Welcome!

Faculty

Prof. Steven Hall
Signals and Systems
Course Coordinator

Prof. Ian Waitz
Thermodynamics and Propulsion

Prof. Kristina Lundqvist
Computers and Programming

Faculty

Prof. Mark Spearing
Materials and Structures

Prof. Mark Drela
Fluids

Prof. Charles Coleman
Systems

Faculty

Col. Pete Young
Systems

Your Interests

My interests are:

1. **Definitely in astronautics – my hero is Neil Armstrong, and I plan to be an astronaut**

2. **Mostly in astronautics**

3. **I like both aeronautics and astronautics**

4. **Mostly in aeronautics**

5. **Definitely in aeronautics – my hero is Chuck Yeager, and I plan to be a test pilot**

Structure of Unified

- Two subjects: 16.01, 16.02 (and 16.071!)

- Five disciplines:
  - Fluid Mechanics (F)
  - Material and Structures (M)
  - Thermodynamics and Propulsion (T)
  - Computers and Programming (C)
  - Signals and Systems (S)

- Systems Problems

- Labs

Typical Week

- 7-8 Lectures

- 2 Recitations

- System Problem or Lab Lecture

- Office hours

- Assignments:
  - Problem Set
  - System Problem
  - Quiz

Week 5					Week 6					Week 7				
M	T	W	TH	F	M	T	W	TH	F	M	T	W	TH	F
9/29	9/30	10/1	10/2	10/3	10/6	10/7	10/8	10/9	10/10	10/13	10/14	10/15	10/16	10/17
HW5o	HW4d	S/L5o	S/L4d		HW6o	HW5d	S/L6o	S/L5d			HW7o	S/L7o	S/L6d	
											HW6d			

	M	T	W	TH	F	M	T	W	TH	F	M	T	W	TH	F
9–10	C	S	C	T	QT	C	S	C	C	S		M	M	C	QC
10–11	S	C	S	S	T	S	U	M	U	M		S	S	M	C
11-12		S		T			S		C			M		C	
1–2				S/L					S/L					S/L	

Recitation Preference

My preference for recitation times are:

1. 9 am. I have a verifiable conflict at 11 am.

2. 9 am. I could attend the 11 am session if needed.

3. I have no strong preference.

4. 11 am. I could attend the 9 am session if needed.

5. 11 am. I have a verifiable conflict at 9 am.

Staff Roles

- Faculty:
  - Set policy
  - Lectures
  - Recitations
  - Develop Homework, Quizzes, Systems Problems
  - Grade quizzes

- Graduate TAs:
  - Manage grading
  - Help grade quizzes
  - Office hours
  - Manage web page

- Undergraduate TAs:
  - Grade homework
  - Help in office hours
  - Help run labs
  - Help in office hours
  - Provide tutoring

Resources

- Course Facts
- Syllabi
- Learning objectives
- Class notes

- Textbooks
  - Buy textbooks at Quantum Books (Kendall Square).

Grades

- **Grades are based on:**
  - **Quizzes (60%)**
  - **Homework (30%)**
  - **Participation (10%)**

- **Grades are based on MIT definition of grades, not a curve**

- **For every assignment, we publish the middle "B" grade**

Academic Honesty

- **Please read Course Facts carefully**

- **Our guidelines allow collaboration (but not copying) on homework, so long as appropriate attribution is given.**

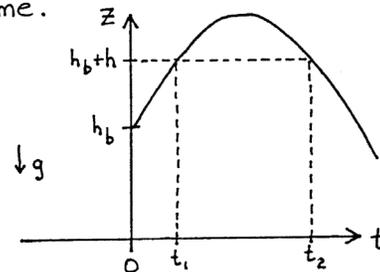- **Academic dishonesty is a serious breach of our rules, and will be treated as such.**

Quiz Policy

- All absences from Quizzes must be excused *prior* to the quiz, by the course coordinator.

- There are no make-up quizzes for unexcused absences.

