Syllabus for MAE 425, Section 1
Vibrations
Spring Semester 2010
Monday, Wednesday, Friday
2:00-2:50 PM
Room EGC 208

Instructor: Hodge Jenkins, Ph.D., P.E., Associate Professor
Department of Mechanical Engineering

Office: Suite 101-D, School of Engineering
Hours: As posted, drop by, or by appointment

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Textbooks and Supplies:
Required: Mechanical Vibrations, 4th Edition,

Recommended: MATLAB® & Simulink® Student Version

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

Catalog Description:
Elements of vibrating systems. One degree of freedom systems: free and forced, and damped and
undamped. Multi-degree of freedom systems: free and forced, and damped and undamped.
Vibration of continuous systems. Design of vibration systems.

Course Objectives:
This course introduces students to the foundations of vibration theory and analysis. It develops
students’ understanding and ability to model mechanical systems and apply numerical and
analytical methods to determine (and design) the dynamic responses of vibratory systems of
single- or multiple-degree-of-freedom. Upon successful completion of this course, students
should be able to perform the following:
1. create linear models from real physical systems
2. develop the unforced response of linear, one degree of freedom systems (damped and
   undamped)
3. develop the forced (general and harmonic) response motion of linear, one degree of
   freedom systems (damped and undamped)
4. develop either the frequency or time response of single degree of freedom systems
5. determine appropriate vibration isolation with two-degree of freedom systems
6. develop forced and unforced responses of linear, multi-degree of freedom systems
7. develop vibration response of continuous systems
8. use modern methods and computer tools to model systems and assess vibration characteristics

Prerequisites: Grade of C or better in EGR 236, MAT 330

Grading:
- Homework 5%
- Quizzes 15%
- Tests (2): Total 30% (15% each)
- Semester Projects: Total 25% (10% first, 15% second)
- Final Exam 25%

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

Homework:
While homework is a small part of the course grade, performing the homework is the only way to have a firm understanding of vibration. Assigned homework will be periodically collected at the beginning of class on the date due. Note: Quizzes may often be homework problems, or very similar.

Homework must be done in an organized manner. 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. Problem solutions should include sketches, diagrams, coordinate systems, governing equations. Show all work. Equations and solutions must follow logically, step by step. Thus, your complete solution is supported by what you have presented.

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.

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

Tests:
There will be two 50-minute tests of approximately 3 to 4 problems during the semester. Problems will be similar to the homework and quizzes. All tests will be closed-notes and closed-book, unless otherwise stated. A calculator is recommended. No make-up tests will be given without a documented excuse.

Semester Projects:
Two semester projects will be given. The projects are a significant part of the course and the means by which a firm understanding of vibration may be obtained. The first project will help you visualize vibrations using Matlab and Simulink. The second project requires you to model and analyzed a complex (multi-degree of freedom) system. Each project will culminate in a written report. More detail on the projects will be provided.

Final Exam:
There will be a comprehensive final exam. It will be closed notes and but open book. It will consist of approximately 6 to 8 problems similar to those on the tests, homework or quizzes. The final exam will be given as follows: **Saturday, May 8, 2:00 p.m. - 5:00 p.m.**
Software:
You will use software to perform simulations and visualizations in some homework and in the projects. MATLAB and SIMULINK are recommended for this purpose. Other software may be used.

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, call or e-mail me to schedule a time.

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 EGC 216. Information will be periodically given via e-mail. You must check your Mercer student e-mail regularly.