

2055 lab guidelines - Winter 2012

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Physics 2055 labs will be held in C3061

Lab Slots are 61, 62 and 44 (Monday and Tuesday afternoon, and Thursday morning)

There will be no lab classes during the week of February 20-24

A hard cover lab notebook is required, though graph paper is not essential because you will be using the lab computers for plotting graphs. **Loose paper is not acceptable.** You can use old lab books if there is sufficient space remaining. Lab notebooks are to be passed in at the end of the lab period.

All instruction sheets and supplemental information can be downloaded from www.mun.ca/physics/people/staff/deacon.php. The notes are in Adobe Acrobat (.pdf) format. Select '[2055]' to access the list of experiments for this course.

It is recommended that you bring your textbook to the lab because it is often necessary to look up information which is not included in the instruction sheets.

The lab will count towards 20% of the total grade for the course, with marks allocated as shown:

Lab reports (9):	9%
LONCAPA pre-labs	2%
Black box problem:	5%
Formal Report:	4%

An overall minimum grade of 50% must be obtained in the laboratory in order to pass the course.

The schedule of experiments is listed below. You should prepare for each lab by a) printing the appropriate lab notes in advance, b) read the relevant theory and background in the textbook, c) plan your experiment by figuring out what sort of data you are going to get and how to analyze it. The "Black Box Problem" will require you to identify three unknown components in a sealed box, using the apparatus provided. You will have 1.5 hours to complete this. More details will be given in the lab.

Makeup labs will normally not be permitted. If you miss a lab because of illness or other justifiable reasons, appropriate documentation (medical certificate, note from supervisor, etc.) must be provided. Failure to produce documentation will result in a mark of zero for lab(s) missed.

Apart from the first week, each of the experiments includes a prelab which must be completed before you start the lab itself. To access the questions, you will need to login to: <http://loncapa.physics.mun.ca/>. Your username and password can be found on D2L. Each exercise will open approximately one week before you are due to do the experiment, and needs to be completed by 2pm on the following Monday. Thus, the first prelab questions will be available on Jan 9, and must be completed by Monday, Jan 16 at 2pm.

Jan	9, 10, 12		Introduction to the lab
Jan	16, 17, 19	prelab	Linear and Nonlinear Resistors
Jan	23, 24, 26	prelab	Kirchhoff's Circuit Laws
Feb	Jan 30, 31, Feb 2	prelab	Charge and Discharge of a Capacitor
Feb	6, 7, 9	prelab	Introduction to the Oscilloscope
Feb	13, 14, 16	prelab	The Diode
Feb	20, 21, 22		BREAK
Mar	Feb 27, 28, Mar 1	prelab	Introduction to AC: The RC Circuit
Mar	5, 6, 8	prelab	RL filter circuits
Mar	12, 13, 15	prelab	Resonance in LCR Series Circuit
Mar	19, 20, 22		Black Box Problem

Students are expected to be familiar with the use of *Kaleidagraph* for data analysis and basic error analysis techniques also. Experimental errors or uncertainties will arise in all of your experiments and you will be expected to perform error analysis as a regular part of your analysis to estimate the uncertainty in your final result. It is recommended that you download the reference notes: *The Treatment of Numerical Experimental Results* (www.physics.mun.ca/~cdeacon/laboratories/err2005.pdf).

Laboratory Report and Marking Guide

Write your data into your book as you do the experiment. If you need to write a formal report, your notebook will be the main source of reference, so it is essential that you write everything down in a legible and organized manner. Do not write results on loose pieces of scrap paper with the aim of copying them into your book later. Do not use liquid paper to cover up mistakes, or remove pages. Additional graphs or figures (e.g., computer-generated plots) should be fastened to your book.

You will probably be working with a partner; however your report must be a result of your own work. Plagiarism (that is, representing other people's work as your own) is a serious academic offence; the University's policies regarding such offences are outlined in the MUN calendar.

The ability to write a clear and concise report is a necessary and valuable skill for any future scientific writing you will be required to do. Your lab report should consist of four clearly identifiable sections, Objective, Data and Results, Analysis and Conclusion. Your mark will be based on these sections and also on your organization, neatness and writing ability.

