

<b>Course</b>	CE 25000 – Statics
<b>Cross-listed Course</b>	ME 25000 – Statics
<b>Type of Course</b>	Required for CE program
<b>Catalog Description</b>	Forces and couples, free body diagrams, two- and three-dimensional equilibrium of particle and rigid bodies. Principles of friction, centroids, centers of gravity, and moments of inertia. Virtual work, potential energy, and static stability of equilibrium. Internal forces, shear and bending moment diagrams.
<b>Credits</b>	3
<b>Contact Hours</b>	3
<b>Prerequisite Courses</b>	PHYS 15200
<b>Corequisite Courses</b>	MA 26100
<b>Prerequisites by Topics</b>	Newton’s laws, trigonometry, vector algebra, basic calculus
<b>Textbook</b>	R. C. Hibbeler, <i>Engineering Mechanics: Statics</i> , Pearson - Prentice Hall, current edition.
<b>Course Objectives</b>	To introduce the fundamental principles of statics and their applications to engineering problems. Students will learn effects of forces on rigid bodies which are in rest or move with a constant velocity and develop a sound mathematical and practical base of knowledge that is needed for other engineering subjects.
<b>Course Outcomes</b>	Students who successfully complete this course will have demonstrated an ability to: <ol style="list-style-type: none"><li>1. Understand force vectors and represent them in one, two, and three dimensions. <b>(1, 7)</b></li><li>2. Use Newton’s Laws of motion to analyze the equilibrium of particles in one, two, and three dimensions. <b>(1, 7)</b></li><li>3. Determine the resultants of forces and moments in two and three dimensions. <b>(1, 7)</b></li><li>4. Use Newton’s Laws of motion to analyze the equilibrium of rigid bodies in two and three dimensions. <b>(1, 7)</b></li></ol>

5. Apply principles of particle and rigid-body equilibrium to analyze simple structures such as pinned trusses, frames, and machines. **(1, 7)**
6. Apply principles of equilibrium to determine internal forces and moments in simple beams, columns, trusses, frames, and machines. **(1, 7)**
7. Understand forces due to dry friction and analyze the equilibrium of simple systems on which friction acts such as wedges, screws, and flat belts. **(1, 7)**
8. Understand the concepts of the center of gravity, center of mass, centroid, and be able to locate these centers on a variety of bodies such as lines, areas, volumes, and masses. **(1, 7)**
9. Understand the concepts of moments and products of inertia as applied to particles, lines, areas, volumes, and masses. **(1, 7)**
10. Understand the fundamental concepts of the virtual displacement and the principle of virtual work. **(1, 7)**

### Lecture Topics

1. General principles – Fundamental concepts of statics
2. Force vectors – Scalars and vectors, vector operations, Cartesian coordinates, Dot product
3. Equilibrium condition of a particle
4. Force systems–The Free Body Diagram–Force System Resultants
5. Moment of a force, principle of moments
  - a) Moment of a couple
  - b) Equivalent system
6. Equilibrium of a rigid body
  - a) Equilibrium condition of a rigid body
  - b) Constraints for a rigid body
7. Structural analysis
  - a) Simple trusses
  - b) The method of joints, the method of sections
  - c) Zero-force members
  - d) Frames and machines
8. Internal Forces
  - a) Internal forces in structural members
  - b) Shear and moment equations and diagrams
  - c) Distributed loading, shear, and moment
9. Friction
  - a) Dry friction
  - b) Wedges and screws
  - c) Frictional force on flat belts
10. Center of Gravity and Centroid
  - a) Moments of gravity
  - b) Centroid
11. Moments of Inertia
  - a) Moments of inertia
  - b) Radius of gyration

- c) Parallel-axis theorem
  - d) Product of inertia for an area
  - e) Mass moment of inertia
12. Virtual Work
- a) Work and virtual work
  - b) Principle of virtual work
  - c) Conservative force
  - d) Potential energy and stability of equilibrium

<b>Computer Usage</b>	None
<b>Laboratory Experience</b>	None
<b>Design Experience</b>	None
<b>Coordinator</b>	Bongsu Kang, Ph.D.
<b>Date</b>	27 March 2018