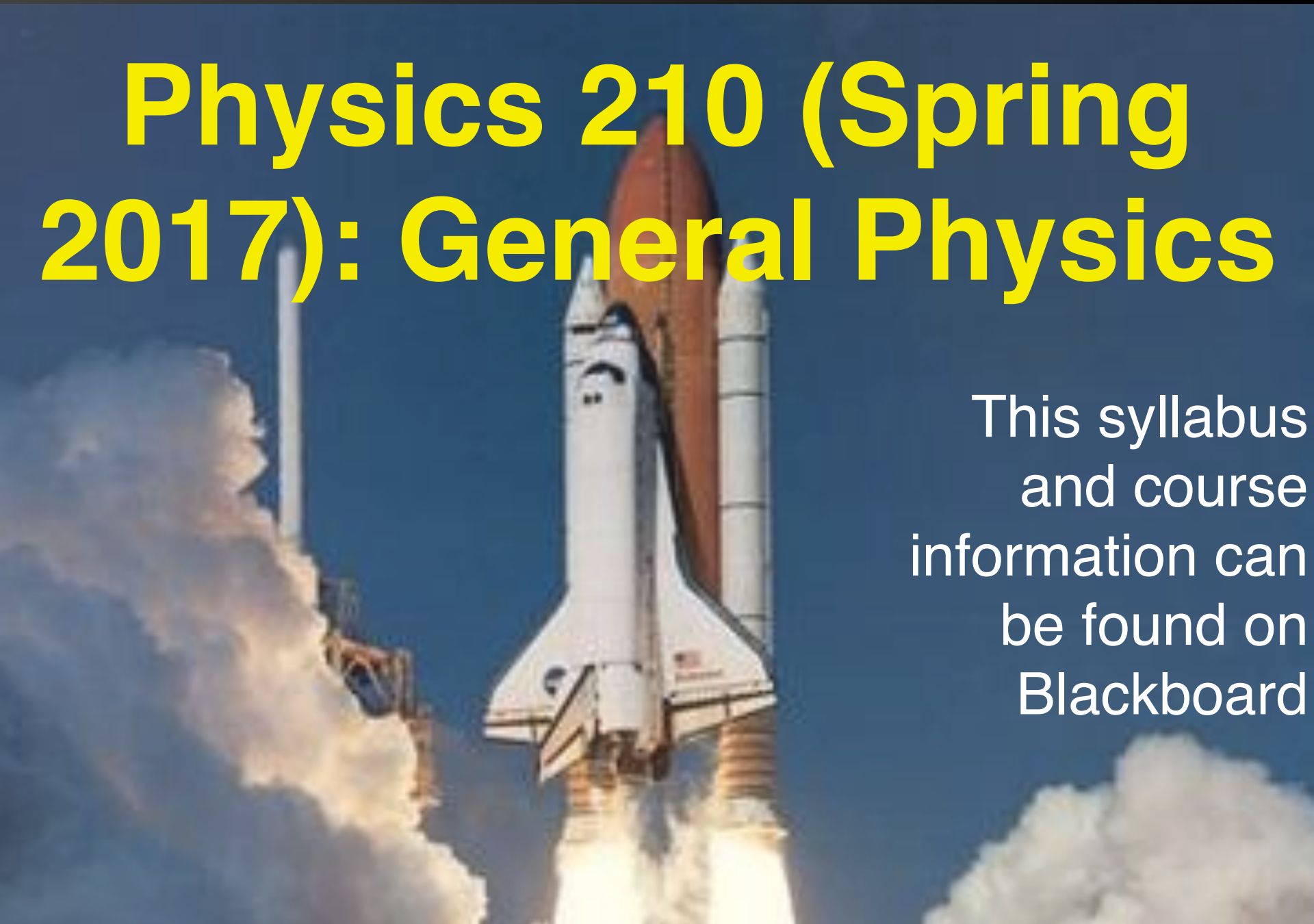
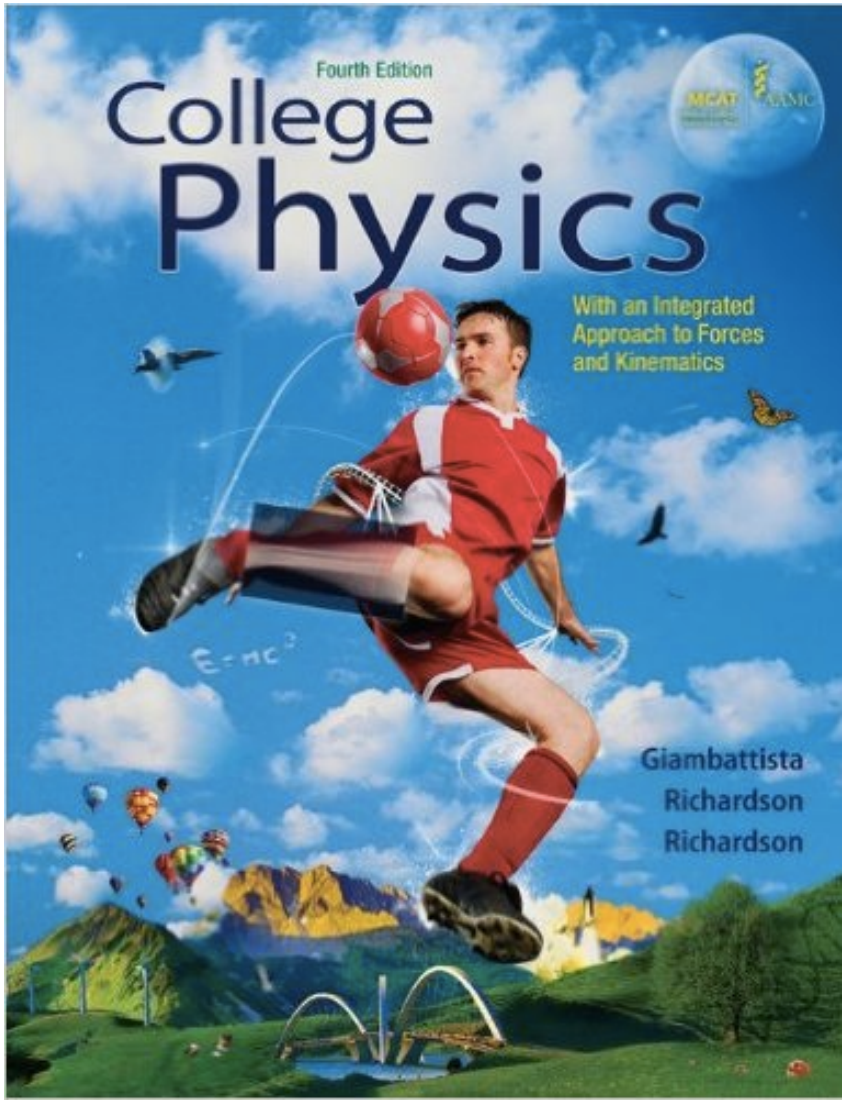
Physics 210 (Spring 2017): General Physics



