Physics 3306

Provides an introduction to a wide variety of topics in classical (pre-quantum) physics as a bridge to prepare students for subsequent upper-level courses in physics. The topics covered include thermodynamics, fluid mechanics, mechanical waves, optics, radiation, electromagnetic phenomena, atoms, and laboratory techniques. Prerequisites: C- or better in PHYS 1106; and in PHYS 1304 or PHYS 1308.

Saptaparna Bhattacharya

February 12th, 2025

A few announcements

- I have created assignments on Canvas
- Did people have trouble interacting with them?
- From now on we will exclusively use Canvas
- You can convert the jupyter-notebook to PDF

PDF conversion works

Lab_1

February 6, 2025

1 Write your name, section, and today's date in the cell below:

- Name -
- Section -
- Date -

2 Synopsis

1. To learn:

- Instruments to measure time, mass and length,
- Physics in instruments beyond hand tools.

2. To do:

- Use the provided hand tools to measure time, mass (weight) and length,
- Research tools that measure nano meter or mass of atoms.

Safety

- I have placed bandaids here at the desk — use them as you see fit
- If you are injured or a classmate is injured, immediately call SMU emergency: 214-768-3333
  - This number is for a life threatening situation
  - For non-life threatening situations, call 214-768-2277
- In general, the SMU webpage on emergencies is very thorough: https://www.smu.edu/studentaffairs/drbobsmithhealthcenter/counseling-services/emergencies

Today’s lab - I

- Switch to a jupyter-notebook and draw a circuit to calculate the internal resistance of a battery
- Once you do this, come and take the materials you need
- This is open ended and different people will come up with different circuits
- A good resource is here: https://learn.sparkfun.com/tutorials/measuring-internal-resistance-of-batteries/internal-resistance

Today’s lab - II

- Get the function generator to show various waveforms for you
- Take pictures and paste them in the notebook
- Explain what each little setting of the oscilloscope does: feel free to look for the exact model of the oscilloscope and get it’s manual and test out the various features

Today’s lab - III

- Studying the Bernoulli’s principle

Today’s lab - III

- The Bernoulli’s equation is:

$$\frac{v^2}{2} + gz + \frac{p}{\rho} = \text{constant}$$

- v = fluid flow speed at a point
- g = acceleration due to gravity
- z = elevation of the point above a reference plane, with positive z-direction pointing upward — so in the direction opposite to the gravitational acceleration
- p = static pressure at a given point
- ρ = density of the fluid at all points in the fluid