Bulletin Description
ENGR 204 Engineering Mechanics (3)
Prerequisite: Prerequisite:
MATH 227, Techniques of integration, analytic geometry, polar coordinates, vectors, improper integrals. Sequences and series.
PHYS 220. Basic mechanics. Calculus is used in examples and problems.

Textbook

References

Coordinator
Michael Holden, Professor of Engineering

Prerequisites by Topic
1. Vector Algebra
2. Basic mechanics with use of calculus
3. Techniques if integration and analytic geometry
4. Forces as vectors
5. Graphing of functions
6. Static equilibrium
7. Representation of points in space
8. Moment of a force as a cross-product
9. Differentiation
10. Integration
11. Natural laws
12. Moments of inertia
13. Force free bodies
Course Objective

1. To understand the concepts and apply the equations of static equilibrium for cable, truss, machine and beam system. [A1,A2, B1].
2. To learn to determine centroids and moment of inertia of bodies. [A1,A2, B1].
3. To learn to analyze the behavior of systems with friction. [A1,A2, B1].
4. To correctly draw free body diagrams for determining internal forces and reactions of various structures. [A1,A2, B1].
5. The description of the motion of points in space using the position vector and its derivatives. [A1,A2, B1].
6. The use of \( F = ma \) to relate force to motion for particles and rigid bodies. [A1,A2, B1,C1].
7. The use of work-energy to solve motion problems. [A1,A2, B1,C1].
8. The use of impulse and momentum methods [A1,A2, B1,C1].
9. Rigid body motion and rotating reference frames. [A1,A2, B1,C1].
10. The use Euler’s laws for the description of two-dimensional rigid body motion. [A1,A2,].
11. The analysis of simple harmonic motion and undamped vibration. [A1,A2, B1,C1].

Topics

1. Position vector its derivatives – velocity and acceleration.
2. Using vectors to represent forces
3. Summing forces and moments
4. Developing force and moment equilibrium equations
5. Equilibrium of frictionless pulley and cable systems.
6. Analyzing equilibrium of truss and beam systems.
7. Determining centroids of areas, volumes and moments of inertia
8. Developing shear and bending moment diagrams
10. Constrained motion.
11. Newton’s laws of motion
12. Work, power and energy.
13. Conservation of energy.
15. Conservation of momentum.
16. Two-dimensional rigid body kinematics.
17. Euler’s laws of motion.
18. Energy methods in rigid body motion.

Professional Component

Engineering Design 0%
Engineering Science 100%

\(^1\)Numbers in brackets refer to the goals and objectives of the School of Engineering
Evaluation

1. Two 50-Minute Exams
2. One comprehensive Final Exam
3. Quizzes
4. Class participation
5. Weekly homework assignments and project
   (Students are encouraged to work together but to hand in separate home works.)

Performance Criteria

Objective 1
1.1 Use vectors to represent forces [1,2,3,4,5]
1.2 Summing forces and moments [1,2,3,4,5]
1.3 Developing force and moment equilibrium equations [1,2,3,4,5]
1.4 Equilibrium of frictionless pulley and cable systems. [1,2,3,4,5]
1.5 Analyzing equilibrium of truss and beam systems. [1,2,3,4,5]
1.6 Develop shear and bending moment diagrams [1,2,3,4,5]

Objective 2
2.1 Students will demonstrate an ability to determine the centroids of areas, volumes of various shapes using both integration and summation [1,2,3,4,5]
2.2 Students will demonstrate an ability to determine moments of inertia about axes using both integration and summation [1,2,3,4,5]

Objective 3
3.1 Students will demonstrate an ability to analyze the behavior of simple systems with friction [1,2,3,4,5]

Objective 4
4.1 Students will demonstrate an ability to draw free body diagrams for the purposes of determining internal forces in members and reactions [1,2,3,4,5]

Objective 5
5.1 The motion, velocity and acceleration of a point. [1,2,3,4,5]
5.2 The difference between a curve and its parameterization. [1,2,3,4,5]

Objective 6
6.1 The use of the instantaneous state to derive equations of motion. [1,2,3,4,5]
6.2 The meaning of the terms in $F=ma$. [1,2,3,4,5]
6.3 The meaning of $F=ma$ as a law. [1,2,3,4,5]

Objective 7
7.1 The concepts of work, power and energy. [1,2,3,4,5]
7.2 Conservative and non-conservative system. [1,2,3,4,5]

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2 Grading policy followed by Performance criteria
3 Numbers in brackets refer to evaluation methods used to assess students’ performances
Objective 8
8.1 The motion, velocity and acceleration of a point. [1,2,3,4,5]
8.2 The difference between a curve and its parameterization. [1,2,3,4,5]

Objective 9
9.1 The concept of angular velocity of a rigid body or reference frame. [1,2,3,4,5]
9.2 Time rates of change of unit vectors in a rotating reference frame. [1,2,3,4,5]
9.3 Absolute and relative velocity and acceleration in a rotating reference frame. [1,2,3,4,5]

Objective 10
10.1 The computation of linear momentum and moment of a rigid body. [1,2,3,4,5]
10.2 The use of Euler’s laws of motion for two-dimensional problems. [1,2,3,4,5]

Objective 11
11.1 The concept of frequency and period for simple harmonic motion. [1,2,3,4,5]
11.2 The governing equation for the simple harmonic oscillator. [1,2,3,4,5]

Fall 2005
Instructor: Mutlu Ozer
Office: Science 112-B
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Email: ozer@sfsu.edu
web page: http://userwww.sfsu.edu/~ozer
I will try to return emails within 48 hours. Please don’t expect an immediate response.