This syllabus and course information can be found on Blackboard

Some practical information

- Classes Tuesday +Thursday 12:30-1:45 pm Faraday 143
- College Physics (Giambattista, Richardson), 4th edition 2012 is the required textbook
- Math 155 (or equivalent) pre-requisite or Math 229 co-requisite
- We will cover chapters 1-12 this semester



Sections (for lab, all in Faraday 235):

210A: Friday 12-2:50 pm

210B: Friday 9-11:50 am

210C: Wednesday 9-11:50 am

210D: Wednesday 12-2:50 pm

210E: Wednesday 3-5:50 pm

210F: Tuesday 9-11:50 am

General course objectives

Aim for students (that would be you!) to:

1. Develop an understanding of the basic concepts and principles in physics.
2. Develop critical thinking skills and a scientific approach to problem solving.
3. Develop and use mathematical formulations of physical principles.
4. Prepare for the MCAT and other professional exams.

More specific course topics

1. How to talk and problem-solve like a physicist
2. The laws of motion (mechanics!)
3. Conservation laws (more mechanics!)
4. Continuous media (sound and waves and vibrations!)

Delving in to those topics

1. How to talk and problem-solve like a physicist
   i. Use significant figures and orders of magnitude to make estimates of physical quantities
   ii. Apply dimensional analysis to an equation involving units of length, time and mass
   iii. Use graphs and tables to record and read data
   iv. Use addition, subtraction, and scalar multiplication of vectors
   v. Convert vectors between angle/magnitude and component form

Delving in to those topics

2. The laws of motion

i. Give examples of Newton's three laws of motion in physical situations
ii. Identify weight, normal force, tension, static friction and kinetic friction in mechanical problems
iii. Draw a vector force diagram in two dimensions, and convert to component equations
iv. Define position, displacement, velocity and acceleration
v. Use one-dimensional kinematic equations for constant acceleration to solve for an unknown variable
vi. Solve equilibrium and dynamic problems with inclined planes and pulleys
vii. Use kinematic equations in two dimensions to solve for quantities in projectile motion

Delving in to those topics

3. Conservation laws

i. Define angular velocity, angular acceleration & centripetal force
ii. Solve problems of horizontal and vertical circular motion
iii. Give examples of Kepler's laws of planetary motion
iv. Define work, kinetic energy, potential energy, and power and their relationships
v. Solve equilibrium and dynamic problems with a spring
vi. Identify conservative forces in mechanical problems and find the potential energy
vii. Define momentum and impulse
viii. Calculate the center of mass of a system of discrete masses or a simple symmetric object
ix. Apply the conservation of momentum to solve problems of collisions between two objects
x. Define torque, moment of inertia, and angular momentum and the relationship between them
xi. Solve problems involving wheels rolling without slipping
xii. Apply linear and rotational equilibrium conditions to solve statics problems

