

Dynamics (EM 313)
Fall 2001 (3 Credit Hours)
Course Information, Assessment and Policy Statement

Instructor:	Dr. Jack Leifer	Office hours:	"Open Door" Policy or by appointment
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Lecture: MWF 11:00 – 11:50 AM, Crouse 222
Text: *Engineering Mechanics: Dynamics* (9th edition), Hibbeler
or combined *Statics and Dynamics* (9th edition)
Prereq: EM 221, MA 214, CS 221. Students not meeting these prerequisites will be dropped.

Catalog Course Description: Study of the motion of bodies. Kinematics: Cartesian and polar coordinate systems; normal and tangential components; translating and rotating reference frames. Kinetics of particles and rigid bodies: laws of motion; work and energy; impulse and momentum.

Concepts to be introduced to the student:*

Position Vector	Work	Angular Acceleration
Velocity	Kinetic Energy	Instantaneous Center
Acceleration	Power	General Plane Motion
Relative Motion	Potential Energy	Mass Moment of Inertia
Projectile Motion	Linear Impulse	Radius of Gyration
Newton's Laws	Impacts	Parallel Axis Theorem
Linear Momentum	Angular Velocity	
Angular Momentum	Angular Impulse	

The student shall be able to: *

1. Define and use all of the above concepts.
2. Give dimensions associated with the above concepts.
3. Express particle velocities and accelerations in rectangular, normal and tangential, and polar coordinates, and be able to convert among systems.
4. Given the position vector $\mathbf{x}(t)$, or the velocity vector $\mathbf{v}(t)$ or $\mathbf{v}(\mathbf{x})$ of a particle, determine the required forces; inversely, given the resultant force, determine the velocity and position vectors.
5. Use work-energy to determine force-velocity-position relationships for particles.
6. Use linear impulse-momentum to determine force-velocity-time relationships for particles.
7. Compute particle motion in various frames of reference.
8. Locate the instantaneous center and use it to solve velocity problems.
9. Calculate mass moments of inertia by integration.
10. Use the parallel-axis theorem correctly.
11. Calculate the mass moment of inertia for a composite body
12. Use the force and moment equations to solve rigid-body problems.
13. Use work-energy equations for rigid bodies.
14. Use impulse-momentum equations for rigid bodies.
15. Draw the appropriate diagrams for each solution method.
16. Incorporate the appropriate kinematic equations for each solution method.
17. Decide in any given problem which solution method is appropriate.
18. Use a combination of methods, if necessary.
19. Check all equations for dimensional homogeneity.
20. Work all problems in either SI or U.S. customary units.

[?] Based on syllabus of Dr. S. Smith, Sp. 1999

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Policy on enrollment: Students may not be enrolled for a third time in any Engineering Mechanics course. If a student has enrolled in EM 313 two times previously and has received two E's, he/she will be dropped from the course.

Homework: Reading assignments and associated homework problems are shown on Page 3 of this syllabus. Homework problems will be due the Wednesday following the day they were assigned, and will be collected at the beginning of class. **If you are not in class, it is still your responsibility to keep up with the class, and turn in your assignments by FAX or email.** Homework is to be completed in the format illustrated in the attached sample homework problem. **Homework problems are an integral part of the course. Students cannot reasonably expect to develop the necessary skills in this course unless the homework problems are completed as scheduled. Homework problems will be collected when they are due, and checked off (but not graded in detail). Homework offered for late submission will not be accepted.** Solutions will be available after homework has been turned in.

Quizzes: Short (20-25 minute, one-problem) quizzes will be given periodically, at the beginning of class. Your lowest quiz grades will be dropped. They have been scheduled as follows:

Quiz 1 Friday 8/31/01	Quiz 2 Friday 9/21/01
Quiz 3 Friday 10/12/01	Quiz 4 Friday 10/26/01
Quiz 5 Friday 11/1/01	Quiz 6 Friday 11/30/01

Tests: Tests have been scheduled as follows:

Test I:	Friday 9/28/01
Test II:	Friday 11/16/01
Final:	Thursday 12/13/01, 8 AM – 10 AM

Make-ups: If you do not notify me of an absence in advance, only extreme circumstances will be considered.

Attendance: Make it a habit to both **attend** class and to arrive to class **on time**. Attendance will be recorded. If you have to miss class, make sure you get the lecture notes from a classmate, as well as handouts or any important announcements pertaining to the schedule, etc. Please refer to p. 49 of the *University of Kentucky 2000-2001 Bulletin* for details. Absence from more than two class sessions for any reason may result in a grade of *E* (which is a failing grade).

Tobacco, food and drink: PCC policy prohibits the consumption of food, drink, or tobacco in classrooms and laboratories.