LEC MWF 1210-1300 SCI 113
Office Hours: M 14:00PM-15:00PM W 14:00PM-15:00PM
T 13:00PM-14:00PM*
* (Volunteer office hour for the students who walk, bike or take public transportation between home and school)

Prerequisite:
MATH 227, PHYS 220.

Evaluation and Grading policy in details:
Attendance: 10% (No partial point. Full point for the students who would have total 4 or less absence in lectures.)
Homework: 10% 
1st Midterm: 40%(Statics)
2nd Midterm: 15%(Dynamics),
Final Exam: 25%(Dynamics)
Unannounced Quizzes: 4 quizzes @ each 5% that total 20% of your grade. You may replace the weighted average of quizzes with the grade of one midterm
<table>
<thead>
<tr>
<th>Grade</th>
<th>Minimum Score</th>
<th>Maximum Score</th>
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<tbody>
<tr>
<td>A</td>
<td>from 100 to 93</td>
<td>C</td>
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<tr>
<td>A-</td>
<td>from 92 to 90</td>
<td>C-</td>
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<tr>
<td>B+</td>
<td>from 89 to 86</td>
<td>D+</td>
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<tr>
<td>B</td>
<td>from 85 to 83</td>
<td>D</td>
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<tr>
<td>B-</td>
<td>from 82 to 79</td>
<td>D-</td>
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<tr>
<td>C+</td>
<td>from 78 to 76</td>
<td>F</td>
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(!) No incomplete grades without a verified excuse.

- **Homework** will be assigned weekly and will be due on Monday of the following week in the beginning of class. No late homework will be accepted.
- **Midterms**: Oct. 12-(Statics), Nov.23-(Dynamics), 2005 **No make-up exams!**
- **Final**: Final exams: [http://www.sfsu.edu/~acadres/final_exams/finalf05.htm](http://www.sfsu.edu/~acadres/final_exams/finalf05.htm)

**Calendar**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Aug 24</td>
<td>Fall '05 Instruction Begins</td>
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<tr>
<td>Sep 5</td>
<td>Labor Day Holiday: No Classes; Offices Closed</td>
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<tr>
<td>Sep 9</td>
<td>Fall '05 Last Day to Add a Class Details: Last day to add classes to program.</td>
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<tr>
<td>Sep 21</td>
<td>Fall '05 Last Day to Drop a Class Details: Last day to drop a course or courses without receiving a &quot;W&quot; grade.</td>
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<tr>
<td>Sep 22</td>
<td>Fall '05 Course Withdrawal Begins Details: First day of withdrawal from course or courses-written approval of instructor and college dean required. Not permitted except for serious and compelling reasons. Withdrawal period is September 22 - November 16.</td>
</tr>
<tr>
<td>Nov 16</td>
<td>Fall '05 Course Withdrawal Deadline Details: Last day of withdrawal from course or courses-written approval of instructor and college dean required. Not permitted except for serious and compelling reasons. Withdrawal period is September 22 - November 16.</td>
</tr>
<tr>
<td>Nov 17</td>
<td>Fall '05 Course Withdrawal Begins (extreme circumstances) Details: First day of withdrawal from course or courses-written approval of instructor and college dean required. Not permitted except for serious and compelling reasons. Withdrawal period is November 17 - December 9.</td>
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<tr>
<td>Nov 24</td>
<td>Thanksgiving Holiday: No Classes; Offices Closed</td>
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<tr>
<td>Nov 25</td>
<td>Thanksgiving Holiday: No Classes; Offices Closed</td>
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<td>Nov 26</td>
<td>Thanksgiving Holiday: No Classes; Offices Closed</td>
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<td>Nov 30</td>
<td>Fall '05 Program Advising for Spring 2006 (classes cancelled except those meeting once a week) Details: Program Advising for Spring 2006 (classes cancelled except those meeting once a week).</td>
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<tr>
<td>Dec 9</td>
<td>Fall '05 Last Day of Instruction Details: Last day of instruction.</td>
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<tr>
<td>Dec 9</td>
<td>Fall '05 Course Withdrawal Deadline</td>
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<tr>
<td>Dec 10</td>
<td>Fall '05 Final Examinations</td>
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