**ENG-222 STATICS SPRING 2014**

**Textbook**: *Engineering Mechanics - Statics*, 13th Edition, R. C. Hibbeler, Pearson

Prentice Hall, 2013

**Reference**: *Vector Mechanics for Engineers: Statics*, 9th Edition, Beer, Johnston,

Mazurek, & Cornwell, McGraw-Hill Co., 2010

**Instructor**: Shou Rei Chang, Ph.D.

Armstrong Room 153

**Educational Objectives:**

(What TCNJ engineers should be able to accomplish during the first few years after graduation )The School of Engineering at The College of New Jersey seeks to prepare its graduates:

* To contribute to the economic development of New Jersey and the nation through the ethical practice of engineering;
* To become successful in their chosen career path, whether it is in the practice of engineering, in advanced studies in engineering or science, or in other complementary disciplines;
* To assume leadership roles in industry or public service through engineering ability, communication skills, teamwork, understanding of contemporary global and socio-economic issues, and use of modern engineering tools;
* To maintain career skills through life-long learning and be on the way towards achieving professional licensure.

**Mechanical Engineering Program Outcomes**

*(What TCNJ Mechanical Engineering students are expected to know and be able to do at graduation. What knowledge, abilities, tools and skills the program gives the graduates to enable them to accomplish the Educational Objectives)*

The Program Outcomes listed below are expected of all graduates of the Mechanical Engineering Program.

**ME graduates will have:**

1. an ability to apply knowledge of mathematics, science and engineering;
2. an ability to design and conduct experiments, as well as to analyze and interpret data;
3. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
4. an ability to function in multidisciplinary teams;
5. an ability to identify, formulate and solve engineering problems;
6. an understanding of professional and ethical responsibility;
7. an ability to communicate effectively;
8. the broad education necessary to understand the impact of engineering solutions in a global and societal context;
9. a recognition of the need for, and an ability to engage in life-long learning;
10. a knowledge of contemporary issues;
11. an ability to use the techniques, skills and modern engineering tools necessary for engineering practice;
12. an ability to apply advanced mathematics through multivariate calculus and differential equations;
13. familiarity with statistics, linear algebra, and numerical methods;
14. a knowledge of chemistry and calculus-based physics with depth in at least one of them;
15. an ability to work professionally on both thermal and mechanical systems areas including the design and realization of such systems.

**Week** ***Section*** **Topics**

1. 1.1-1.6 **General Principles:**

Review Math

Introduction – Fundamental Concept

Units of Measurement, System of Units

Numerical Calculations

2 2.1-2.9 **Force Vectors:**

Scalars and Vectors

Vector Operations

Position Vectors

Force Vector Directed Along a Line

Dot Product

3 3.1-3.4 **Equilibrium of a Particle:**

Condition for the Equilibrium of a Particle

The Free-Body Diagram

Coplanar Force Systems

Three-Dimensional Force Systems

4 9.1-9.5 **Center of Gravity and Centroid:**

Center of Gravity, Center of Mass, and

Centroid of a Body, Composites Bodies

Theorems of Pappus and Guldinus

5 4.1-4.4 **Force System:**

Moment of a Force – Scalar Formulation

Cross Product

Moment of s Force – Vector Formulation

Principle of Moments

**Examination I**

6 4.5-4.9 Moment of a Force about a Specified Axis Moment of a Couple

Simplification of a Force and Couple System

Reduction of s Simple Distributed Loading

7 5.1-5.3 **Equilibrium of s Rigid Body:**

Conditions for Rigid-Body Equilibrium

Free-Body Diagrams

Equations of Equilibrium

8 5.4-5.7 Two- and Three-Force Members

Equations of Equilibrium

Constrains and Statical Determinacy

9 6.1-6.3 **Structural Analysis:**

Simple Trusses

The Method of Joints

Zero-Force Members

10 6.4-6.6 The Method of Sections

Space Trusses

Frames and Machines

**Examination II**

11 7.1-7.4 **Internal Forces:**

Internal Loadings Developed in Structural Members

Shear and Moment Equations and Diagrams

Relations between Distributed Load/Shear/Moment

Cables

12 8.1-8.8 **Friction:**

Characteristics of Dry Friction

Wedges, Friction Forces on Flat Belts

Rolling Resistance

13 10.1-10.8 **Moments of Inertia:**

Definition of Moments of Inertia for Areas

Parallel-Axis Theorem for an Area

Radius of Gyration of an Area

Moments of Inertia for Composite Areas

14 11.1-11.7 **Virtual Work:**

Definition of Work

Principle of Virtual Work

Conservation Forces

Potantial Energy

Stability of Equilibrium Configuration

15 - **Final Examination**

**SCHEDULE**

1. Discussion Lecture: Tuesday/Friday 12:30 PM – 1:50 PM
2. Fourth hour:

i.      Fourth hour educational activities for which the meeting is required for both students and instructor:  "The fourth 'design hour' for this class meets weekly.  In this class, students are engaged in one or more intensive design experiences that require the extended mentoring and contact time with the faculty"

ii.      Fourth hour educational activities for which the meeting is not required:  "This class contains one (or specified number) intensive design or analytical experiences or other appropriate activity that require each student to significantly increase out-of-class learning."

**GRADING POLICY**:

Homeworks 10%

Quizs 20%

Examinations 40%

Final Examination 30%

**Total**: 100%

**OFFICE HOURS:**

**Tuesday/Friday:** 11:30 AM – 12:20 PM

**Tuesday:** 2:00 – 3:00 PM

*Other hours by appointment*