Welcome to Physics 2130

Physics is the **Language** of Nature!

Therefore it is the basis of science and engineering

So.....

you will be learning a new *language* this semester!!

Chapter 1   Measurement

- Importance of Physics
  - Basic law of the universe
  - Foundation of all science and engineering field

- Physics is based on **observation** and **measurement**. The result of measurement is a physical quantity which consists of a **numerical value** together with its **units**
  - e.g. the length of the table: $l = 2$ m

International System of Units (SI)

- Length
  - meter (m)
- Time
  - second (s)
- Mass
  - kilogram (kg)
- And other basic quantities to be introduced later....

Length

Describe "length".

Units of length measurement:
- meter (SI -- preferred)
- inch/foot/yard/rod/mile
- furlong
- Smoot
- etc.....

1 meter = length light travels in vacuum in 1/299,792458 seconds

Time

Describe "time".

Units of temporal measurement:
- second (SI -- preferred)
- day
- year
- fortnight
- etc.....

1 second = time taken by 9192631770 oscillations of light emitted by a cesium-133 atom.

Mass

Describe "mass".

Units of mass measurement:
- kilogram (SI -- preferred)
- slug
- ounce
- grain
- etc...

1 amu (atomic mass unit) is universal and defined as 12 u = mass of carbon-12 (^{12}C) atom. But mass varies with relative speed!!

1 kg = 6.02213665x10^{26} u.

Unit Conversion

- A physical quantity may have more than one choice of units

  e.g. Time can be measured in day, hour, minute or second:

  Example: Express the speed of light c = 3.0 x 10^8 m/s in terms of mile per hour (mph)

  we know: 1 mile = 1609 m, 1 h = 3600 s

  $$c = \frac{3x10^8\,m}{s} \, x \, \frac{1mile}{1609m} \, x \, \frac{3600s}{1h} = 6.7x10^8\,mph$$