Welcome to Physics 221

Phy 221 2006S Lecture 1

Lecture 1: Goals

• Explain key points of Syllabus.
• Introduce Units used to express physical quantities.
• Introduce key vector concepts.

Syllabus: Basic Info

• Where do you have to go
  - The Lectures: MWF 8-8:50 9-9:50 10-10:50
  - The Recitations
    - Day: Tuesday at various times and alternate Thursdays: see syllabus
    - Evening: Your instructor will explain the schedule at first meeting
  - The Lab: Every other week
    - no lab first week
  - The Lecturers
    - David Atwood 9-9:50 10-10:50 atwood@iastate.edu
      - Office hours Monday and Wednesday 3-4pm or by appointment
    - Paula Herrera-Siklody 8-8:50 siklody@iastate.edu
      - Office hours Wednesday 9:10am or by appointment
  - Web Page: http://www.public.iastate.edu/~atwood/phy221.html

Evening Exams

• This Course has 2 hour Evening midterm Exams
  - Thursday February 16 8:00pm-10:00pm
  - Thursday March 30 8:00pm-10:00pm
• You need to appear at these times at room assignments TBA
• If you have some problem with these times you need to discuss the issue with Dr. Atwood.
• One makeup midterm at time TBA during dead week.
• You may write the midterm if miss a midterm. Provided you have obtain approval from Dr. Atwood.
• Inform Dr. Atwood ASAP when you miss a midterm.
  - If you missed a midterm because of illness, inform Dr. Atwood the day of the midterm or the day after
  - If you know in advance you need to miss a midterm, inform Dr. Atwood in advance
• Exam Aids: On the midterm and final exams you can use the following aids:
  - A calculator
  - An "Aid Sheet"- a single 8½ × 11 page of notes (can write on both sides)

WebCT

• This course extensively uses WebCT for:
  - Some assignments:
    - Homework due Thursday
    - Preflights due MWF both at 8am.
  - View your grades
  - Communication: Solutions; discussions; slides
• All students are required to use WebCT
• Your ISU NetID and Password allows access to WebCT
• You should be able to log in within 2 days of registration in the course.
• Please check login this week (see web page for details) and do non-graded sample quiz titled "do this quiz first"
• If you are not registered on WebCT, eg due to enrolment trouble or any other reason, send Dr. Atwood an email with your ISU NetID, Section# and Lab# (if known). He will put you in by hand.
  (atwood@iastate.edu)

Goals of Course

Conceptual Understanding: More than just learning a few equations
• ACTs
• Recitation activities
• Problems

- Introduction to Classical Physics
  - The laws of Motion
  - Working with Laws of motion
  - Conservation Laws
  - Some Forces of Nature
  - Gravitation
  - Electric Force
  - Application to Electrical circuits

Key Scientific and Engineering Skills
• Problem Solving
• Scientific Communication
Assignments

- **Reading Assignments:** Do them
- **Course:**
  - To help you with the reading assignments, there is a short "preflight" due at 8am on lecture days starting with Lecture 3 (Jan 13). Preflights for lectures 3-5 are ungraded. For prefights you have only one try.
  - Each Thursday starting Jan 12 there is a longer WebCT homework assignment. The Jan 12 assignment is ungraded.
  - Each Tuesday starting Jan 17 there is a written assignment due to your recitation instructor at the beginning of recitation. Assignments are posted on WebCT two weeks before due date.
  - On Tuesday recitations starting Jan 17 there is a 20 min quiz.
  - On Thursday recitations there is a "Group Problem Solving" exercise.
- **Lab**
  - The prelab in your lab manual is due to your lab instructor before the lab.
  - Your lab instructor will send you away if you don't have your prelab.
  - Exception: for first lab fill out "prelab 0" and hand it in to your instructor
  - The first lab has a post-lab exercise instead of a prelab exercise.
  - Therefore for the second lab you need to bring the prelab for that lab and the post-lab for the first lab.
- **Lab Report**
  - To be handed in at the end of the lab period

Lab Waiver

- If you are repeating this course but have previously successfully completed the lab portion I suggest you

Get a Lab Waiver

- This will exempt you from having to do the labs this time around.
- Forms are available from Deb Schmidt in Physics Room 12.
- Please double check a few weeks later to ensure that your lab waiver is approved.

Grading

<table>
<thead>
<tr>
<th>Item</th>
<th>Normal</th>
<th>Lab Waiver</th>
<th>Grading Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Exam</td>
<td>270</td>
<td>270</td>
<td>&gt;800 &gt;A-</td>
</tr>
<tr>
<td>2 Midterms</td>
<td>370</td>
<td>370</td>
<td>&gt;700 &gt;B-</td>
</tr>
<tr>
<td>WebCT Homework</td>
<td>40</td>
<td>55</td>
<td>&gt;500 &gt;C-</td>
</tr>
<tr>
<td>Preflights</td>
<td>40</td>
<td>55</td>
<td>&gt;500 &gt;D-</td>
</tr>
<tr>
<td>Recitation Quizzes</td>
<td>50</td>
<td>90</td>
<td>&lt;500 F</td>
</tr>
<tr>
<td>Written Homework</td>
<td>70</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Group Problems</td>
<td>30</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Labs</td>
<td>70</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
</tbody>
</table>

![Grading Scale](image)

Basic Letter Grade Thresholds:

<table>
<thead>
<tr>
<th></th>
<th>F</th>
<th>D-</th>
<th>C-</th>
<th>B-</th>
<th>A-</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Score</strong></td>
<td>400</td>
<td>500</td>
<td>600</td>
<td>700</td>
<td>800</td>
</tr>
</tbody>
</table>

Notes:
- Grading is absolute (except for a small per TA adjustment of Written assignments, quizzes, and labs).
- We will not raise the grade thresholds but may lower them if necessary.
- About 16% of final exam consists of lab questions. All students, even those with lab waivers, are responsible for doing these questions.
- Please frequently check your grades for accuracy. In particular during Week 9 double check grades for assignments due before Feb. 24. After Week 9 those grades will be locked in. Likewise during week 15 double check grades for assignments due before April 14.