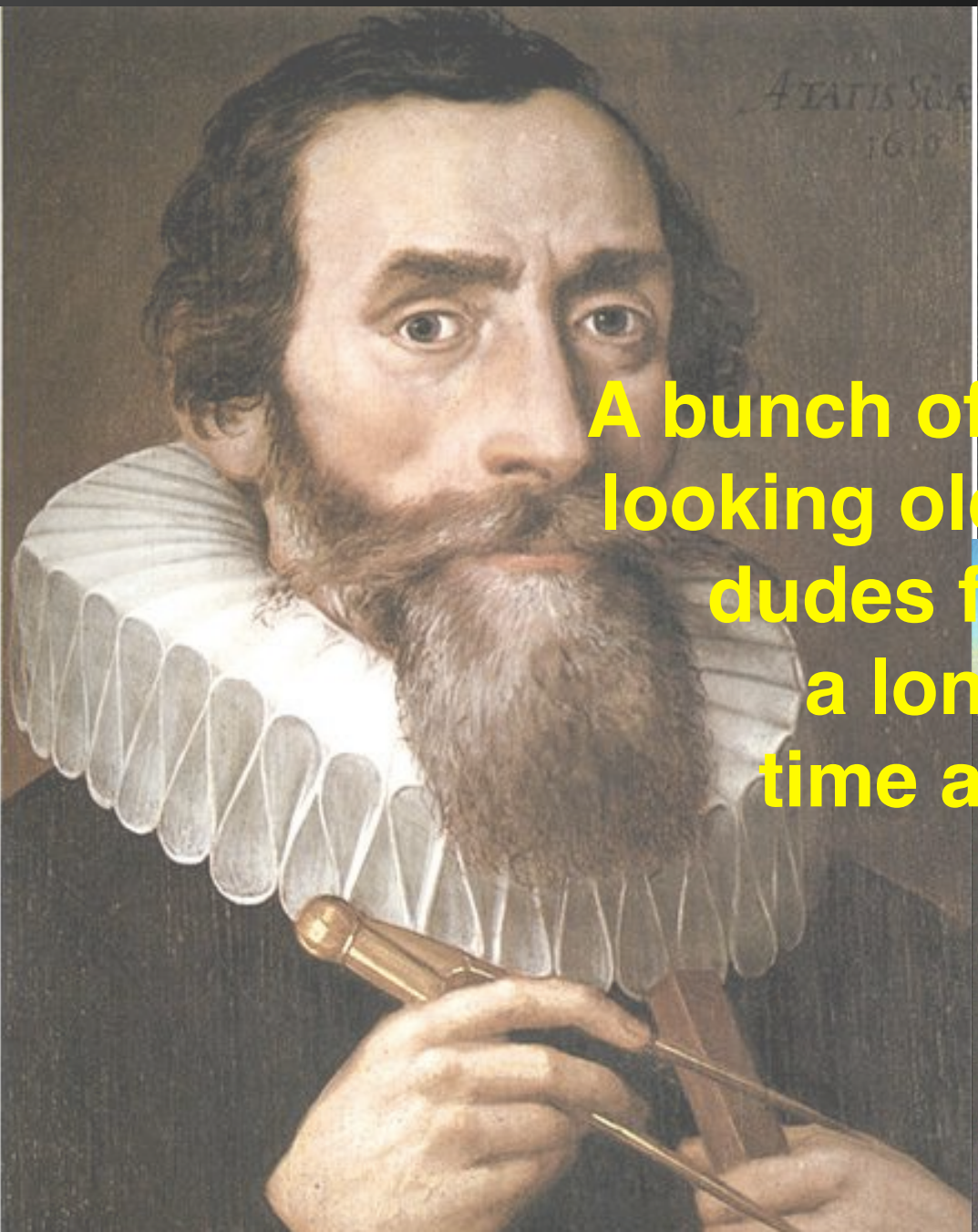
Delving in to those topics

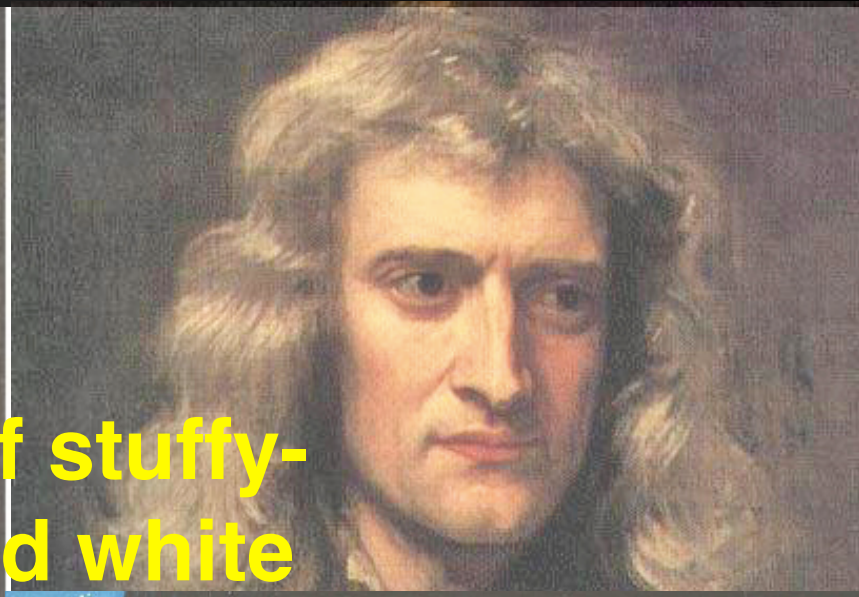
4. Continuous media
   i. Define pressure and density.
   ii. Apply Pascal's principle and Archimedes' principle to problems of static fluids.
   iii. Solve problems of fluid flow.
   iv. Describe the difference between stress and strain and how they apply to deformation.
   v. Give examples of harmonic motion and graph their physical quantities.
   vi. Solve problems of pendulum motion.
   vii. Define amplitude, period, phase, wavenumber, nodes and antinodes for oscillations and waves.
   viii. Describe the principle features of transverse, longitudinal, traveling and standing waves.
   ix. Solve problems of reflecting, refracting, and interfering waves.
   x. Find the speed of a wave from the properties of the medium.
   xi. Apply the principles of waves to sound.
   xii. Solve problems involving the Doppler effect.

Phew!

We'll keep busy this semester :)

Starting out with mechanics - why study this?





A bunch of stuffy-looking old white dudes from a long time ago

Why are we studying this?