Sample Homework

Homero Gutierrez | Problem 1.1 A | September 9, 1994

The plot below shows the height of the rocket as a function of time.

Let h_b = height at burnout

before burnout (path unknown)

after burnout (rocket in free fall)

Because of symmetry, the rocket reaches its maximum height at time $t = \frac{1}{2}(t_1 + t_2)$. The only acceleration experienced by the rocket during the free fall phase is that due to gravity, which is directed downward.

@ $t = 0$, $v = v_0$

@ $t = \frac{1}{2}(t_1 + t_2)$, $v = 0$

The acceleration, therefore, is

$$a = \frac{\Delta v}{\Delta t} = \frac{0 - v_0}{\frac{1}{2}(t_1 + t_2) - 0} = \frac{-v_0}{\frac{1}{2}(t_1 + t_2)}$$

But this must equal $-g$.

$$\frac{-v_0}{\frac{1}{2}(t_1 + t_2)} = -g$$

$$\Rightarrow \boxed{v_0 = \frac{1}{2}g(t_1 + t_2)}$$

Exploratory Subject

- **For now, don't declare Unified to be an "exploratory subject."**

- **We will make an announcement before Add Date regarding Unified as an exploratory subject.**

Active Learning

- What is Active Learning?
  - Teaching techniques that stress students' active involvement in their own learning
  - ". . . interactive engagement of students in heads-on (always) and hands-on (usually) activities which yield immediate feedback through discussions with peers and/or instructors." (Hake)

- Why active learning?
  - Increased gain in understanding
  - Provides more feedback to instructors
  - More motivating to students
  - Accommodates different learning styles

Active Learning Methods

- Cooperative activities
  - Opening organizing discussion
  - Concept Tests
  - Turn-to-your-partner discussions
  - In class demo
  - etc.

- Individual activities
  - Cold calling
  - Reading quiz at the beginning of the lecture
  - Pop quiz on material
  - Muddiest part of the lecture
 - etc.

Concept Tests

- **Part of *Peer Instruction* approach advocated by Mazur**

- **Questions are**
  - **Conceptual**
  - **Multiple choice**
  - **Brief (~1 minute)**
  - **Designed to surface misconceptions**

- **Use flashcards or PRS (personal response system) to determine class response**

- **Benefits**
  - **Confidential**
  - **Simultaneous**
 - **Provides continual feedback to both students and teacher**

Effectiveness of Peer Instruction

- **Data taken over a number of years generally show that Peer Instruction results in a better learning outcome**
  - **Equal or better performance on "conventional" problems**
  - **Better performance on conceptual problems**