Regardless of your grade, you will fail if...

- Any laboratory has not been satisfactorily completed (see lab sheet handed out first recitation)
- The student has engaged in any form of academic dishonesty.

Assistance

- The Help Room located in room B54.
  - Starts operation Jan. 18 at 9am.
  - Schedule posted on door and on WebCT.
  - To get more attention, go there during offpeak hours.
- Useful Material and announcements will be posted on WebCT.
  - There is also a Discussion Board.
- Supplemental Instruction will be available and announced when organized.
- The Dean of Students Office: Academic Success Center
  - [http://www.dso.iastate.edu/dept/asc/tutoring.htm](http://www.dso.iastate.edu/dept/asc/tutoring.htm)
  - matches students or groups of students with advanced students for tutoring at a modest fee.
Miscellaneous

- Students with SAAR forms need to file them with Dr. Atwood during the first two weeks of class or as soon as possible after the form is issued.
- The "University Physics, Student Solutions Manual" contains solutions to some of the back of chapter problems. Working through problems is an excellent method to study. On WebCT I list a number of additional sources of problems that you might find useful.

Units

- In physics we need to describe the real world so a system of units is required.
- Scientists and engineers around the world use the SI system.
- The metric system based on SI is used for conventional measures in all countries aside from the USA.

This is the system we will use in this course.

Basis Units

- Three basic units of SI with English system equivalents are the following (four others are also defined):
  - Length: The meter (1 m = 3.281 ft)
  - Mass: The kilogram (1kg = 0.06585 lb)
  - Time: The second (same as English system)
- Some other kinds of units can be expanded as products or ratios of these units. For example:
  - Unit of speed m/s
  - The 'derived' unit for force (Newton) is 1N = 1 kg m/s²
  - Additional abbreviations are sometimes introduced as a short form for combinations of basic units, for example the Newton (N) above.

Multiples of Units

<table>
<thead>
<tr>
<th>Power of 10</th>
<th>Prefix Symbol</th>
<th>Formal conversion of units:</th>
</tr>
</thead>
<tbody>
<tr>
<td>10^24</td>
<td>Yotta-</td>
<td>Multiply by the appropriate representation of 1 to cancel the unwanted units away:</td>
</tr>
<tr>
<td>10^21</td>
<td>Zetta-</td>
<td>-eg. convert 10 mi/hr into m/s</td>
</tr>
<tr>
<td>10^18</td>
<td>Exa-</td>
<td>10 mi/1 hr = 10 (mi/1 hr) * (1609m/1mi)</td>
</tr>
<tr>
<td>10^15</td>
<td>Peta-</td>
<td>= (1609 m)/(3600s)</td>
</tr>
<tr>
<td>10^12</td>
<td>Tera-</td>
<td>s / hr</td>
</tr>
<tr>
<td>10^9</td>
<td>Giga-</td>
<td>eg. 1 kilometer = 1km = (1000m) / (1000m)</td>
</tr>
<tr>
<td>10^6</td>
<td>Mega-</td>
<td>1m</td>
</tr>
<tr>
<td>10^3</td>
<td>Kilo-</td>
<td>1m</td>
</tr>
<tr>
<td>10^-2</td>
<td>Centi-</td>
<td>1m</td>
</tr>
<tr>
<td>10^-3</td>
<td>Milli-</td>
<td>1m</td>
</tr>
<tr>
<td>10^-6</td>
<td>Micro-</td>
<td>1m</td>
</tr>
<tr>
<td>10^-9</td>
<td>Nano-</td>
<td>1m</td>
</tr>
<tr>
<td>10^-12</td>
<td>Pico-</td>
<td>1m</td>
</tr>
<tr>
<td>10^-15</td>
<td>Femto-</td>
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<tr>
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<td>Atto-</td>
<td>1m</td>
</tr>
<tr>
<td>10^-21</td>
<td>Zepto-</td>
<td>1m</td>
</tr>
<tr>
<td>10^-24</td>
<td>Yocto-</td>
<td>1m</td>
</tr>
</tbody>
</table>

Consistency of Equations

- If A=B then A and B must have the same combination of units (dimensionality).

  - For example
    \[(\text{distance}) = (\text{speed})(\text{time})\]
    \[\left[ \text{m} \right] = \left[ \left( \text{m} / \text{s} \right) \right] \left[ \text{s} \right] \]

  - The famous equation
    \[E=mc^2\]
    \[\left( \text{kg} \right) \left[ \text{m} \right] \left[ \text{s} \right] \]
    \[\left( \text{kg} \right) \left( \text{m} \right) \]
Location in Space

- To locate an object in space we need to establish a coordinate system with an origin and axes.
- Points are located by giving their x and y (and z) coordinates.

A vector describes a displacement or from one point to another.
The components of the vector describe the displacement in the x and y direction.
Two vectors are parallel if they describe the same displacement even if that displacement begins at different points.

Vector Addition

Geometrically: Parallel transport the tail of B to the head of A. The sum goes from the tail of A to the head of B.

Note: This construction only works if head of A is at the tail of B. Otherwise you need to move B to make that true

Algebraically: Add the components

Vector addition is commutative and associative