

HAROLD WASHINGTON COLLEGE

1. TITLE, NUMBER, AND CLASSIFICATION:

Name of Course Physics - Statics
Department, Name
and/or Number Code 077
Course Number: 0215

DIVISION: COLLEGE CREDIT CONTINUING EDUCATION

Curriculum: Liberal Arts & Sciences Pre-Credit
 Career Community Service
 Vocational Skills

Program general education name or describe program,
 developmental if applicable:
 ESL
 career/occ: _____
 other: _____

2. COURSE TERM: 17 week SEMESTER OTHER: specify number of weeks: _____

3. CREDIT AND CONTACT HOURS:

(i) credit hours 3 (ii) contact hours 3 (iii) types of activities
per week LECTURE/DISCUSSION LAB
 CLINICAL/WORK EXPERIENCE
 OTHER

4. PREREQUISITES - if none check here ; otherwise describe below:

Physics 235.

5. CATALOG DESCRIPTION - write below, as in current college catalog;

Rigid bodies, fluid statics, friction, moments of inertia, centroids, and virtual work. Writing assignments, as appropriate to the discipline, are part of the course.

6. STUDENTS FOR WHOM THE COURSE IS INTENDED:

Advanced pre-engineering students with a background in first semester engineering physics, differential calculus and concurrent enrollment in integral calculus.

7. COURSE OBJECTIVES: Be specific enough (in material covered, depth of coverage, list of objectives, or any appropriate comments) for the purpose of **articulation with other schools**. After successful completion of the course:

1. The student will have mastered the principles of mechanics and developed the confidence and judgement needed to solve problems involving static equilibrium.
2. Will be able to draw a free body diagram and to focus in on the necessary physical aspects and associated geometry of a given problem.
3. Will be able to collect the appropriate data and apply methodically the relevant equations of mechanics to provide a solution to the problem at hand.

Specific Objectives:

1. To introduce principles of mechanics, units and numerical methods.
2. To develop the properties of vectors and concurrent force systems.
3. To develop the techniques used to solve problems involving distributed and concentrated force systems.
4. To introduce the principles of rigid body equilibrium in structural analysis and how they apply to trusses, frames, and machines.
5. To analyze the internal forces in beams and cables.
6. To apply all the above to systems involving frictional forces.
7. To investigate the properties of centroids and of the center of gravity.
8. To introduce the concept of moments, moment of inertia, and radius of gyration.
9. To investigate the principles of virtual work, potential energy, and stability equilibrium.

8. COURSE OUTLINE:

1. General Principles
 - 1.1 Mechanics
 - 1.2 Fundamental concepts
 - 1.3 Units of measurement
 - 1.4 International System of units
 - 1.5 General procedure for analysis

2. Force Vectors
 - 2.1 Scalars and vectors
 - 2.2 Vector operations
 - 2.3 Vector addition of forces
 - 2.4 Addition of a system of coplanar forces
 - 2.5 Cartesian vectors
 - 2.6 Addition and subtraction

3. Equilibrium of Particle
 - 3.1 Condition for the equilibrium of a particle
 - 3.2 The free body diagram
 - 3.3 Coplanar force systems
 - 3.4 Three-dimensional force systems

4. Force System Resultants
 - 4.1 Cross product
 - 4.2 Moment of force-scalar formulation
 - 4.3 Moment of force-vector formulation
 - 4.4 Transmissibility of force and the Principle of Moments
 - 4.5 Moment of force about a specified axis
 - 4.6 Moment of a couple
 - 4.7 Moment of a force on a rigid body
 - 4.8 Resultants of a force and a couple system
 - 4.9 Further reduction of a force and a couple system
 - 4.10 Reduction of a simple distributed loading

5. Equilibrium of a Rigid Body
 - 5.1 Conditions for rigid-body equilibrium
Equilibrium in two dimensions
 - 5.2 Free-body diagrams
 - 5.3 Equations of equilibrium
 - 5.4 Two-and three-force members
Equilibrium in three dimensions
 - 5.5 Free-body diagrams
 - 5.6 Equations of equilibrium
 - 5.7 Constraints for a rigid body

6. Structural Analysis
 - 6.1 Simple trusses
 - 6.2 The method of joints
 - 6.3 Zero force members
 - 6.4 The method of sections
 - 6.5 Space trusses
 - 6.6 Frames and machines

7. Internal Forces

- 7.1 Internal forces developed in structural members
- 7.2 Shear and moment equations and diagrams
- 7.3 Relations between distributed load, shear, and moment
- 7.4 Cables

8. Friction

- 8.1 Characteristics of dry friction
- 8.2 Problems involving dry friction
- 8.3 Wedges
- 8.4 Frictional forces on screws
- 8.5 Frictional forces on flat belts
- 8.6 Frictional forces on collar bearings, pivot bearings, and disks
- 8.7 Frictional forces on journal bearings
- 8.8 Rolling resistance

9. Center of Gravity and Centroid

- 9.1 Center of gravity and center of mass for a system of particles
- 9.2 Center of gravity, center of mass, and centroid for a body
- 9.3 Composite bodies
- 9.4 Theorem of Pappus and Guldinus
- 9.5 Resultant of generally distributed force system
- 9.6 Fluid pressure

10. Moments of Inertia

- 10.1 Definition of moments of inertia for areas
- 10.2 Parallel axis theorem for an area
- 10.3 Radius of gyration of an area
- 10.4 Moments of inertia of an area by integration
- 10.5 Moments of inertia for composite areas
- 10.6 Product of inertia for an area
- 10.7 Moments of inertia for an area about inclined axis
- 10.8 Mohr's circle of moments of inertia
- 10.9 Mass moment of inertia

11. Virtual work

- 11.1 Definition of work and virtual work
- 11.2 Principle of virtual work for a particle and a rigid body
- 11.3 Principle of virtual work for a system of connected rigid
- 11.4 Conservative forces
- 11.5 Potential energy
- 11.6 Potential-energy criterion for equilibrium
- 11.7 Stability equilibrium

Assignments: Selected problems from each chapter are assigned and are to be turned in on a bi-weekly basis.

9. **TEXTS AND MATERIALS USED:** List of materials and specific chapters and sections of book (or books) used in this course. List books by author, title, publisher, year. State whether each material is supplied by the student or by the school. If different textbooks are used, state which is used most commonly, and attach variations by instructor.

Supplied by student:

Engineering Mechanics - Statics, by RC Hibbeler, 8th Edition, Prentice-Hall

Chapters 1-11

10. **AMOUNT OF WRITING REQUIRED:**

The amount of writing required is that amount the student would need to explain the rationale and approach that he would use to solve the assigned problems.

11. **METHODS OF EVALUATION:**

Four exams (including a final) given at 3-4 week intervals - 80%

Four quizzes - 10% (one quiz given in each exam period).

Homework - 10% (graded on the quality of work as well as accuracy).

12. **AUTHORIZED SIGNATURE AND FILE DATE:**
DEPARTMENT AND CAMPUS:

Selene DeBebrud 9/28/98
Physical Science Department
Harold Washington College