

Preface

The presentation, *General Physics - Theory & Experimentation* is the essence of author's continued quest for excellence in introductory level laboratory experiments for colleges. The experiments have been designed with two main aims in mind; the first of these is to expose the students to the proper scientific techniques for doing an experiment; *any* experiment, at *any* level. Be it a high school laboratory or a university research laboratory, the scientific community follows the same basic principles for investigating the unknown. Toward this end, the author has included a section called *Setting Up*, which makes students aware of the steps leading to the development of the experiment. This is followed by mathematical analysis (rigorous at times), that *percolates* the theory to the equation of a straight line, or that of a polynomial. In nearly every experiment, results are *extracted* from a graph for which a minimum of ten trials are carried out in the laboratory. The author believes in extensive use of mathematics and has developed special equations for a number of experiments, such as *Simple Pendulum*, *Equilibrium of a Crane*, and *The Prism*. At the same time, however, the author believes that physics and mathematics are distinct from one another and should remain separated. This is why students are encouraged not to use words like *slope* or *intercept* in describing the results of their work. All *slopes* and *intercepts* should be interpreted in physics, and only these interpretations should form *Results* of experiments.

The second aim of developing these experiments is to achieve high degree of accuracy in the outcome of *any* and *every* experiment. Gone are the days when an instructor would apologetically face bewildered students for a 30% error in result. Even in this age some instructors are ready to accept an error as high as 10%, while using modern-day apparatus. The author does not believe in errors greater than 3%. If error exceeds 3%, then one is simply not comparing apples with apples. It has been shown and proven by the author that apparatus need not be expensive in order to obtain accurate results; even in experiments like the study of torques using a meter stick, or the study of equilibrium conditions using a crane, or the study of *Hooke's Law*, where simple apparatuses are used, it is possible to achieve an accuracy of 98% or better.

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The author also wishes to state that he is very proud of *all* of his students who have shown great enthusiasm in the laboratory, thereby encouraging the author to develop these experiments.

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