Physics 231 Lecture 1

- Instructor: Bill Lynch
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  - 333-6319, W106 Cyclotron
  - Off. Hrs 9:10-10:10 1248 BPS
- Required materials:
  - Text: Serway, Faughn (MSU Ed. Or Ed. 6)
  - Clickers for class participation and quizzes
- Physics learning center (help room): BPS #1248.
  - Staffing schedule on Phys. 231 home page.
  - If you want to see where it is, just follow me at the end of the lecture.
- Class calendar provides approximate guide to course. More detailed information provided during the lectures.
- Course grade is based on homework, three midterm exams and a final exam.
  - Each midterm (20 pts)
  - Final (30 pts)
  - Homework (10 pts)
  - Maximum points (100 pts)
- There are possibilities for extra credit:
  - Extra questions will be added to the final. If they are answered correctly, the points will be added to your total score.
  - Up to five points will be given for in-class quizzes.
- There will be no makeup opportunities for quizzes.
  - We drop 30% of the possible quiz points. If you get 70% of the possible quiz score, you will get the 5 extra credit points.
- Grade scale: minimum score (pts)
  - 4.0 92
  - 3.5 84
  - 3.0 76
  - 2.5 68
  - 2.0 60
  - 1.5 52
  - 1.0 44

- All midterms are counted in the score (no dropping of lowest score).
- Make-up exams will be given after each exam, but students need to obtain permission BEFORE the normal exam to take make-up.

- Exams are closed book, closed notes. No Cell Phones.
- We provide a formula sheet.
- Mid-term exams can be corrected by logging onto LON-CAPA. Corrections due at 11 pm on the first Tuesday following the exam.
- Homework is to be done using LON-CAPA and is due at 11 pm on Tuesday evenings.
  - No extensions of 11 pm deadline, network failure notwithstanding. – Don’t wait until the last minute.
  - Being out of town away from a computer is not a valid excuse.
Chapter 1:

- Main points:
  - Use SI units:
    - Mass: kilograms (kg)
    - Length: meters (m)
    - Time: seconds (s)
  - Units and unit conversions.
  - Use of dimensional or unit analysis to check answers.
  - Significant digits

- Basic units and dimensions:

<table>
<thead>
<tr>
<th>dimension</th>
<th>symbol</th>
<th>English unit</th>
<th>SI</th>
<th>conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>[L]</td>
<td>Inch (in)</td>
<td>Meter (m)</td>
<td>39.37 in/m</td>
</tr>
<tr>
<td>Time</td>
<td>[T]</td>
<td>Second (s)</td>
<td>Second (s)</td>
<td></td>
</tr>
</tbody>
</table>
Example 1:
- Mary is 66 inches high. What is her height in meters?

\[ \text{Ans.} \]
\[
66 \text{ in} = 66 \text{ in} \left( \frac{1 \text{ m}}{39.37 \text{ in}} \right) = 1.68 \text{ m}
\]

Note: we can check by cancelling out the units in dimensions, 66 in, 1 m are all lengths \([L]\), equation becomes (in dimensions)
\[
[L] = [L] \left( \frac{[L]}{[L]} \right)
\]
\[\Rightarrow\] can check dimensions in the same manner.
Example 2:

- John’s room measures 9 ft by 12 ft. What is the area of his room in m$^2$?

\[
L = 12 \text{ ft} \\
W = 9 \text{ ft}
\]

\[
A = L \cdot W = (12 \text{ ft})(9 \text{ ft}) \cdot \left( \frac{12 \text{ inches}}{1 \text{ ft}} \right)^2 \left( \frac{1 \text{ m}}{39.37 \text{ in}} \right)^2
\]

\[
= 10. \text{ m}^2
\]
Significant digits:

- We usually need to know how accurate some value is. A convenient shorthand is to keep only the number of *significant figures* for which the value is certain.
- Example 3:
  - Harold knows that the distance from his house to the road is more than 12 meters but less than 14. To appropriate number of significant figures, what is this distance?
  - Answer: 13 m.

- Example 4:
  - Bertha knows that the distance from floor to the top of her kitchen table is somewhere between 75 and 85 cm. To appropriate number of significant figures, what is this distance?
  - Answer: $8.1 \times 10^1$ cm or .8 m. 80 is the *wrong answer* because it implies that the distance is accurate to 1 cm. Another form of correct answer would be $80 \pm 5$ cm,. It is better but it provides more information than the question asks.
Consistency in significant figures

- When multiplying numbers, the number of significant figures in the final answer should equal the number of significant digits in the least accurate number:
- Example:
  - \((4.2)(3.03)=?\)
- \((4.2)(3.03)= 12.726\): To the correct significant figures: answer=13.
- What is the circumference of a circle of radius 0.05 m?
Consistency in significant figures

• When multiplying numbers, the number of significant figures in the final answer should equal the number of significant digits in the least accurate number:
  • Example:
    – \((4.2)(3.03) = ?\)
  • \((4.2)(3.03) = 12.726\): To the correct significant figures: \(\text{answer} = 13\).
  • What is the circumference of a circle of radius 0.05 m?

[Diagram of a circle with radius labeled as \(r = 0.05 \text{ m}\)]

\[
C = 2\pi r
\]

\[= 0.3141592 \text{ m}
\]

\[= 0.3 \text{ m}
\]

• When adding numbers, the number of decimal places in the sum should match the smallest number of decimal places of all terms.
  – Example \(113.2 + 2.54 = ?\)
  • Answer \(= 115.7\). (115.74 is not correct.)