Phys101 Lecture 1

- Course Info
  - Instructor
    - Michael Chen
      http://www.sfu.ca/~mxchen ➔ Course webpage
      Office hours (P9442): Mon 12:30 -1:20; Tue 11:30-12:20.
  - Webct (the gradebook - check your marks)
  - Open Labs: Mon and Tue: 12:30-5:20, AQ4120
  - Grading
    - Assignments (written + MasteringPhysics) and quizzes: 10%
    - Midterms: 2 x 20% = 40%
    - Final exam: 50%

    Note: Final exam can weight more (if it's better than a midterm).
    No make-up midterms.
  - Textbook
    - Giancoli "*Physics: Custom Edition For Simon Fraser University*"
    - MasteringPhysics Access Code (included in each new book)

Mastering Physics

- An online personalized assignment system
  Worth about 5% of your total mark
- Get your access code
  - If you buy a new text book, the access code is included;
  - If you buy a used book, you would need to buy the access code separately.
- Use your SFU email address as your Mastering Physics ID !!
  e.g., mxchen@sfu.ca

Suggestions

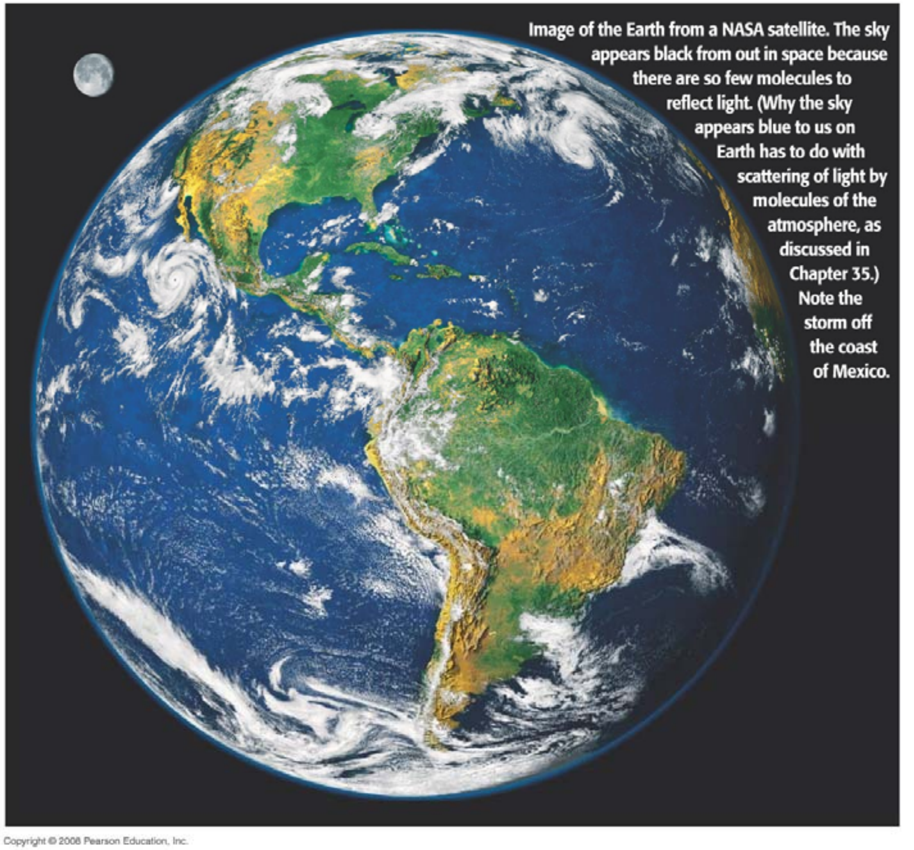
- Read the textbook

  Not just the formulas and examples!

- Make sure you fully understand the assignments, lecture examples and textbook examples. Many of them will appear in the exams.

Chapter 1

Introduction, Measurement, Estimating



Models

Models are very useful during the process of understanding phenomena.

A model creates **mental pictures**; it often idealizes and simplifies the physical situations and therefore should be considered as an approximation. We must understand the **limits** of the model.

Models used in this course include:

Particle (point mass) – no size, no rotation.

Rigid body – No deformation.

Ideal flow (inviscid flow) – viscosity is ignored.

Laminar flow – no turbulence.

Ideal gas – no long range forces.

Measurement and Uncertainty

Significant Figures

No measurement is exact; there is always some uncertainty due to limited instrument accuracy and difficulty reading results.

The photograph to the left illustrates this – it would be difficult to measure the width of this board more accurately than ± 1 mm.

Significant Figures

The number of **significant figures** is the number of reliably known digits in a number. It is usually possible to tell the number of significant figures by the way the number is written:

23.21 cm has **four** significant figures.

0.062 cm has **two** significant figures (the initial zeroes don't count).

80 km is ambiguous—it could have **one** or **two** significant figures. If it has **three**, it should be written 80.0 km.

Significant Figures

Scientific notation is commonly used in physics; it allows the number of **significant figures** to be clearly shown.

For example, we cannot tell how many significant figures the number 36,900 has. However, if we write 3.69×10^4, we know it has **three**; if we write 3.690×10^4, it has **four**.

Much of physics involves **approximations**; these can affect the precision of a measurement also.

Units, Standards, and the SI System

We will be working in the SI system, in which the basic units are **kilograms**, **meters**, and **seconds**. Quantities not in the table are **derived** quantities, expressed in terms of the **base** units.

TABLE 1–5
SI Base Quantities and Units

Quantity	Unit	Unit Abbreviation
Length	meter	m
Time	second	s
Mass	kilogram	kg
Electric current	ampere	A
Temperature	kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

Other systems: **cgs**; units are centimeters, grams, and seconds.

British engineering system has force instead of mass as one of its basic quantities, which are feet, pounds, and seconds.

Converting Units

Unit conversions involve a conversion factor.

Example: 1 in. = 2.54 cm.

Written another way: 1 = 2.54 cm/in.

So if we have measured a length of 21.5 inches, and wish to convert it to centimeters, we use the conversion factor:

$$21.5\ \text{inches} = (21.5\ \cancel{\text{in.}}) \times \left(2.54\,\frac{\text{cm}}{\cancel{\text{in.}}}\right) = 54.6\ \text{cm}.$$

Conversion factor (1)

Dimensions and Dimensional Analysis

Dimensions of a quantity are the **base units** that make it up; they are generally written using square brackets.

Example: Speed = distance/time

Dimensions of speed: [*L*/*T*]

Quantities that are being **added** or **subtracted** must have the same dimensions. In addition, a quantity calculated as the **solution** to a problem should have the correct dimensions.

1-7 Dimensions and Dimensional Analysis

Dimensional analysis is the checking of dimensions of all quantities in an equation to ensure that those which are added, subtracted, or equated have the **same** dimensions.

Example: Is this the **correct** equation for velocity?

$$v = v_0 + \tfrac{1}{2}at^2.$$

Check the dimensions:

$$\left[\frac{L}{T}\right] \stackrel{?}{=} \left[\frac{L}{T}\right] + \left[\frac{L}{T^2}\right][T^2] = \left[\frac{L}{T}\right] + [L].$$

Wrong!