Part I Course Organization
Date       Topic
1/15     Introduction
1/17     General Principles
1/22     Units, Dimensional analysis
1/24     Force vector, Resultants
1/29     Moment vector, Resultants
1/31     Free body diagram
2/5     Equilibrium, degrees of freedom
2/7     Adequacy of constraints
2/12     Structural analysis
2/19     Midterm #1 (15%)
2/21     Method of joints (graphical)
2/26     Method of joints (computational)
2/28     Method of sections
3/5     Virtual work principles
3/7     Virtual work: reactions, member forces
3/12     Distributed loads in beams
3/14     Midterm #2 (15%)
3/26     Moment and shear diagrams
3/28     Moments and concentrated loads
4/2     Moments for distributed forces
4/4     Moments and shears for irregular loads
4/9     Moments and shears – problems
4/11     Moments and shears – problems
4/16     Center of gravity/center of mass
4/18     Resultants of distributed loads
4/23     Midterm #3 (15%)
4/25     Review
4/30     Review

Final Exam     (40%)     May 15 2-4PM
Homework     (15%)


Quizzes: Once a week, one problem, graded 0-10.

Homework will be assigned during lectures

Grading: \[ y = 0.075x - 2.0 \] where x is % representing average quiz or exam + HW grade.

\begin{align*}
y > 4.00 & \quad A \\
3.67 < y < 4.00 & \quad A- \\
3.33 < y < 3.67 & \quad B+ \\
3.00 < y < 3.33 & \quad B \\
2.67 < y < 3.00 & \quad B- \\
2.33 < y < 2.67 & \quad C+ \\
2.00 < y < 2.33 & \quad C \\
1.67 < y < 2.00 & \quad C-
\end{align*}
Part II  Detailed Course Objectives
Course Information, Textbook, and Supplementary Materials

Course Description: This course will present the theory and applications of basic engineering mechanics, including a review of vectors, the computation of resultant forces, the equations for equilibrium of particles and rigid bodies, the computation and diagramming of internal shear and moment forces, and dry friction.

Required for: All Civil and Environmental Engineering undergraduate degree programs

Prerequisite: PHYS 151L Fundamentals of Physics I

Co-requisite: Mechanics and Thermodynamics - 4 units


Reference: None

<table>
<thead>
<tr>
<th>Topics Covered</th>
<th>Learning Outcomes</th>
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<tbody>
<tr>
<td>Basic knowledge of forces and moments on and between components of a structure.</td>
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</table>
| Emphasis on the fundamental steps (e.g., setup, analysis, solution, discussion) of engineering problems. | Students will understand forces and moments and analysis in the following areas of study:  
1. Forces and vectors, Cartesian vector notation and operations  
2. Particle equilibrium  
3. Moments and force system resultants  
4. Rigid body equilibrium  
5. Structural analysis of trusses and frames/machines  
6. Internal forces, shear/moment diagrams  
7. Dry friction  
8. Express force and position vectors in Cartesian vector form, determine unit vectors, vector sums, dot products, and cross products.  
9. Draw and label free-body diagrams  
10. Determine the resultant force acting on a particle  
11. Determine the forces necessary for a particle to remain static using equations of equilibrium. |
| Analyzing forces and moments on a static rigid body                           | 12. Determine the moments of forces in two or three dimensions  
13. Determine force and moment resultants  
14. Determine point loads statically equivalent to distributed loads  
15. Replace supports with equivalent reaction forces  
16. Write and solve equations of equilibrium of a rigid body                     |
| Analyzing forces and moments on/between multiple static rigid bodies          | 17. Use the methods of joints and sections to analyze truss structures  
18. Determine the forces acting between members of frames and machines composed of pin-connected members |
| Analyzing internal forces/moments in a static rigid body                      | 19. Use the method of sections to determine internal forces  
20. Determine internal shear and bending moments using loading equations  
21. Understand and draw shear / bending moment diagrams                       |
Lecture and Lab Schedule

<table>
<thead>
<tr>
<th></th>
<th>Lecture</th>
<th></th>
<th>Lab</th>
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<tbody>
<tr>
<td>Sessions per Week</td>
<td>2</td>
<td>Duration per Session</td>
<td>1 hour</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sessions per Week</td>
<td>n/a</td>
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Contribution of Course to Meeting the Professional Component (Criterion 4)

**Engineering Topics**

In this course, students will learn a basic knowledge of forces and moments on and between components of a structure with an emphasis on the fundamental steps (e.g., setup, analysis, solution, discussion) of engineering problems. They will also learn to analyze: forces and moments on a static rigid body, moments on/between multiple static rigid bodies and internal forces/moments in a static rigid body.

Relation of Course Objectives to Program Outcomes

The Civil Engineering program is designed to teach beyond the technical content of the curriculum and prepare the students to utilize what they learn in a professional setting.

This course contributes to the program outcomes as outlined in the adjacent table.

<table>
<thead>
<tr>
<th>Course Contribution to Program Outcomes (a-k)</th>
<th>Key</th>
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<tbody>
<tr>
<td>a. An ability to apply knowledge of mathematics, science, and engineering.</td>
<td></td>
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<tr>
<td>e. An ability to identify, formulate and solve engineering problems.</td>
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<tr>
<td>h. The broad education necessary to understand the impact of engineering solutions in a global economic and environmental and societal context.</td>
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<td>j. Knowledge of contemporary issues.</td>
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Prepared by: Dr. Mihailo Trifunac
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Date: Spring 2013