- But... classical mechanics underlies all of newer, more modern physics
- The class will teach you key tools necessary for electricity and magnetism in the next course
- The material here also covers relevant physics for our every-day lives!

www.symmetrymagazine.org/article/august-2014/lhc-physicist-takes-on-new-type-of-collisions

Courtesy of EA SPORTS

signal to background

August 21, 2014

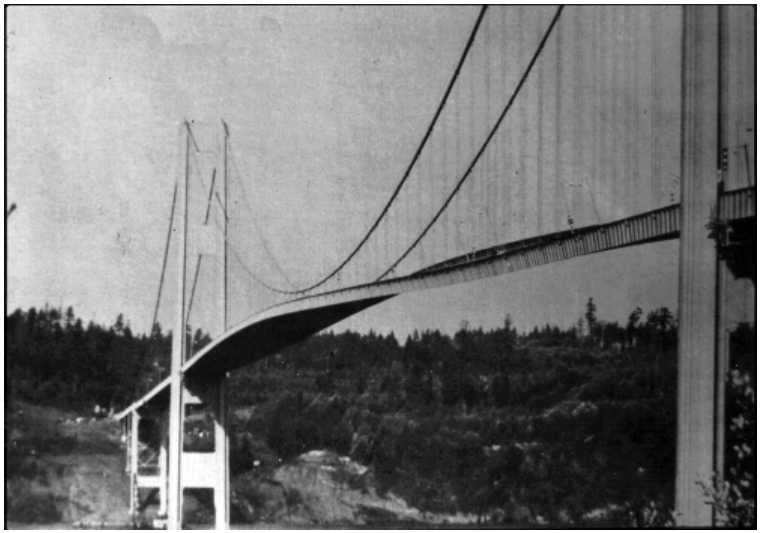
LHC physicist takes on new type of collisions

A former Large Hadron Collider researcher brings his knowledge of high-energy collisions to a new EA SPORTS NHL hockey game.

http://www.symmetrymagazine.org/article/august-2014/lhc-physicist-takes-on-new-type-of-collisions

Sports

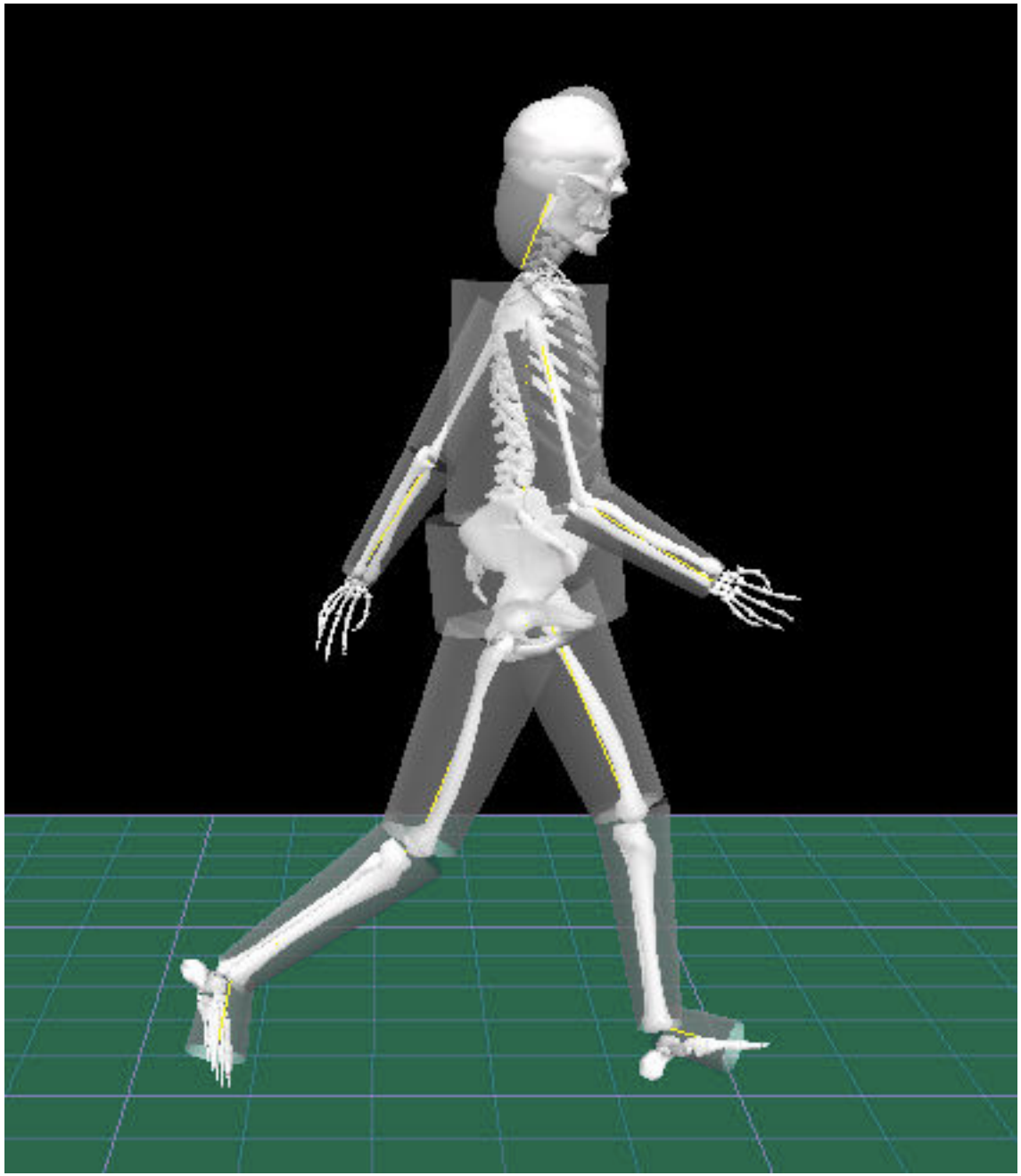
An unfortunate example for the engineers