Effectiveness of Peer Instruction
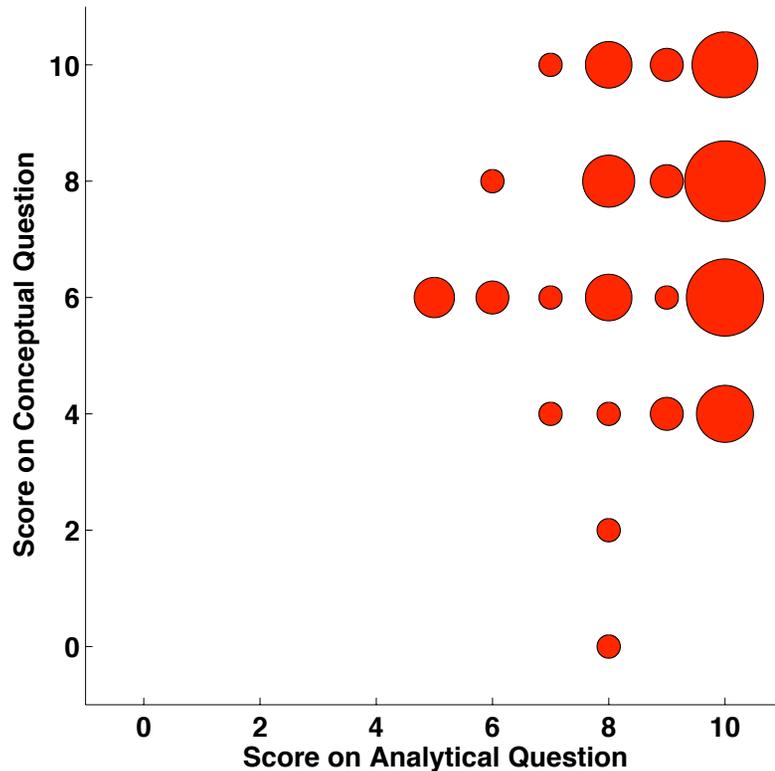
Results after lecture with effective concept test
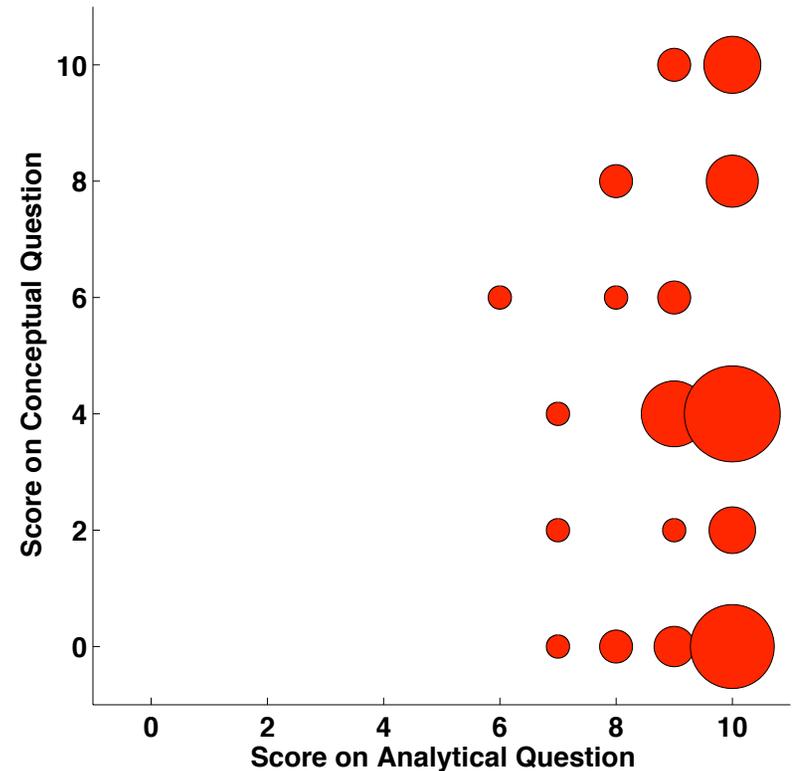
Results after lecture with ineffective concept test

Educational outcome can depend critically on a single lecture

Muddiest Part of the Lecture

- Procedure:
  - Decide on question (e.g., "What was most confusing concept?" "What was most important concept?")
  - Allow time at end of lecture for students to write responses
  - Collect responses
  - Respond at next class or through some other mechanism

- Benefits:
  - Gives instant feedback to instructor
  - Allows corrective action early
  - Allows reflective time for students
  - More effective than "are there any questions?"

Due to Mosteller, 1989

What can you expect from us?

- **Commitment to effective teaching**

- **Technical excellence**

- **Highest professional standards**

- **Intensive engagement with you in the teaching-learning process**

- **Trust and mutual respect**

What do we expect from you?

- ☐ Commitment to learning

- ☐ Achievement of learning objectives

- ☐ Highest professional standards

- ☐ Feedback – what works, what doesn't work

- ☐ Trust and mutual respect

What can you expect from Unified?

- Expect to be challenged

- Expect to work hard

- Expect to learn a lot

- Expect to have fun

How to do well in Unified

- Come to class (awake!)

- Participate in the learning process

- Manage your time well

- Work smart

- Read ahead

- Get enough sleep

Welcome!