate conclusions using correct terminology.

* **Final Exam** (comprehensive)  **20 – 30%**

The same objectives apply as with tests, but it is anticipated that students will provide increased evidence of synthesizing a combination of concepts.

Note: The instructor will provide specific weights, which lie in the above-given ranges, for each of the grading components at the beginning of the semester.

**Academic Integrity:** Dishonesty disrupts the search for truth that is inherent in the learning process and so devalues the purpose and the mission of the College. Academic dishonesty includes, but is not limited to, the following:

* plagiarism – the failure to acknowledge another writer’s words or ideas or to give proper credit to sources of information;
* cheating – knowingly obtaining or giving unauthorized information on any test/exam or any other academic assignment;
* interference – any interruption of the academic process that prevents others from the proper engagement in learning or teaching; and
* fraud – any act or instance of willful deceit or trickery.

Violations of academic integrity will be dealt with by imposing appropriate sanctions. Sanctions for acts of academic dishonesty could include the resubmission of an assignment, failure of the test/exam, failure in the course, probation, suspension from the College, and even expulsion from the College.

**Student Code of Conduct:** All students are expected to conduct themselves as responsible and considerate adults who respect the rights of others. Disruptive behavior will not be tolerated. All students are also expected to attend and be on time for all class meetings. No cell phones or similar electronic devices are permitted in class. Please refer to the Essex County College student handbook, *Lifeline*, for more specific information about the College’s Code of Conduct and attendance requirements.

**Course Content Outline:** based on the text **Engineering Mechanics – Statics,** 12th edition, by R C Hibbeler; published by Prentice Hall, 2010; ISBN #: 0-13-607790-0

**Week**

**(2 meetings**

**@80 minutes) Topic/Content**

1 General Principles

2 Force Vectors

3 Equilibrium of a Particle

**Test 1**

4 Force System Resultants

5 – 6 Force System Resultants (continued)

Moment of a Force – Scalar and Vector Formulations

Moment of a Force about a Specified Axis

Moment of a Couple

Simplifications of a Force and Couple System

Reduction of Distributed Loading

**Test 2**

7 – 8 Equilibrium of a Rigid Body

9 – 10 Structure Analysis

Simple Trusses

Method of Joints

Method of Sections

Structure Analysis

11 Internal Forces

Shear and Moment Equations and Diagrams

Relations between Distributed Load, Shear, and Moment

**Test 3**

12 Friction

13 Center of Gravity and Centroid

14 Moment of Inertia

15 **Comprehensive Final Exam**