Report: In keeping with ABET's emphasis on providing opportunities for students to develop communications skills, you will be required to write a short (5-7 page) report. I will offer a list of topics later in the semester. Reports are to be typed in Microsoft Word (or similar text processing program), and are to be checked by you for accurate spelling and grammar. As an engineering professional, you will find that the appearance and accuracy of your written documents will matter as much as their technical content, therefore, your reports will be graded on writing quality as well as content. You are encouraged to take advantage of PCC's writing center for assistance. This report will be due in class on Friday December 7th.

Computer access: Computers for engineering student use are generally available in the student computer labs M-Th until 10:30 PM, and on certain weekends. All software needed for this class is installed on those computers. Additional lab hours will be announced as they become available.

Special Circumstances: If you have a learning or physical disability which might affect your performance in this class, please contact Bonita Lykins as soon as possible for further instructions. Once an evaluation has been made, appropriate accommodations will be determined.

Course Grading: Grades for the course will be determined as follows:

Collected homework:	10%	A = 90 - 100
Quizzes:	25%	B = 80 - 89
Report:	10%	C = 70 - 79
Tests:	30%	D = 60 - 69
Comprehensive Final Exam:	<u>25%</u>	E = Below 60
Total:	100%	

Cheating and Plagiarism: The University's minimum penalty for cheating or plagiarism is a failing grade for the course.

Midterm Grade: An estimate of the midterm grade will be made prior to the withdrawal deadline.

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Tentative Course Outline: The following topics will be covered in this course, in the order shown. Homework assigned during week n should be turned in the Wednesday of week $n+1$ **at the beginning of class. Late homework will not be accepted.**

<u>Week</u>	<u>Month</u>	M	W	F	<u>Topic</u>	<u>Sections</u>	<u>Problems</u>
1	Aug.		22	24	Rectilinear Motion	12.1 – 12.3	12: 4,20,31,42,46,62
2	Aug.	27	29	31 ^{Q1}	Curv Motion; Proj Motion	12.4 – 12.6	12: 73,81,88
3	Sept.	3 ^{NC}	5	7	N-T, Cylindrical Coordinates Relative Motion	12.7 – 12.8 12.9 – 12.10	12: 117,121,154 12: 178,189,202
4	Sept.	10	12	14	Newton's Law for Parts, r'linear Newton's Law in N-T, Cyl. Cds.	13.1 – 13.4 13.5 – 13.6	13: 3,25,29,41 13: 64,69,102,111
5	Sept.	17	19	21 ^{Q2}	Wk of a Force; Work and Energy Sys of Particles; Power and Eff.	14.1 – 14.2 14.3 – 14.4	14: 6,11,21 14: 39,53,61
6	Sept.	24	26	28 ^{T1}	Cons. Forces; Cons. of Energy Review	14.5 – 14.6	14: 78,90
7	Oct.	1	3	5 ^{NC}	Linear Impulse – Momentum Linear Impulse - Impact	15.1 – 15.2 15.3 – 15.4	15: 19,25 15: 33,50,53,74,77,81
8	Oct.	8	10	12 ^{Q3}	Angular Momentum Angular Impulse	15.5 15.6 – 15.7	none 15: 96,102,107
9	Oct.	15	17	19	RB Motion: Trans., Simp. Rot. General Plane Motion	16.1 – 16.3 16.4	16: 5,7,9,21,26 16: TBD
10	Oct.	22	24	26 ^{Q4}	Relative Motion: Velocity Relative Motion: Acceleration	16.5 – 16.6 16.8	16:57,69,78,95 16:108,135,141,147,148
11	Oct.	29	31	1 ^{Q5}	Moment of Inertia	17.1	17:3,9,14
12	Nov.	5	7	9	Planar Kinetics: Translation Rotation; General Plane Motion	17.2 – 17.3 17.4 – 17.5	17:30,38,47 17:61,71,97,103,106
13	Nov.	12	14	16 ^{T2}	Rigid Body Work	18.1 – 18.3	18:5,11,31
14	Nov.	19	21	23 ^{NC}	Rigid Body Work and Energy	18.4 – 18.5	18:45,59,62
15	Nov.	26	28	30 ^{Q6}	Linear/Angular Impulse and Mom.	19.1 – 19.2	19:13,22
16	Dec.	3	5	7	Conservation of Momentum Review	19.3	19:27

Notes:

- (1) Please note that the homework programs shown represent the minimum amount of work a student should do if he or she expects to pass the course. Other problems that should be completed (but are not subject to collection) are those examples shown in class, and the solved example problems included in your textbook.
- (2) Working on assignments in groups is encouraged. Studies have shown that students learn faster and retain more when they participate in study groups. If you have trouble finding an appropriate group, please contact the course instructor.
- (3) Although group work is encouraged, you must turn in your own work. Please indicate the names of any study partners on your homework. Note the penalties for plagiarism stated previously.
- (4) This is a fast-paced class. Preparing for each lecture by reading the assigned sections is essential, as there is too material to allow all of it to be covered in detail!
- (5) This is a three-hour class. If you expect an average grade, it should be expected that three hours of outside preparation are required for every hour you spend in class, on the average. Adjust your outside commitments accordingly!