

2403 Engineering Physics Lab Syllabus

This syllabus applies to *all sections* of the 2403 laboratory course. Your instructor will provide more information concerning such matters as specific requirements for your laboratory notebook and formal reports.

Text: *Physics Lab for Engineering Students*. You can download a free copy of this manual from the course website: <http://www.homepage.villanova.edu/donald.shaw>

Course Description: Selected experiments in mechanics and electromagnetism will be performed using modern data collection and analysis techniques. Most experiments are designed to confirm or illustrate an existing model or theory while a few experiments emphasize the discovery approach where it is assumed that we do not have a prior understanding of the phenomenon being studied. The experiments are interactive since the data can immediately be examined, analyzed and decisions made concerning the possible need for additional or revised data. The experiments are structured in such a way that you set up the equipment, collect data and interpret the results using computer data analysis programs and finally enter the data, graphs and your conclusions in your lab notebook *during the lab period*.

Course Objectives: The primary course objectives are to:

- (1) Develop the skills needed to set up the equipment required to test models or theory developed in the lecture course.
- (2) Learn how to use the *Data Studio* computer based data collection system to obtain data efficiently.
- (3) Use *Excel* to analyze the data and fit the data to relatively simple models using the least squares method or the *Solver* tool of *Excel* for more complex models.
- (4) Be able to interpret your results and develop correct conclusions.
- (5) Maintain a laboratory notebook and write formal reports using the format of a short research paper.

Lab Attendance: *An unexcused absence may have a significant affect your grade since you will lose credit for that particular lab.* If you have an official

excuse you must provide it (in writing) to your instructor at the next lab. If you must miss a lab try to attend another lab during the same week since there will be no other chance to do the lab. Have that instructor initial your notebook and show this to your own instructor during your next lab session. If you miss a lab for an official reason, you may be required to submit additional formal

report(s) to replace the missed lab.

Honesty: In preparing your lab notebook and formal reports you must not consult 2403 notebooks or reports from current or previous semesters written by others. You will of course have the same data as your lab partner but *your written discussion and conclusion for each lab must be done individually*. All references used in writing your formal reports must be cited. Violations may result in the grade F for the lab notebook or formal report and may lead to failure for the course.

Overview: You should read about the experiment before coming to the lab. Normally your instructor will supplement your preparation by giving a brief introduction to specific facets of the experiment. A weekly record of your experimental work will be maintained in your lab notebook. In addition two formal reports in the format of research papers are also required.

Preliminary Summary Sheet: Before leaving the lab you must submit the completed *Preliminary Summary Sheet* signed by each of the lab partners at your workstation.

Laboratory Notebook: You must download a copy of the manual from the course website and also obtain a loose-leaf

2403 Lab Experiments	
Introductory Topics	
Introduction, Errors and Curve Fitting	
Data Studio Program	
Data Analysis and Plotting with Excel	
Week	Experiment
Jan. 12	Kinematics in Two Dimensions
Jan. 19	Newton's II Law, Work and Energy
Jan. 26	Frictional Laws and Work-Energy with Non Conservative Forces
Feb. 2	Dynamics of Circular Motion and Resistive Force Models
Feb. 9	Free Fall and Resistive Force Models
Feb. 16	Conservation of Momentum and the Impulse – Momentum Principle
Feb. 23	Mechanical Oscillations
Mar. 9	Electric Potentials and Fields
Mar. 16	Resistors and Capacitors
Mar. 23	Charge in a Magnetic Field
Mar. 30	Electromagnetic Induction I
Mar. 14	Electromagnetic Induction II
Mar. 20	Makeup Lab

notebook to organize your work. *Each student must maintain his or her own individual laboratory notebook.* Your **data, graphs, calculations, discussion and conclusions** are to be placed in your loose-leaf notebook. You will of course have the same data as your lab partner but *your written discussion and conclusion for each lab must be done individually*. Data tables must have a title and the units for each column included. Graphs should have a title and clearly labeled axes with units. If you do a least squares fit to the data be sure to include the fitted coefficients on your graph. Be very careful in making and explaining any inferences based on your graphs. Each experiment must have a detailed conclusion. Your results, graphs and calculations must be entered into your notebook **before** you leave the lab. If necessary you can finish your discussion and conclusions at home.

Formal Reports: In addition to the lab notebook, two formal reports must be submitted. Your instructor will provide you with details concerning experiment selection, due dates and style

requirements. *Each student must submit their own individual report with your own conclusions even though you will be sharing the same data with your lab partner.*

Grade Determination: The lab grade will be based on your Lab Attendance, your Lab Notebook, Preliminary Summary Sheets and the two formal reports. The Lab Notebook along with the Preliminary Summary Sheets will be worth 50% and the two Formal Reports 50% of your final grade. Any absences that have not been made up will have a significant impact on your Laboratory Notebook score and consequently on your

course grade. Your instructor will provide you with more specific details concerning his policies.

Attendance: For each missed lab you lose 10 points from the 50 points given for your lab book. *It is your responsibility* to make sure that your attendance has been officially recorded.

Lab Notebook and Formal Report Due Dates: The Formal Lab reports and the Lab Notebook must be submitted on time to avoid possible penalties.