Physics 207, Sections: 301/601 – 309/609
General Physics I, Michael Winokur

Agenda for Today

- Course Introduction
  - General Announcements
  - Structure of the course
  - Scope of the course
  - Begin chapter 1

Course Homepage:
http://www.physics.wisc.edu/undergrads/courses/spring10/207/

General Announcements

- Assignments:
  - Text: Randall Knight, Physics for Scientists and Engineers with Modern Physics
  - Reading Assignment: Chapters 1 & 2 (sections 2.1-2.4)
    - Position, Time, Change (i.e. motion), Vectors, Units, Assessment
  - HW1: Due Wednesday 1/27 at midnight (Also Mastering Physics Practice Problem Set )
    - See www.masteringphysics.com
  - Register for a Mastering Physics Account
    - Instructions are posted:
      - http://www.physics.wisc.edu/undergrads/courses/spring10/207/HW.htm

Homework will usually be due by midnight on Wednesday with a 1% per hour penalty (up to 50% maximum)
Announcements, cont’d

- **Labs**
  - [http://www.physics.wisc.edu/undergrads/courses/spring10/207/labs.htm](http://www.physics.wisc.edu/undergrads/courses/spring10/207/labs.htm)
  - Located in room 4310 Chamberlin Hall
  - Begin on Monday of next week (Expt. 1a & c)
  - Few formal write-ups, mostly worksheets

- **Lectures:** (the PowerPoint component) will be posted at the course website

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Announcements, cont’d

- **Honors students:** One Friday seminar per week (including exams weeks, may miss up to three.) More on Friday

- **Drop in tutoring:** In room 2131 Chamberlain (shared with Physics 201, start next week), See:
  - [http://www.physics.wisc.edu/undergrads/courses/spring10/207/consult.htm](http://www.physics.wisc.edu/undergrads/courses/spring10/207/consult.htm)

- **Discussion Sections:** Start today, one session will center on group problems (Th/Fr) and one on homework/exam (Tu/We) review.
Grading

- **Several components:**
  - **Lecture:** Occasional reading quizzes
  - **Homework Sets** (15%)
  - **Exams:**
    - Three evening midterms (16%) and a final (22%)
  - **Discussion section:** (5%)
    - Review homework, at most one day per week
    - Cooperative learning exercises
  - **Labs:** (10%)
    - Mostly worksheets (up to one formal write up)
    - May miss up to one lab (only with a valid excuse)

Lecture

- **Three main components:**
  - Discussion class material
    - Selected topics from text
  - Demonstrations of physical phenomenon
    - Physics is an experimental science
    - Example: Ping-pong ball bazooka
  - Interactive exercise with conceptual “Active Learning” problems
    - Critical thinking and problem solving
    - (Almost no memorization required)
A quick “quiz” on what not to do…

- Please read and study the following paragraph for a minute or so.

“Last Fernday, George and Tony were in Donlon peppering gloopy saples and cleaming, burly greps. Suddenly, a ditty strezzle boofed into George’s grep. Tony blaired, “Oh George, that ditty strezzle is boofing your grep!”

- After reading and studying the paragraph, and without referring to the paragraph, please answer the following questions:

A quick “quiz” on what not to do…

- 1. When were George and Tony in Donlon?
- 2. What did the ditty strezzle do to George’s grep?
- 3. What kind of saples did George and Tony pepper?
- 4. What was Tony’s reaction?
- 5. What do you imagine happened next?
- 6. Based on the incidents in this story, do you think George and Tony will want to return to Donlon? Why or why not?
Course Objectives

- To begin to understand basic principles (e.g. Newton’s Laws) and their consequences (e.g. conservation of momentum, etc.)

- To solve problems using both quantitative and qualitative applications of these physical principles

- To develop an intuition of the physical world

Again: Memorization is of little importance

Scope of Physics 207

- **Classical Mechanics:**
  - **Mechanics:** How and why things work.
    - Motion (dynamics), balance (statics), energy, vibrations
  - **Classical:**
    - Not too fast \( (v \ll c), c \approx \text{speed of light} \)
    - Not too small \( (d \gg \text{atom}), \text{atoms} \approx 10^{-9} \text{ m} \)

- Most everyday situations can be described in these terms.
  - Path of baseball (or a ping pong ball)
  - Path of rubber ball bouncing against a wall
  - Vibrations of an elastic string (Vibration Demo) (These reflect Newton’s Laws and forces)
  - Properties of matter; a roll of the dice (Thermodynamics)
Today and Thursday’s Topics:

- Position and Time (Chapter 1)
  - Position
  - Time
  - Displacement versus time (velocity)
  - Systems of units
  - Dimensional Analysis
  - Significant digits

- At right is the world’s smallest biped: A single molecule of kinesin, walks along a cellular microtubule fiber, pulling along behind it a vesicle of nutrients

http://www.ted.com/index.php/talks/sheila_patek_clocks_the_fastest_animals.html

Chapter 1 Objectives

- Understand particle one-dimensional motion
- Use motion diagrams
- Distinguish position, velocity & acceleration
- Gain experience with vector algebra
- Understand proper use of significant figures
- Understand position vs. time graphs
Position and Time

• An example below:

Question: What is happening in the two time elapse sequences shown below?

What construction could I use to quantify it?

Random facts about the cardiovascular system

• 15 million blood cells are produced and destroyed every second

• 60,000 miles of blood vessels in our bodies

• Red blood cells live 120 days

• Smallest cross-section: 30 micron diameter capillary

• Largest cross-section: 1 inch diameter (i.e., aorta)
A preliminary step

- Predicated on the need to know where and when?
- Where requires a spatial reference frame and a system specifying position (magnitude, direction and units)
- When requires a temporal reference frame (magnitude, direction and units)

A particle representation
Different representations

<table>
<thead>
<tr>
<th>time (sec)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>x (meters)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Pictorial

Graphical

Algebraic

\[ x = t \cdot (1 \text{ meter/sec}) \]

A slightly more complicated example

<table>
<thead>
<tr>
<th>time (sec)</th>
<th>1</th>
<th>2</th>
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<td>x (meters)</td>
<td></td>
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</tbody>
</table>

Pictorial

Graphical

Algebraic

\[ x = x_0 + v_0 \ t + \frac{1}{2} a t^2 \]
**Standard Quantities**

- Basic elements of substances and motion.
- All things in classical mechanics can be expressed in terms of the fundamental quantities:
  - Length \( L \)
  - Mass \( M \)
  - Time \( T \)

- Some examples of more complicated quantities:
  - Speed has the quantity of \( L / T \) (i.e. miles per hour)
  - Acceleration has the quantity of \( L/T^2 \) (Chapter 2)
  - Force has the quantity of \( ML / T^2 \) (Chapter 4)

**Units**

- **SI (Système International) Units:**
  - mks: \( L = \) meters (m), \( M = \) kilograms (kg), \( T = \) seconds (s)

- **British Units:**
  - \( L = \) inches, feet, miles, \( M = \) slugs (pounds), \( T = \) seconds

- We will use mostly SI units, but you may run across some problems using British units. You should know how to convert back & forth.

- Ask yourself, why do units matter?
Recap

• For Thursday’s class
  » Start Homework, Mastering Physics
  » Read Chapters 1 & 2 (through section 2.4)