ORIENTATION

The purpose of the physics laboratory is two fold. The primary aim is to give you an opportunity to see the principles that are studied in the lecture illustrated by simple experiments. A secondary purpose is for you to learn some elementary laboratory techniques and especially the proper way to write a lab report.

As this is a laboratory course, attendance for all experiments is expected. There are no make-up periods. Three or more unexcused absences will result in a failing grade.

Your laboratory reports are the principal criteria for determining your grade in the course. The instructor will explain his grading procedure and the features he considers important. In general, however, the emphasis is on correct use of your original data to obtain results consistent with these data, together with a presentation that is clear, complete, and concise.

The reports may be written on any type of paper but must be neatly written, printed in ink, or typed. The reports are due at the beginning of the lab period one week following the performance of the experiment. Late reports will be marked down severely.

Significant Figures and Treatment of Errors

This is a very important topic and is covered in some detail in the first laboratory. The procedures learned there should be practiced in all of the following laboratories.

Graphs

To present data in the form of a graph, attention must be paid to the following:

1. Choose a scale so that the graph is as large as possible.
2. Label the abscissa (horizontal axis) and the ordinate (vertical axis) with both a numerical scale and the proper units.
3. If a straight line is to be drawn through the points, determine the slope and intercept of the line by the method of least squares. The formula to be used are given below. A derivation of these formula can be found in the references listed in the first laboratory.

x_i, y_i = N data points
$\bar{x}, \bar{y}$ = mean values of x and y

If the equation of the line is written

$$y = mx + b$$

the best estimates for m and b are

$$m = \frac{\sum_{i=1}^{N} y_i x_i - N\bar{x}\bar{y}}{\sum_{i=1}^{N} x_i^2 - N(\bar{x})^2}$$

$$b = \bar{y} - m\bar{x}$$

As an illustration, consider the following data:

	1	2	3	4	5	6
x_i (s)	0.50	1.00	1.50	2.00	2.50	3.00
y_i (m)	5.0	9.5	11.0	14.5	16.0	19.0

$\bar{x} = 1.75$ s, $\bar{y} = 12.5$

$$\sum_{i=1}^{N} x_i y_i = 154.5 \text{ m.s}, \quad \sum_{i=1}^{N} x_i^2 = 22.75 \text{ s}^2$$

$$m = \frac{154.5 m.s - 6(1.75 s)(12.5 m)}{22.75 s^2 - 6(1.75 s)^2} = 5.3 \text{ m/s}$$

$$b = 12.5 m - (5.3 \frac{m}{s})(1.75 s) = 3.2 \text{ m}$$

A sample graph displaying these data is given here: