UNIVERSITY OF MARYLAND BALTIMORE COUNTY
Department of Mechanical Engineering

Summer 2012

ENME 221 - Dynamics (3 credits)
Lecture: TWTh 6:00 pm - 8:30 pm, ITE 102 (LH8)

Prerequisites: PHYS 121, ENES 110, MATH 152

I know this is a boiler-plate paragraph, but it's important. Read it! ↓

ACADEMIC INTEGRITY

"By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, or the UMBC policies section of the UMBC Directory." *UMBC Faculty Senate, February 13, 2001.*

Instructor:	**Dr. David Irvine**
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Text: R. C. Hibbeler, *Engineering Mechanics: Dynamics*, Twelfth Edition, Pearson Prentice Hall, Upper Saddle River, New Jersey, 2010. (ISBN 13: 9780137032297) This includes what you need for *Mastering Engineering*, an online supplement.

General Course Description: Dynamics is the science of the motion of rigid bodies. This course will develop the mathematical description of the motions of particles and rigid bodies and the relationship of these motions to the forces that cause them. This course is the first in a series of courses (ENES 221, ENME 360, ENME 403, ENME 482L) that deal with the motion of structures and systems in the mechanical engineering curriculum.

Lectures and Discussions: Lectures will discuss both the theory and application of dynamics. Since there is no time for separate discussion sessions in the summer intensive version of this course, students will do timed practice problems in class. With a total of only eighteen meetings – which must include tests – these classes are apt to seem like sprits. Falling behind will virtually assure a lower grade, if not outright failure. Students not used to summer sessions can easily miss this vital point, until it's too late.

Mastering Engineering: Our course ID is MEIRVINE63126

Homework Policy: The majority of the homework will be submitted via Mastering Engineering. The grading policy is given with each assignment. Basically, one gets six shots at any problem. Also, given the flexibility of this system, late homework can realistically be accommodated. A percentage will be subtracted for each day late, adjusted so that the potential credit is minimal by the final.

There will also be one written homework with each assignment. These will test-like questions, graded with a rubric. To receive full credit, you must not only get the correct answer, your problem solution must be clear and correct.

Homework is intended to provide training, and hence *expected* to be less than perfect; its relatively low weighting reflects this, and the final grades are computed with this expectation. Experience has shown that answer manuals tend to subvert this process, even if used conscientiously – only consulted, for instance, after a serious attempt at independent solution. Therefore, answer manuals are not made available; the overall grading structure is constructed accordingly. And accordingly, the bottom line is *don't use them*. Go back and reread that boiler-plate on the first page of this syllabus!

Assessment: The relative weighting of these performance factors is:

5% – Homework – Written (the lowest two will be dropped);
10% – Homework – Online (late acceptable, but penalized)
60% – Semester Exams (3 @ 20% each);
25% – Final Exam.

The grading scale will be determined shortly after every exam, and posted. The percentages will apply to a student's total score. Thus, the question, "What was my grade on this exam" is without meaning. What counts is the total.

Mechanical Engineering repeat policy:

At UMBC, students may not register for a course more than two times. They are considered registered for a course if they are enrolled after the end of the schedule adjustment period – Friday, July 12th for this summer. Students may petition the Office of Undergraduate Education for a third and final attempt of a course taken at UMBC or another institution; the Department of Mechanical Engineering, however, will not support petitions to repeat required lower-level courses (100-200) for the purpose of continuing in the major.

Schedule for Lectures: This is subject to change. The current version number will be posted on the first page of Blackboard. Be sure you keep up to date.

Class	Date	Topic	Section
1	Tue, July 10	*Introduction*: overview of course; overview of first section. *Kinematics of a particle:* rectilinear & curvilinear motion; Cartesian components; normal/tangential components	12.1-7
2	Wed, July 11	*Kinematics of a particle:* absolute dependent motion; relative (non-accelerating) motion; *Kinetics of a particle:* equations of motion for a particle/system of particles; Cartesian coordinates	12.8-10; 13.1-4
3	Thr, July 12	*Kinetics of a particle:* Equations of motion, normal & tangential; cylindrical	13.5-6
4	Tue, July 17	Drill on unit one	12.1-10; 13.1-6
5	Wed, July 18	Overview of unit two; ***unit one exam***	12.1-10; 13.1-6
6	Thr, July 19	*Kinetics of a particle:* work & energy; time integral of F=ma; conservative forces and potential energy; conservation of energy; impulse and (linear) momentum	14.1-6; 15.1-2
7	Tue, July 24	*Kinetics of a particle*: Conservation of linear momentum; impact; angular momentum; moments of a force & angular momentum; angular impulse	15.3-7
8	Wed, July 25	Drill on unit two	14.1-6; 15.1-7.
9	Thr, July 26	Overview of unit three; ***unit two exam***	14.1-6; 15.1-7
10	Tue, July 31	*Kinematics of a rigid body*: rotation; absolute & relative motion; instantaneous center of no motion	16.1-6
11	Wed, Aug 1	*Kinematics of a rigid body*: the general case of relative motion. *Kinetics of a rigid body*: moment of inertia;	16.7-8; 17.1
12	Thr, Aug 2	*Kinetics of a rigid body*: planar motion; translation; rotation about a fixed axis; general motion	17.2-5
13	Tue, Aug 7	Drill on unit three	16.1-8; 17.1-5
14	Wed, Aug 8	Overview of unit four; ***unit three exam***	16.1-8; 17.1-5
15	Thr, Aug 9	*Kinetics of a rigid body*: work and energy for an extended body; energy of a couple *Kinetics of a rigid body*: linear and angular momentum linear and angular impulse; conservation of momentum; eccentric impact (yes, quite a bit. ☺)	18.1-5; 19.1-4
16	Tue, Aug 14	*3D kinematics of a rigid body*:	20.1-3
17	Wed, Aug 15	Drill on full course	Full course
18	Thr, Aug 16	Final exam	Full course

COW_ENES 221 Course Goals as Related to ABET Outcomes

Course Goals	Supports ABET Outcomes	Activity	Basis for Assessment
1. The students generate and use free-body diagrams to solve problems of dynamic equilibrium.	a, e, g, k	Lecture, in class examples, discussion session assistance, homework, exams	Student assessment, instructor assessment, graded homework, quizzes, and exams
2. The students will use vector calculus to determine position, velocity, and acceleration of a particle traveling on free or prescribed paths. They will calculate the forces acting on the particle and on the ground.	a, e, g, k	Lecture, in class examples, discussion session assistance, homework, exams	Student assessment, instructor assessment, graded homework, quizzes, and exams
3. The students will be introduced to Cartesian, cylindrical, and natural coordinates and select coordinates appropriate to a given problem. The students will choose frames of reference appropriate to a given physical arrangement of components in relative motion.	a, e, g, k	Lecture, in class examples, discussion session assistance, homework, exams	Student assessment, instructor assessment, graded homework, quizzes, and exams
4. The students will use vector calculus to determine position, velocity and acceleration of rigid bodies traveling freely and on a prescribed path. They will calculate forces acting on both the body and the ground.	a, e, g, k	Lecture, in class examples, discussion session assistance, homework, exams	Student assessment, instructor assessment, graded homework, quizzes, and exams
5. The students will use kinetic and potential energy to solve problems in both conservative and non-conservative fields for particles and rigid bodies.	a, e, g, k	Lecture, in class examples, discussion session assistance, homework, exams	Student assessment, instructor assessment, graded homework, quizzes, and exams
6. The students will use impulse and momentum applied to both linear and rotational systems or particles and rigid bodies.	a, e, g, k	Lecture, in class examples, discussion session assistance, homework, exams	Student assessment, instructor assessment, graded homework, quizzes, and exams