Objective (10 marks):

The Objective should be brief and concise (approximately 5 to 6 sentences) and should demonstrate that you have prepared for the lab and that you understand what you hope to achieve over the course of the experiment. It should state the main goal of the experiment and include one or two main points of the necessary theory. Do not copy large sections from the lab sheet.

Data/Results (25 marks):

This should contain all the experimental data recorded but no calculations. Whenever possible, the data should be arranged in tables. The tables should be tidy and easy to read. Include an estimate of the uncertainty in the recorded values. Use the proper significant figures. If you notice anything unusual while recording the data, a brief description of what occurred should be included.

Analysis (45 marks):

The Analysis section will contain graphs, calculations and answers to extra questions. Calculations should be written out neatly and you should explain your steps carefully. If using a computer for doing calculations, you should provide a comment either in your lab notebook or on the computer printout to explain what you have done. The final values from all calculations should be easy to see and must include proper significant digits, units and associated uncertainty. The source of the accepted value used for comparison should be given (text book or other reference). Figures should be numbered (i.e., Figure 1, Figure 2, etc.) for easy reference. Usually a graph will include a line of best fit on the same axes as the experimental data. The axes should be labeled appropriately, and a suitable title should be included.

Conclusion (20 marks):

The Conclusion should provide a concise summary of the results obtained. The Conclusion should not contain a recap of the procedure, but rather it will summarize the main points of what was learned or achieved by performing the experiment. You should determine whether or not the objective of the lab was met. Did the experimental data follow the predicted relationship? How do the measured values compare to accepted values? If the accepted value is found to be outside the range of experimental uncertainty of the measured value or the predicted relationships were not verified, you should attempt to explain the discrepancy in terms of errors that may be present in the experiment, such as systematic error. "Human error" should never be used to explain discrepancies. (If you made a mistake, then you should have corrected it) You will not lose marks if your result(s) differ from accepted values provided you have taken reasonable care in analyzing and interpreting the data.

See the Marking Guide for Second Year Reports for further details.

Formal Report

Professional scientists routinely write reports for publication in scientific journals. These are sometimes called *formal reports*, and are usually divided into major sections: Abstract, Introduction, Method, Results, and Discussion, where each section describes part of the experiment.

You are required to use the results from the last three labs ("Introduction to AC", "RL filter circuits" and "Resonance in LCR Series Circuit") to write a paper in the style of a formal report entitled "AC Filter Circuits". Don't think of these as separate experiments. Rather, you should think of filters as a topic, where you will describe the difference between low pass, high pass and band pass filters and show how your results demonstrate the operation of these kinds of filter.

Your report should, as far as possible, look like a published article. This means that you will need to take great

care with your writing and presentation, as well as choosing which data to present. The report should be written using word processing software such as Word or LaTeX. Open Office is a popular office suite that is available on the lab computers also. You are encouraged to use the Writing Centre for help. The final report should be written using 12pt font and **no more than eight (8) pages** in length, including diagrams, and is due on the last day of classes, Thursday, April 5.

For more details, see the notes on *Writing a Formal Report*, downloadable from www.physics.mun.ca/~cdeacon/labs/formal.pdf

Computing Facilities

The second year laboratories are served by a network of PCs, with software for data analysis, document preparation and web browsing. Students without computer accounts will be assigned usernames during the first lab class. Please note the following:

- Do not share your username with anybody and keep your password confidential.
- Do not leave your computer unattended
- Save your work regularly
- Remember to logout when you finish.

Safety Information

1. Eating and drinking are not permitted in the laboratory.
2. Keep the area around your experiment clean and tidy.
3. Place coats and bags under the benches or on one of the side benches.
4. Laboratory equipment should be handled with care at all times. All breakages should be reported immediately, no matter how trivial they may seem.
5. Always check electrical circuits carefully before you switch on.
6. Cell phones should be turned off.
7. Lab stools must be placed under the bench before you leave.
8. A first aid kit is available.