Syllabus for MAE 322, Section 1
Machine Design
Spring Semester 2007
Meeting: Monday, Wednesday, Friday
11:00-11:50AM
Room EGC 110

Instructor: Hodge Jenkins, Ph.D., P.E.
Assistant Professor
Department of Mechanical and Industrial Engineering

Office: Suite 101-D, School of Engineering
Hours: As posted, drop by, or by appointment
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Textbooks and Supplies:
Recommended: Pro/Engineer and Pro/Mechanica Wildfire 2, MATLAB software

Web Sites: http://faculty.mercer.edu/jenkins_he/MAE322.htm

Catalog Description:
Application of the principles of solid mechanics, materials science, and statistics to the design and analysis of specific machine components such as screws, bearings, gears, welded joints, springs, etc.

Course Objectives:
Upon successful completion of this course, you should be able to do the following:

• Apply of the principles of solid mechanics, materials science, and statistics to the design and analysis of specific machine components such as screws, bearings, gears, shafts, keys, springs, etc.
• Determine component life based on static and dynamic loading.
• Select appropriate materials for component application.
• Design gear trains, weldments, flywheels, brakes, springs, keys.
• Select belts, chains, springs, gears, bearings, fasteners for appropriate application.
• Use computer-based tools such as Pro/Engineer, Pro/Mechanica and MathCAD to solve design problems.
• Successfully apply principles of engineering design to an open-ended machine project.
• Develop lifelong learning through out of classroom design and research experience.
• Develop a written detailed design for significant components of a machine.
**Prerequisites:**
Grade of C or better in EGR233, MAE-320

**Course Content:**
Failure theories, Distortion Energy
Failure theories, Shear and Normal
Failure theories: Brittle Materials
Stress Intensity, Fatigue
Fatigue failure criteria
Stress Concentration
Surface Fatigue
Shafts: Loading and power, Stress and Failure, Deflection and Design
Fasteners: bolts, pins, and rivets
Springs: Compression, Extension & Torsion,
Screws types, stresses, strengths
Spur gears: materials, manufacturing, design, loading
Gears: helical, bevel, worm,
Gear trains
Keys & couplings
Bearings and mounts
Fly wheels, critical speeds
Clutches and Brakes
Belts and chains
Wear
Welds/Welding

Pro-Engineer/Pro-Mechanica Modules

**Grading:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>10%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>15%</td>
</tr>
<tr>
<td>Project</td>
<td>15%</td>
</tr>
<tr>
<td>Tests</td>
<td>30% (15% each)</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
</tr>
</tbody>
</table>

Grade Averages: A (90-100), B (80-89), C (70-79), D (60-69), F(<60)

**Homework:**
Homework is a part of the grade as performing the homework is the only way to have a good understanding of the course material. Problems will be assigned periodically in class. Assigned homework will be collected and graded. Late homework will not be accepted.

Homework must be done neatly on engineering, graph, or plain white paper using a pencil. Messy, unorganized papers will receive less than full credit. Sketches should be done using appropriate tools (straight edge, pencil, etc.) Show all forces, coordinate systems, governing equations that are used in the solution. Equations and solutions must follow logically, step by step, referring to figures as necessary. Thus, your complete solution is supported by what you have presented. Show all your work. Generally, leave variables in the equations until the solution is found, then substitute the values for the variables to obtain the specific answer in the correct units. Begin each problem on a new sheet of paper, and combine all sheets together, in order and stapled.

Each student must turn in his own work. DO NOT COPY HOMEWORK.
Solutions will be placed in the library on 2-hour reserve.

**Project:** There will be a semester-long design project to use your newly acquired design skills. Partial submittals will be required throughout the semester.

**Quizzes:**
Short, 10 to 15-minute problem or question will be handed out periodically. Quizzes may or may not be announced. Quizzes may be closed notes and closed book. A calculator is recommended.

**Tests:**
There will be two 50-minute tests of 3 or 4 problems during the semester. Problems will be similar to the homework and quizzes. A calculator is recommended. No make-up tests will be given without a documented excuse.

**Final Exam:**
There will be a comprehensive final exam. It will consist of approximately 6 to 7 problems similar to those on the tests.

The final exam will be given as follows:

**Thursday: May 3, 2006, 9:00 A.M. - 12:00 P.M.**
Course Standards:

1. **Assignments are due at the beginning of the class period on the date due.** In an exceptional circumstance you may petition to hand in an assignment late. If granted, the grade will be reduced one letter grade per day late.

2. **Attendance is required** due to the large amount of in-class work and team activities we will be doing. You can’t “make up” experiential learning. More than three absences will result in grade penalties. It is especially important that you be present when your classmates give peer reviews and oral presentations, since you will be giving written feedback. Absences during peer reviews and oral presentations will be counted as double.

3. **Grading** encompasses every aspect of the course, from participation through final products. You can assume that every task requested directly or indirectly factors into your grade. For example, having your work prepared for your group is as important as having it ready for me. Regular feedback will be given on documents handed in.

4. You are encouraged to schedule a **conference** at any point that you need it. If you need to see me, catch me after class to schedule a time or call Mrs. Lin Young, the ECE/MAE Secretary, at 301-4146 to get on my calendar.

5. Please turn off cell phones and pagers before entering the classroom.

6. The **honor code** provisions as outlined in the *Bulletin* and in the student handbook, *The Lair*, will be assumed for everyone. It should be clear from class discussion which projects will be collaborative and which ones must be individual. When in doubt, please ask to avoid potentially embarrassing situations. Plagiarism is a violation of the honor code and is prohibited.

7. Students requiring accommodations for a disability should inform the instructor at the close of the first class meeting or as soon as possible. If you are not registered with Disability Services, the instructor will refer you to the Disability Support Services office for consultation regarding documentation of your disability and eligibility for accommodations under the ADA/504. In order to receive accommodations, eligible students must provide each instructor with a “Faculty Accommodation Form” from Disability Services. Students must return the completed and signed form to the Disability Services Coordinator on the 3rd floor of the Connell Student Center. Students with a documented disability who do not wish to use academic accommodations are also strongly encouraged to register with Disability Services and complete a Faculty Accommodation Form each semester. For further information, please contact Carole Burrowbridge, Disability Services Coordinator, at 301-2778 or visit the website at [http://www.mercer.edu/stu_support/swd.htm](http://www.mercer.edu/stu_support/swd.htm)

8. This syllabus is subject to change.

**Electronic Communication:**
Electronic communication is an important adjunct to face-to-face communication, including from professor to students, students to professor, and students to students. You must have regular access to your e-mail. If you do not have an active e-mail address on the first day of class, please secure one. Access to the Web and to the Internet is also integral to the class work. A number of laboratories on campus will provide access, in addition to EGC 102 and ECG 111-B. Information will be periodically given via e-mail. You must check your Mercer student e-mail regularly.