Syllabus

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Course Website:
    http://users.wpi.edu/~qwen/teaching/PH2651C16/

Course Objectives:
1. Learn about a handful of beautiful physics experiments
2. Perform measurements and estimate their uncertainties
3. Learn technical skills:
   • Analyze and present experimental data using MATLAB
   • Write scientific reports using LaTeX

Experiments:
We have seven experiments available, of which you will choose to complete five. The available choices are:
1. Oscillations of an LCR circuit
2. Motion of electron in crossed fields (Thomson’s apparatus)
3. Magnetic field measurements
4. Superconductivity measurements
5. Photon interference
6. Physical pendulum
7. Cavendish experiment

Timelines and Lab Rules:
You will work in groups. Each group will have two students. You are your teammate will take data and write the lab reports together. Each team will about a week to complete a lab. Please read the detailed instructions and complete the pre-lab questions in advance. You will need to turn in the answers to the pre-lab questions in the first day of the lab. You will not be allowed to touch the equipment unless you come prepared - this is necessary for your own safety (in one case you will be dealing with 2500 V!) as well as keeping you from damaging sensitive equipment. Before starting an experiment, it recommended to have a detail plan and design for the experiment. After you collected all the data, you will learn how to use Matlab to process, analyze and plot the data with the help of your TA.

Grading Policy:
The final grade of the course will be determined from the following three components:
• Pre-lab question, 10%
• Final presentation, 25%
• Reports, 65%
Each group will select a lab for final presentation. The quality of final presentation will be evaluated not only by the instructor but also the TAs and other groups.
Grading Rubrics for Lab Reports:
Each lab report will be graded using the criteria listed in table below. Each of the items will be graded according to clarity and conciseness. It is recommended to write your lab report using LaTeX. A template for LaTeX is included on the course website. Examples of lab reports are listed on course website as well. An extra credit of 5 points will be given to the lab reports compiled using LaTeX.

Table 1: Grading rubric for lab reports

<table>
<thead>
<tr>
<th>Figure</th>
<th>Figure labels and legends</th>
<th>Figure captions (below the figure)</th>
<th>Mention each figure in the text</th>
<th>15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tables and Equations</td>
<td>Table captions (above the table)</td>
<td>Mentioning each table in the text</td>
<td>Mentioning most equations in the text</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td>Abstract</td>
<td>10%</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Introduction</td>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Text</td>
<td>Methods (procedure, equipment, reagents)</td>
<td>10%</td>
<td></td>
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<td></td>
<td>Discussion (analysis)</td>
<td>30%</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Conclusion</td>
<td>10%</td>
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</table>

The following are some details on how to prepare a good lab report.

Each figure should be clear to a reader without having to refer to the text. Thus the axes must be properly labeled, the data-points identified in a legend (if appropriate), and the figure caption must have enough information so that the message of the figure is conveyed. But the caption should not be more than a few lines of text and therefore has to be concise. Each data point in the plot should have an error bar to represent the uncertainty of the data. Equations should not randomly appear, and instead are a part of the narrative. Also, don't include lots of algebra, so it's OK to say “... after some algebra, Eq. (1) simplifies to ...” Special characters should be appropriately inputted.

The introduction should contain a concise synopsis of the theory and how it applies to your experiment. Do need to derive all the equations in great depth, since you are not writing a textbook. Just providing a quick refresher to readers who has learned the physics, but has perhaps forgotten some of the details. The discussion/analysis section should contain error analysis.

Special accommodations:
If you need course adaptations or accommodations because of a disability, or any other private concerns, please contact me as soon as possible.