Dynamics
ME EN 2030
University of Utah

Class Time: MWF 9:40 – 10:30 AM; WEB L103
Instructor: Professor Bruce Gale; MEK 1580; bruce.gale@utah.edu; 801-585-5944
Office Hours: T 2-3 PM; MWF 3-3:30 PM (when possible); other times by appointment
TA Info: Farshad Mogharrabi (mogharrabi.f@gmail.com)
Office Hours: MTWF 12-2 PM (MEK tutoring center)
Text: *Engineering Mechanics: Dynamics*, 14th Ed., R.C. Hibbeler, Pearson, 2016

We will use an online homework system (*MasteringEngineering*) that you will need to purchase access to. This may be done separately or in combination with the text, with the following options (with approximate pricing):

- Print Text + *MasteringEngineering*, ISBN: 9780134116990 ($190)
- Loose-leaf Text + *MasteringEngineering*, ISBN: 9780134082424 ($120)
- *MasteringEngineering* with E-Text, ISBN: 9780133976687 ($100)
- *MasteringEngineering* (HW only, for students who already have a book): ISBN: 9780133976595 ($61)

Any of the first three items above may be purchased at greater discount through the campus bookstore. All options may be purchased through the publisher's website (http://www.mypearsonstore.com/). **Because homework will be done online, there is no need to have this particular text or edition; you will only be required to have access to the homework system. There are a number of texts, including older ones, from a variety of publishers that all include approximately the same information. Any of these would be suitable as a tool for learning the concepts of the class and as a long-term reference for your engineering bookshelf.

Class Web Page: Canvas via CIS (make sure you are set up to receive notifications for announcements)
Prerequisites: ME 2010 (Statics), CVEEN 2010 (Statics), or equivalent
Co-requisite: Math 2250

Grading

Homework	15%
Two midterm exams, each	20%
Final Exam	30%
Mini-Projects	15%

Grades will be based on the standard >93%=A, 90-93%=A-, 87-90=B+, 83-87%=B, …, 73-77%=C, 63-67%= D, and <60%=F. In the event that grades are abnormally low, the required scores will be adjusted accordingly.

Homework

- A homework assignment will be assigned for each lecture and will be due 3 days after the lecture (i.e. material covered on a Monday will have homework due on Thursday, Wed: Sat, Fri: Mon). It is recommended that you work the applicable problems shortly following each lecture to give you time to get help, if needed. You should expect to spend at least two hours doing homework for each hour spent in lecture, meaning that each homework assignment should take about 2 hours. As in many classes, being diligent with homework is the key to learning.
- As noted above, assignments will be completed online using *MasteringEngineering*, the book publisher's homework system. Each student must register online and enroll in UTAHDYNAMICSSPR18. Completed assignments will be due by 11:30 PM on the day due. Credit cannot be obtained for assignments completed after the posted deadline. **At least 60% of the HW must be worked to pass the class.** Each attempt at a homework problem will result in 10% less points issued for that problem. As the online system does not give partial credit, you can request partial credit for a problem by turning in on Canvas a written version of the problem. The written portion must be in the approved class homework format. Each Thursday you will be required to turn in the written portion of the homework that was assigned on Monday, and these will be graded for format and to ensure you are working the problems.
- You are encouraged to work with others on the homework, but the work you submit should reflect your understanding of the problem.

Quizzes

Unannounced quizzes may be given during lecture at various times through the course of the semester and will be completed on Canvas. Quizzes will be counted as part of the homework grade, with each quiz having the value of a typical homework assignment.

Mini-Projects

Students will be assigned to teams of 4-5 students and required to carry out a dynamics-related project. This project is designed to apply class concepts to more realistic, open-ended problems than homework typically involves. Analysis and

findings will be reported in a succinct, professional memo. Everyone must participate with a team; projects completed by individual students will not be accepted.

Schedule
Topics to be covered in class are listed in the outline below. The listed schedule is subject to change (any changes will be announced).