http://upload.wikimedia.org/wikipedia/commons/1/19/Tacoma_Narrows_Bridge_destruction.ogg

Airplane takeoff

Biomechanics



Some more fun

And then next semester and beyond

Grading

- Problem sets every ~1-2 weeks, each with the same weight: combined total, 10% of grade
  - Sometimes covering 1 chapter, sometimes 2 chapters
- Lab reports and lab work, with schedule and rules posted separately, 25% of grade
- Short online quizzes (**to make you read the appropriate material in advance**!) due before most chapters, 5% of grade. This will allow us to focus on problems, not basic material
  - If you submit **all** the online quizzes by the end of the semester, your will get the full 5% credit (NO exceptions though for any missing ones)
- Tests: **4 per semester (3 + final)**, in class, schedule on syllabus, total of 60% of grade (exam 1: 10%, exam 2: 15%, exam 3: 15%, final: 20%)
  - Except for final, not explicitly cumulative, but you will need to master one set of skills before you will do well on your future exams

On the grading of labs

See lab syllabus - however, two important things to note:

(1) If you do not get a minimum of 60% on your total lab score, you will not be allowed to pass the larger course, even if you get a perfect score on everything else

(2) It is up to you to ensure that your assignments are handed in correctly and received by the TA - when in doubt, email the TA!

On the homework

- Will be using McGraw-Hill Connect, connected to blackboard, for the homework
- You should make sure to sign up and that you can access the homework **AS SOON AS POSSIBLE**
- Let me know if you run into troubles
- MH-Connect can be … finicky. If you think your assignment was not graded correctly, **don't panic**
  - Take a screenshot (showing that it's your work) and come to office hours or send to me by email
  - It is YOUR responsibility to ensure that it is handed in and graded
- Sign up using your NIU student email address to ensure correct synch to blackboard
  - If you still have trouble, contact McGraw-Hill. I can always synch your grades manually every few weeks

On the homework

SIGN UP ASAP

http://connect.mheducation.com/class/j-adelman-spring-2017

On the homework

- All due as on the syllabus
  - I will often but not always announce this in class - it's up to you to stick to the schedule
  - Start the HW early! If you get stuck and need help, please go to the physics help room, ask your lab TAs, or talk to me
  - **NO** late homework will be accepted without penalty
    - Scores reduced by 10% for each day late except last assignment (chapter 11), when late homework not accepted. (No chapter 12 HW)
- It's your responsibility to remember to hit the submit button!

