ME 213: Dynamics

Winter 2010

Instructor

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Communication

Please see my extensive web pages for contact information. It is the most up to date.

Email will be sent regularly to your university email accounts. This will allow me to contact you regarding the class between lectures. If you would rather have your email forwarded some-where else, please read how to do that. This information and the answers to most any question you may have regarding the course and computer usage (including old exams, and the syllabus) can be found on my computer help page or the course web page.

Because weather in Winter Quarter can be unpredictable, it is advisable that you set a filter on your university account so that any email I send to you with the text "cancel" in it will be forwarded to your cell phone as an SMS text message.

Time and Place

MWF: 8:30-9:35 AM, 148 Russ Hall

Office Hours

Will change depending on student schedules. 1:00-2:00 PM, Monday and Wednesday, and by appointment. I check my email many times each day. You will get a quicker response by email than by any other mode of communication.

Text

Gray, Costanzo, Plesha, Engineering Mechanics: Dynamics, McGraw Hill, 2009. - Required
Also see the course web page.

Software

You are expected to have a graphics calculator with linear algebra and numerical solver capabilities.
Mathematica, MATLAB, Octave, any version (student or professional version). These are available through your WSU account (except Octave, which you may download and use for free on your home computer), but you may find it convenient to buy at the bookstore and install on your home computer. They will run on any platform.
Please read the text and use the on-line help. Syntax issues are sufficiently discussed or displayed in these resources. It is highly recommended that you learn to use Mathematica and MATLAB on your UNIX account as soon as possible. Each has strengths and weaknesses, and they can be of great help with more complex problems, especially on your project. Examples are given for all three in my Computer Literacy course notes.

Prerequisites

ME 212 Minimum Grade of C and (ME 102 or CEG 220)

Prerequisites by topic (5%)

You are expected to know the following. You will be tested on them the first day of the second week. Please review your old course notes and texts:

1. Definite Integrals
2. Polar Coordinates
3. Parametric Equations
4. Vector Algebra
5. Force Systems
6. Equilibrium
7. Structures
8. Distributed Forces
9. Friction
10. Mass Moment of Inertia
11. Parallel Axis Theorem
12. Mechanics of Particles and Rigid Bodies (PHY 240)

Course Contents

At the successful conclusion of this course, students will be able to:

- solve problems involving kinematics of particles.

- solve problems using kinetics of particles, Newtons laws, momentum, and energy methods.

- solve problems applying kinetics of systems of particles.

- solve problems by applying kinematics of rigid bodies (2-D).

- solve problems by applying Newtons laws for 2-D bodies.

- solve problems by applying energy and momentum methods for 2-D rigid bodies.

Lecture Schedule

Week	Monday	Wednesday	Friday
		Day	
1 (Jan 3)	1.1-2.1	2.2-2.3	2.4-2.5
2 (Jan 10)	2.6-2.7	2.8-3.1	3.2
3 (Jan 17)	X	3.3	E
4 (Jan 24)	4.1-4.2	4.3	4.4
5 (Jan 31)	5.1	5.2	5.3
6 (Feb 7)	5.5	E	6.1
7 (Feb 14)	6.2	6.3	S
8 (Feb 21)	6.4	Appendix A	7.1
9 (Feb 28)	7.1 (cont)	E	8.1
10 (Mar 7)	8.2	8.3	Review

Major Dates

Date	Event
Jan 11	Prerequisite Quiz
Jan 18	Martin Luther King day (no classes)
Jan 22	Exam I
Feb 10	Exam II
Feb 19	Service day
Feb 26	Pre-proposal (project draft) due
March 3	Exam III
March 12	Project due
March 19 (8:30-10:30)	Final Exam

Homework (10%)

Each homework problem is worth 1 point. You are encouraged to work together in small groups, but keep in mind that homework is assigned in order to help you learn and keep up with the course material. You are expected to learn how to use your *matrix capable, numerical solution capable, graphics calculator*[1] and MATLAB in order to solve more complex problems. This will benefit you during quizzes. You are also encouraged to do additional problems out of the text for practice. The assigned problems are the *minimum* necessary to master the material. *The only way to learn the skills taught in this course is to apply them.* Homework may not be turned in late [2] Please see me if you need help with the homework. Homework grades, unlike other grades, will be curved such that the average homework grade is a *B for problems turned in*.

Homework (posted by due date)

This homework is a minimum amount of homework to understand the material. Only exhaustive solution of the problems in the text can guarantee mastery of the material.

