Syllabus for EGR 233  
*Dynamics of Rigid Bodies*  
Summer Semester 2006  
*M,T,W,H*  
2:45-4:45 PM  
Room EGC 109

**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.  
During summer an appointment is recommended.

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**Textbooks and Supplies:**  
Russell C. Hibbeler, Prentice-Hall, 2004  

**Web Sites:** [http://faculty.mercer.edu/jenkins_he/EGR233.htm](http://faculty.mercer.edu/jenkins_he/EGR233.htm)

**Catalog Description:**  
Rectilinear and curvilinear motion of particles, equations of motion, linear and angular momentum, systems of particles, kinematics of rigid bodies, equations of motion for rigid bodies, plane motion of rigid bodies.

**Course Objectives:**  
Upon successful completion of this course, you should be able to do the following:  
- Use rectangular, polar and spherical coordinate systems for 2-D and 3-D vectors.  
- Determine position, velocity, and acceleration of particles in 2-D and 3-D.  
- Determine trajectories of projectiles.  
- Analyze dependent motion of cabling and pulleys.  
- Prepare appropriate free body diagrams for rigid bodies that are not in equilibrium.  
- Determine forces imposed upon a dynamic rigid body.  
- Solve dynamic problems involving linear and angular momentum.  
- Determine effects of impact on two bodies in a plane.  
- Solve dynamic problems involving friction.  
- Use energy and work relationships to solve dynamic problems.  
- Calculate mass moment of inertia for bodies.  
- Determine translational and rotational planar movements for rigid bodies.
Prerequisites:
EGR 232, MAT 192, PHY 161

Course Content:
Particle Kinematics-Rectilinear Motion
Curvilinear Motion: Rectangular Coordinates
Projectiles
Curvilinear Motion- Normal/Tangential Coordinates
Curvilinear Motion- Cylindrical Coordinates
Dependent Motion
Relative Motion
Newton's Laws of Motion
Equations of Motion: Rectangular Coordinates
Equations of Motion: Normal/Tangential Coordinates
Equations of Motion: Cylindrical Coordinates
Particle Kinetics: Work and Energy
Conservation of Energy
Particle Kinetics: Impulse and Momentum
Particle Kinetics: Impact
Particle Kinetics: Angular Momentum
Rigid Body Kinematics: Translation & Rotation
Rigid Body Kinematics: Relative Velocity
Rigid Body Kinematics: Instant Centers
Rigid Body Kinematics: Relative Acceleration
Mass Moment of Inertia
Planar Equations of Motion
Rigid Body Kinetics: Translation
Rigid Body Kinetics: Rotation about fixed axis
Rigid Body Kinetics: General Plane Motion

Grading:
Homework  5%
Quizzes     15%
Tests (2)  20% each
Final Exam  40%

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, and form good engineering work habits. Problems will be assigned periodically in class. Compile your homework in a notebook. Assigned homework in notebooks will be collected and reviewed periodically. Homework score will be based mostly on effort, so attempt a solution for all problems. Do your own work. Copied work will receive a zero score. Late homework will not be accepted.

Homework must be done neatly on engineering (or graph) paper in pencil. Please place your name, date and assignment number on each page in the upper right hand corner. 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.

Quizzes:
A short, 10-15 minute problem or question will be handed out periodically. Quizzes may or may not be announced. Quizzes will be closed notes and closed book. Quizzes will be based on the assigned homework. A calculator is recommended.

Tests:
There will be two 75-minute tests of approximately 4 problems during the semester. Problems will be similar to the homework and quizzes. All tests will be closed notes and closed book. 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 be closed notes and closed book. It will consist of approximately 6 to 7 problems similar to those on the tests, homework or quizzes.

The final exam will be given as follows:
Saturday, July 29, 2006  1:00 PM - 3:00 PM

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 is updated daily using the current course enrollment; as students are added to or removed from class rosters, the lists will be updated accordingly. Your Mercer student e-mail will be used for communication. You are responsible to review your e-mail for updated class information.