On the homework

- Some of the homework questions will be relatively easier, some of the questions will be relatively harder
  - That is OK! The homework is designed to make you think about the concept that we're using. Not all of it should be easy!
- All homeworks get equal weight (and thus not all homework problems if one week has more problems or fewer problems)

On the quizzes

- These are really meant to take only a small bit of your time and are easier than the homework
- All quizzes get equal weight (same idea as for HW)
- The idea is that you should **read the book** in advance of us covering a chapter or subject
  - This way, I spend less time regurgitating the book and more time going over interesting problems
- If you hand in all the quizzes, you get an automatic 100% for your quiz grade - but no exceptions at all for missing one, and no late quizzes accepted at all

On the exams

- There will absolutely be no make-up tests, and tests cannot be taken at a different time for any reason unless you document this at the beginning of the semester (such as if you are an athlete)
- In the case of convincing and well-documented emergencies the missed test grade may be waived, however, do not assume this is automatic.
  - I need to see some convincing evidence of a valid, good emergency. Faking an emergency is worse than missing an exam, and will be brought to the attention of the appropriate NIU personnel as potential academic misconduct

On electronics

- No electronic devices of any kind allowed allowed during tests
  - Calculators the sole exception during exams (but only a calculator, nothing beyond that), **definitely useful to have, let me know if you do not have one**
  - If you are spotted with your phone or other electric item out during an exam, you fail it
- It's fine to use electronics during the course, as long as it is **not distracting** to me or to other students (if it is, I will ask you to stop)
- You can take a **single** "cheat sheet" of material with you to each exam, but no other paperwork

On electronics

- Cell phones need to stay in your pocket and be turned off during class
  - If your phone rings, we will know it was you. It is distracting and thus unfair to your fellow students
- No texting or using your phone, anyway
  - I reserve the right to take points off of future exams if I spot you breaking this policy, even if only in class and not during the exam

On cheating and plagiarism

- This is a serious subject - just avoid it at all costs!
  - If you are spotted cheating on an exam, appropriate measures will be taken up with the Office of Community Standards and Student Conduct (this is serious, folks!)
  - Plagiarism on lab reports is an equally serious offense. We will be using SafeAssign for your lab reports. This will spot your plagiarism, and you will be held accountable for it

Grading

- I reserve the right to curve the exams to improve grades, but do not consider it as guaranteed, and do not ask for it
- After weighting components as listed previously, the grades will be:
  - A: 90-100%
  - A-: 85-90%
  - B+: 80-85%
  - B: 75-80%
  - B-: 70-75%
  - C+: 65-70%
  - C: 60-65%
  - D: 50-60%
  - F: 50% or less

Office hours

- Office Hours: Faraday 219, Tuesday + Thursday 2-3 pm (right after class!) or by appointment
- Preferred method of communication: email (jahred.adelman@niu.edu)
  - You can always try and stop by, but you will have better luck if you set up an appointment or come during the above times
  - I am not on campus every day

Attendance and class

- You should come to every class (shouldn't need to ask this of you, but I state it anyway)
  - Please avoid food in the classroom as much as possible
  - Bottles and cans of liquid are OK (no straws!) so that we can all stay hydrated, but is otherwise disruptive to me and to others
  - Talk to me privately if this is a problem
- Would prefer that you pay attention in class to what I say instead of trying to write down every single thing on slides (you anyway have the textbook, on which these lectures are based!)

The plan of action: We'll go over a full chapter of material without stopping or hopefully pausing for too many breaths, and when we finish (if there is time left before we have to move on), we'll play with some animations and/or do some extra practice problems on the board. Problems with be from the textbook text, from extra problems in the text, and other non-textbook material

BUT feel free to interrupt to ask questions, either by raising your hand or just shouting out

A word or two (or three) on communication

You should be checking your email and blackboard **at least once per day**

”"I don’t check my email” or “I didn’t see that message on blackboard” are **not** valid excuses

If you have trouble with homework, or with class, or with lab, it’s your responsibility to contact me and/or your lab TAs as far in advance as possible. Informing us early of troubles will do you a lot more good than not informing us or informing us after-the-fact

Tentative schedule

Date	Topics	Sections in book (Approximate)	Homework/quizzes (Due before class)
Jan 17	Introduction+talking physics	1.1-1.3	
Jan 19	Units, dimensional analysis, estimation, recording data	1.4-1.9	
Jan 24	Vectors, vector components,	2.1-2.3	Quiz #1 (Chapter 2)
Jan 26	Yet more vectors + equilibrium	2.3-2.4	
Jan 31	Gravity, constant forces, friction	2.5-2.9	
Feb 2	**EXAM 1 (Chapters 1-2)**		Homework #1 (Chapters 1-2)
Feb 7	Displacement, velocity, acceleration	3.1-3.2	Quiz #2 (Chapter 3)
Feb 9	Mass + motion, net force	3.2-3.3	

