Syllabus for **MAE 322**  
**Machine Design**  
Spring Semester 2006  
**M,W,F**  
**11:00-11:50AM**  
**Room EGC 220**

**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  
**Phone:** 478-301-2831 (w)  
770-474-3522 (h)  
**Email:** jenkins_he@mercer.edu

**Textbooks and Supplies:**  
ISBN 0-07-252036-1  
Recommended: MATHCAD software, Pro/Engineer and Pro/Mechanica Wildfire 2

**Web Sites:** [http://faculty.mercer.edu/jenkins_he/MAE322.htm](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 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.

Prequisites:
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 part of the grade as performing the homework is the best way to have a good understanding of the course material, and form good engineering work habits. Problems will be assigned and will be collected at the beginning of class on the due date. Late homework will not be accepted.

Homework must be done neatly on engineering (or graph) paper in pencil, or using personal computer word processing. Please place your name, date and assignment number on each page in the upper right hand corner. Multiple pages must be stapled together. Messy, unorganized papers will receive less than full credit. Sketches should be done using appropriate tools (straight edge, compass, etc.) Show all forces, coordinate systems, governing equations that are used in the solution. Equations and solutions must follow logically, step by step. 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 staple all the sheets together in order.

You may work together in small groups, but copying is not permitted. 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-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 4, 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.

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 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 with a documented disability should inform the instructor at the close of the first class meeting. The instructor will refer you to the office of Student Support Services (SSS) for consultation regarding evaluation, documentation of your disability, and recommendations for accommodation, if needed. Students will receive from SSS the Faculty Accommodation Form. On this form SSS will identify reasonable accommodations for this class. The form must be given to the course instructor for signature and then returned to SSS.

To take full advantage of disability services, it is recommended that students contact the Office of Student Support Services, immediately. The office is located on the third floor of the Connell Student Center.

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. Students are required to use their Mercer assigned e-mail address for all electronic communication. 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 ECG 102 and 216-A.

COURSE E-MAIL INSTRUCTIONS
An automatically generated class e-mail list based on course enrollment in the Student Information System will be used. The list will be updated daily using the current course enrollment; as students are added to or removed from class rosters, the lists will be updated accordingly.

The list name will be the same as the course id and section number with all spaces and punctuation removed (e.g., MAE322001). To send a message to your class list, you would address the message to: MAE322001@Mercer.edu

Note that entries are not case sensitive.