	Day		
Week	Monday	Wednesday	Friday
1 (Jan 3)	-	1.3, 1.5, 1.8, 2.2, 2.10	2.15, 2.24, 2.50
2 (Jan 10)	Statics Final, 2.79, 89, 2.120, 2.138, 2.143	2.161, 2.172, 2.193	2.222, 2.249, 3.4
3 (Jan 17)	X	3.5,3.6, 3.22,3.47	E
4 (Jan 24)	3.91, 3.94, 3.109	4.7, 4.14, 4.17	4.30, 4.36, 4.39
5 (Jan 31)	4.54, 4.59, 4.72, 4.78	5.5, 5.12, 5.23	5.50, 5.58
6 (Feb 7)	5.66, 5.77, 5.87 5.90	E	5.113, 5.119, 5.128
7 (Feb 14)	6.17, 6.20, 6.27	6.53, 6.55	S
8 (Feb 21)	6.78, 6.84, 6.87, 6.98	6.112, 6.120	Statics Chap 10: 82, 85, 91
9 (Feb 28)	7.10, 7.16, 7.18	E	7.22, 7.25
10 (Mar 7)	7.35, 8.14, 8.25, 8.43	8.66, 8.69	8.82, 8.88

X: No Class
E: Exam
S: Service day

Professionalism (5%)

Professionalism is a measure of your behavior regarding expected practice as an engineer. This includes aspects such as attendance, note taking, consistency of performance, tenacity in problem solution, leadership, legibility and organization of problem solutions, clarity of communication, etc. For details on expected behavior, please consult *The Unwritten Rules of Engineering* by

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[1]This is a tool invented in the 20th century. Please obtain one before we are too far into the 21st.

[2]Solutions covered in class immediately after homework is due. It's not fair to others to hold up going over solutions because of a few late assignments. It is strongly encouraged that you complete late assignments for your own benefit.

W.J. King, with revision by J.G. Skakoon. This book is available at the library. However, for your own professional development, I highly recommend that you own a personal copy.[3] One point will be deducted from your professionalism score each time you receive less than a 70 on an exam *and* do not see me personally during the next week to clear up confusion.

Design Project (10%)

A design project will be assigned during the quarter. You may not consult other members of the class (outside of your group) for assistance on the project. You may (and are expected to) consult the library and the instructor.

The design project is set up as a competition. You will have to write a pre-proposal, which forms, essentially, a draft of your design report. I will provide you feedback on report writing within one week. Your final proposal will be ranked against performance of this and previous classes. Only one project may 'win' a score of 100. Other projects will be relegated to scores of 95 and below. Any information you generate or obtain should b treated as proprietary because this *is* a competition.

At the conclusion of the project each member of the group is advised to grade the other members of the group. You have 100 points to divide amongst your fellow group members and yourself. I use these ratings to compensate for individuals who do not pull their own weight in a group, or excel within a group.

Exams (70%)

There are 3 midterms and a final exam. The final counts as 3 exams. You may drop the lowest 2. Your final grade will be no less than one letter grade below your final exam grade, presuming you pass the project. If you receive a passing grade on the project and a 100 on the final exam, you will receive an 'A' in the class.

Problem Solutions

Problem solutions must be neat and orderly. They must include each of the following, when applicable. You must be capable of making that decision. For example: To use Newton's law, you must draw a free-body diagram. Free body diagrams don't make sense when not applying either Newton's laws or variants of Newton's laws, i.e. sketches for determining properties of areas, etc. All work must be done on 8.5 in. by 11 in. paper.

1. What are you looking for? Briefly. For example: *The force in cable AB*.

2. What laws apply? What principles apply? For example: Newton's law-translation (alternatively can be stated in equation form: $\sum \mathbf{F} = \mathbf{0}$). You must list all laws and principles that you will apply in solving the problem. Equilibrium will be the most common in Statics.

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[3]If you read an older edition of the book (prior to Skakoon), please be attentive to the fact that some of the comments, especially those regarding polishing shoes, are considered rather quaint today. Appearance is not quite as important today is it was then.

3. Sketch *and/or* free body diagram (FBD). You must have at least one except under the most unusual circumstances where neither applies.

4. List of known quantities, list of *all* vectors to be used, including the knowns and unknown variable in the vectors. This is an organizational toolkit for substituting into item 2.

5. Generation of the set of equations with substitutions made. Solution if simple, set of equations to be solved if not. Solution is always expected on homework, using Mathematica at your discretion. Expectation of solution on quizzes will be declared. If solution is not expected on a quiz, the set of equations that must be solved, and the procedure for solving them must be stated.

6. When you generate a solution, *does the result make sense*? As engineers, you must have insight as to whether or not an answer seems reasonable *before* you solve the problem. How long is a table? Two to 12 feet would be a reasonable range. If you get three miles long, you should know that the answer is wrong.

A template is available for use at the start of the quarter, while problems are short enough to fit the template. **You are required to use this template until instructed otherwise.**

Cheating

Don't. I helped write the university rules, and I will pursue them when warranted.

Cheating is defined as: Copying the solution of a problem from any source. Using any source other than specified during a quiz or exam to solve the problem. Quizzes will be out of the book, but *other than the page of the problem, the book may not be used to solve the problem*. Taking credit for work that was copied from another source is plagiarism and considered cheating.