Lecture	Date	Lecture Topic	Reading	HW Due
1	19-Aug	Introduction		22-Aug
2	21-Aug	Kinematics	12.2-3	24-Aug
3	23-Aug	Kinematics (x-y)	12.4	26-Aug
4	26-Aug	Kinematics (x-y)	12.5-6	29-Aug
5	28-Aug	Kinematics (n-t)	12.7	31-Aug
6	30-Aug	Kinematics (r-q)	12.8	2-Sep
	2-Sep	**Labor Day**		
7	4-Sep	Dependent Motion	12.9	7-Sep
8	6-Sep	Relative Motion	12.10	9-Sep
9	9-Sep	Kinetics of Particle (x-y)	13.1-4	12-Sep
10	11-Sep	Kinetics of Particle (n-t)	13.5	14-Sep
11	13-Sep	Kinetics of Particle (r-q)	13.6-7	16-Sep
12	16-Sep	Work & Energy	14.1-4	19-Sep
13	18-Sep	Work & Energy	14.5-6	21-Sep
	20-Sep	**Exam 1***		
14	23-Sep	Impulse & Momentum	15.1-3	26-Sep
15	25-Sep	Impact	15.4	28-Sep
16	27-Sep	Angular Impulse & Momentum	15.5-7	30-Sep
17	30-Sep	Particle Systems – Steady Fluid Flow	15.8	3-Oct
18	2-Oct	RB Kinematics	16.1-3	5-Oct
19	4-Oct	Absolute Motion	16.4	7-Oct
	7-11 Oct	**Fall Break**		
20	14-Oct	Relative Motion – Velocity	16.5	17-Oct
21	16-Oct	Instant Center	16.6	19-Oct
22	18-Oct	Relative Motion – Acceleration	16.7	21-Oct
23	21-Oct	Relative Motion – Acceleration		24-Oct
24	23-Oct	Mass Moments of Inertia	17.1	26-Oct
25	25-Oct	RB Kinetics	17.2-3	28-Oct
26	28-Oct	RB Kinetics	17.4	31-Oct
	30-Oct	**Exam 2***		
27	1-Nov	RB Kinetics	17.5	4-Nov
28	4-Nov	RB Kinetics	17.5	7-Nov
29	6-Nov	RB – Work & Energy	18.1-4	9-Nov
30	8-Nov	RB – Work & Energy	18.5	11-Nov
31	11-Nov	RB – Impulse & Momentum	19.1-2	14-Nov
32	13-Nov	RB – Impulse & Momentum	19.3	16-Nov
33	15-Nov	RB – Impulse & Momentum	19.3	18-Nov
34	18-Nov	Vibrations – Undamped Free	22.1	21-Nov
35	20-Nov	Vibrations – RB, Energy Methods	22.2	23-Nov
36	22-Nov	Vibrations – Undamped Forced	22.3	25-Nov
37	25-Nov	Vibrations – Damped Free	22.4	28-Nov
38	27-Nov	Vibrations – Damped Forced	22.5	30-Nov
	29-Nov	**Thanksgiving Holiday**		
39	2-Dec	Intro to 3D Dynamics	20-21	5-Dec
40	4-Dec	Project and Review		7-Dec
	12-Dec	**Final Exam (8-10 AM)***		

Objectives

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

1) Analyze rectilinear and curvilinear motion (kinematics) of particles
2) Solve problems involving the kinetics (relation of forces, mass and motion) of single particles
3) Apply the concepts of energy and momentum, both linear and angular, to the motion of particles
4) Analyze the 2-D (and, to a lesser extent, 3-D) motion of rigid bodies, using the concepts of:
   a) Relative acceleration and velocity
   b) Instantaneous center
5) Solve kinetics problems involving 2-D motion of rigid bodies in inertial reference frames
6) Apply the principles of conservation of energy, conservation of momentum, etc., to solve for the motion of rigid bodies or systems of bodies under various applied forces, moments, impulses and constraints
7) Apply the principles of dynamics to design. This will be demonstrated by the completion of an engineering project with a brief written report

General Class Policies

1. Withdrawal procedures and dates are described in the College of Engineering Guidelines.
2. Student records, scores, exams and homework are confidential
3. Attendance: Failure to attend more than 25% of the class periods will result in failure of the class unless extenuating circumstances exist.
4. Cheating and Shared Work: Cheating on in-class assignments and exams will result in a zero on that assignment. Shared work on take home assignments will result in a shared grade.
5. Other general policies are described in the College of Engineering Guidelines.

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the instructor and to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD) to make arrangements for accommodations.----All written information in this course can be made available in alternative format with prior notification.