SYLLABUS

Textbook: Experimentation, D. C. Baird, 3rd Edition
Class Time and Location: Tuesday and Thursday, in EEP 246
Course Instructor: Dr. Vladimir Sobolev
Office, office hours: 222 EEP; M, W, F 4:00 – 6:00 PM; T, Th 2:00 – 5:00 PM
Phone, E-mail: 394–1225; Vladimir.Sobolev@sdsmt.edu

Catalog course description: (0-1) 1 credit. Prerequisite or co-requisite: PHYS 213. This laboratory accompanies PHYS 213. Introduction to physical phenomena and measurements. Recording and processing data, determining uncertainties, reporting results. The experiments supplement the work in PHYS 211 and PHYS 213.

Students with special needs or requiring special accommodations should contact Dr. Vladimir Sobolev, at 394-1225, EEP 222 and/or the campus ADA coordinator Jollie McCoy at 394-1924 at the earliest opportunity.

Grade Structure:

10 experiments at 40 points each: 400 points possible.
➢ The introductory exercise will not be graded.
➢ Pre-labs are 10 points, reports are 30 points.

In order to receive a passing grade on a lab report the structure of the report must conform exactly to the instructions given in this syllabus. Neatness, grammar, and the completeness of statements and responses to questions will all contribute to the grade.

<table>
<thead>
<tr>
<th>Point Range</th>
<th>Percentage Range</th>
<th>Letter Grade</th>
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</thead>
<tbody>
<tr>
<td>360-400</td>
<td>90-100</td>
<td>A</td>
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<tr>
<td>320-359</td>
<td>80-89</td>
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<td>240-319</td>
<td>60-79</td>
<td>C</td>
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<td>200-239</td>
<td>50-59</td>
<td>D</td>
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<tr>
<td>&lt; 200</td>
<td>below 50</td>
<td>F</td>
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General Education Goal:

Students will understand the fundamental principles of the natural sciences and apply scientific methods of inquiry to investigate the natural world.

Student Learning Outcomes: As a result of taking courses meeting this goal, students will:

1. Demonstrate the scientific method in a laboratory experience.

Assessment: Students will be able to relate obtained experimental data with corresponding physics laws and formulas and critically evaluate these data with proper accuracy using appropriate formulas, and present scientifically sound laboratory reports.

Policies:

The laboratory period is three hours long and there are 13 of them this semester. Each student is required to successfully complete all of the assigned experiments to be eligible for credit and to receive a grade in the course.
Pre-laboratory exercises are due immediately at the beginning of the lab period and will not be accepted late. Students with excused absences for a portion of the lab period must turn in the pre-lab early.

Absences must be made up. As the instructor permits, the student may arrange to make up the missed work in another section or in a scheduled make-up period.

A record of the experimental work is kept by each student in a hardcover notebook (National 53-108 or similar).

You will also need the following:

1. A ruler with centimeter markings.
2. A calculator.

Laboratory regulations prohibit smoking and food in the laboratories. This includes soft drinks. They detract from the business at hand and put the apparatus in danger of damage due to spills and debris. Breakable equipment is used by lab groups in many of the assigned experiments. Each group is requested to look over the equipment at the end of the period to see if it is in usable condition for the next lab. Report breakage or missing equipment immediately. Please leave your work area in orderly condition when you leave the lab.

Academic misconduct:

Any violation of academic integrity policy, such as cheating and plagiarism, will not be tolerated in this course. Penalties may range from a failing grade for the work in question to failure of the course.

The Laboratory Experiment:

You will work in groups and you are encouraged to cooperate in carrying out the experiment. However, each student is responsible for the contents of their lab notebook. Lab notebooks are to be turned in for grading at the end of each lab period. Notebooks are returned to students at the beginning of each lab period. Each lab record should include the following items:

1. Title
   Date
   Partners Names
2. A statement of the objectives of the experiment.
3. Data
   Graphs
   Calculations
4. Error Analysis
5. The results of the experiment.
6. Answers to questions.
7. Conclusion

Following are more detailed instructions:

DATA:
a) Data must be recorded directly into the notebook and before any calculations are made. The left hand page of the notebook may be used as a scratch pad.

b) Measurements should be repeated as many times as necessary to establish the value of the quantity and its uncertainty.

c) Clearly define all measured quantities with a sketch if appropriate.

d) Arrange data in a tabular form in such a manner that all entries pertinent to a given trial form a row rather than a column.

e) Label explicitly each table of data so that the purpose for which the data are being obtained is clear.

f) Each column of data should have an explicit heading. If symbols are used to label the columns the symbols should be clearly defined on the data page. The heading should also include units.

g) In the same table with the raw data it is often convenient to include calculated quantities associated with the data. If comparisons are to be made among some of the calculated values, these quantities should be tabulated side by side.

GRAPHS:

a) Select a scale such that the graph will cover the greatest part of a whole page yet be easily read.

b) Label the axis and indicate the units for each axis.

c) Make the points on the graph distinct by drawing small circles or other symbols centered on the points. Use different point symbols for each separate curve.

d) Draw a smooth curve on the graph. Never simply connect the points. The curve may be the average of the points, the theoretically predicted curve, or the results of a least squares analysis. The best curve may not pass through any of the points.

e) Give the graph a title which includes what is being plotted. The system on which the measurements were made, and the purpose of the plot. Write a paragraph of explanation or interpretation of the graph.

f) In determining the slope of a straight line graph do not directly use experimental data points. Use to arbitrary, well separated points on the best line through the data or perform a least squares analysis of the data. In any case indicate how the best line was chosen.

CALCULATIONS:

a) Calculations should be organized logically in the report with brief explanations of what is being calculated.

b) For repeated calculations of the same type, show one sample calculation.

RESULTS:
a) Clearly indicate your results with the proper number of significant figures and either a calculated or estimated uncertainty. Do not forget to include units.

b) Results should be collected together in a meaningful way near the end of the report.

ANSWERS TO QUESTIONS:

Answers questions in complete sentences demonstrating relevance to the experiment.

Experiment Schedule (Tentative and subject to change if needed)

<table>
<thead>
<tr>
<th>Week of: Mon.– Fri.</th>
<th>Tuesday (A)</th>
<th>Wednesday (B)</th>
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<tbody>
<tr>
<td>A1</td>
<td>A2</td>
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<td>Sept. 11 – 15</td>
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<td>3</td>
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<td>Sept. 18 – 22</td>
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<td>Sept. 25 – 29</td>
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<td>Oct. 2 – 6</td>
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<td>Oct. 9 – 13</td>
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<td>Oct. 23 – 27</td>
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