Tentative schedule

Date	Topics	Sections in book	Homework/quizzes (Due before class)
Feb 14	More on forces + relative velocity	3.4-3.5	
Feb 16	Constant acceleration, free fall	4.1-4.3	Quiz #3 (Chapter 4)
Feb 21	Apparently weight, projectile motion	4.3-4.5	
Feb 23	**EXAM 2 (Chapters 1-4)**		Homework #2 (Chapters 3-4)
Feb 28	Uniform circular motion, centripetal force	5.1-5.2	Quiz #4 (Chapter 5)
March 2	Curved tracks, satellite motion	5.3-5.4	
March 7	Roller coasters, artificial gravity	5.5-5.7	
March 9	Work, kinetic energy, Potential energy	6.1-6.4	Quiz #5 (Chapter 6)

Tentative schedule

Date	Topics	Sections in book (Approximate)	Homework/quizzes (Due before class)
March 21	Potential energy, gravitational energy, elastic + spring energy, power	6.5-6.8	Homework #3 (Chapter 5)
March 23	Impulse+momentum, momentum conservation, center of mass	7.1-7.5	Quiz #6 (Chapter 7)
March 28	Finding the center of mass, collisions, elastic collisions, rotational inertia	7.6-7.8	Homework #4 (Chapter 6)
March 30	Rotational inertia, torque, statics, rotational motion	8.1-8.6	Quiz #7 (Chapter 8)
April 4	Angular momentum, angular vectors	8.7-8.9	Homework #5 (Chapter 7)
April 6	**EXAM 3 (Chapters 5-8)**		Homework #6 (Chapter 8)
April 11	States of matter, pressure	9.1-9.5	Quiz #8 (Chapter 9)
April 13	Buoyancy, fluid flow, viscosity, terminal velocity	9.6-9.11	

Tentative schedule

Date	Topics	Sections in book (Approximate)	Homework/quizzes (Due before class)
April 18	Stress, strain, material strength	10.1-10.6	Quiz #9 (Chapter 10)
April 20	Harmonic motion, pendulums	10.7-10.10	Homework #7 (Chapter 9)
April 25	Wave motion, harmonic waves	11.1-11.4	Quiz #10 (Chapter 11)
April 27	Reflection, refraction, interference, diffraction	11.5-11.10	Homework #8 (Chapter 10)
May 2	Sound waves, intensity, musical instruments, hearing	12.1-12.6	Quiz #11 (Chapter 12)
May 4	Hearing, Doppler effect, echoes	12.7-12.9	Homework #9 (Chapter 11)
May 11	**Exam 4 during finals (Chapters 1-12), 12 pm - 1:50 pm**		

Disability statement

If you need an accommodation for this class, please contact the Disability Resource Center **as soon as possible**.The DRC coordinates accommodations for students with disabilities. It is located on the 4th floor of the Health Services Building, and can be reached at 815-753-1303 (V) or drc@niu.edu. Also, please contact me privately as soon as possible so we can discuss your accommodations. The sooner you let us know your needs, the sooner we can assist you in achieving your learning goals in this course.

My aim is for you to enjoy this course and to learn the material - please let me work with you so that we can achieve our goals.

About me

- I answer to “Jahred”, “Professor Adelman”, “Professor Jahred”, “Dr Adelman”, “Dr Jahred” and occasionally “Professor Dr. Adelman”, if needed
- But I **may not** answer to “hey you” or to emails that do not have an appropriate greeting (such as “Hello XYZ” or “Greetings, ABC”, etc)

About me

- For those who do not know me, I'm a particle physicist working on searches for new physics with Higgs bosons using the ATLAS experiment at the LHC (at CERN)
  - Ask me after class or during office hours about my research. I like to talk about it :)

About me

- I'll try to update my teaching style as the semester goes on, based on my experience, observations and your feedback
  - If I am going too fast... or too slow, or if my style (or hand-writing) is incomprehensible, please speak up