PHYS 122L Introductory Physics Laboratory Spring, 2013

SYLLABUS

Instructor: **Dr. Laszlo Takacs**
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Place and Time:

Lecture	SO 112, Tu 2:30-3:20 pm
Lab	PHYS 110, Tu **or** Th (depending on registration) 3:45-6:30 pm

Office hours: After lecture or make appointment

Required Course Materials:

Lab Pack, sold by the bookstore. (If it's not on the shelf, go to the desk and ask them to print one.)
Official Lab Notebook, also available at the bookstore. (Ask a clerk if you are not sure what to buy.)

Course Objectives

This is your first physics lab during your studies at UMBC. Therefore, there will be about as much emphasis on how to carry out and report measurements as on the physics of the lab itself. Nevertheless, keep in mind that clear understanding of the physics involved is the most essential requirement. Here is a formal list of objectives, in order of decreasing importance:

- Observe physical phenomena familiar from your lecture course. The hands-on experience should help you understand the ideas and concepts. (If you cannot quite recall the physics behind a measurement, get your introductory physics book an relearn it before the lab.)
- Become familiar with the intricacies of working in a lab, such as how to plan a measurement, set up a measurement, work with equipment, take and record data.
- Analyze your data, compare theory with experiment.
- Present your results in a complete and clearly written report. (This is very important. In the real world your work is usually judged by what you write about it, whether you prepare a report for you boss in industry, a dissertation as a graduate student, or a research paper in academia. Fair or not, a badly written reports is dismissed, no matter how great the work would be otherwise.)
- Learn proper error analysis. It is an integral part of every laboratory measurement. It is not the purpose of the measurement, nevertheless no lab report is complete without an estimation of the experimental error for every directly measured and derived quantity. You will learn how to find the proper balance.
- You will learn the proper methods of estimating and reporting errors, error propagation,

fitting of theoretical curves (straight lines in this lab) to measured data.

What do you need for the course?

1. Lab Pack: Contains description of each measurement. Become familiar with the material before the lab. When you arrive to the lab, you should be ready to start the measurement.
2. A standard notebook that consists of permanently bound pages and duplicate pages that are perforated. At the end of each lab section, you will tear out the duplicate pages and submit them to your TA, while keeping the primary copy for your own records. The TA will staple your duplicate pages to your lab report before returning the graded report to you. Please make sure you have turned in your duplicate data pages at the end of each section. Lab reports without these pages will be subject to a 30% grade reduction.
3. Any general physics textbook, preferably the one you used in PHYS 121/122 and know in great detail. Consult your textbook whenever you are not solidly grounded in the principles. Reports with incorrect physics will be brutally downgraded. You must understand what you are doing in the lab and why. Quizzes will test whether you do.
4. Notes passed out in the lab or posted on BlackBoard.
5. Chemical safety goggles. Use them whenever there is the slightest chance of a mishap – practically always, when you work in the lab. Even if your measurement is not dangerous, there may be another one going on that is.
6. Access to MATLAB through the university computer labs. MATLAB is licensed to UMBC, thus it is available on most computers on campus.

MATLAB

In this course, you will use programs written in MATLAB for data analysis and plotting. You are **not** required to learn programming in MATLAB; the codes will be supplied to you. You will only run the programs, like you would run a computer game. Some limited familiarity with the basic syntax is necessary for data entry and will be discussed in class.

Your write-up of any assignment that requires MATLAB must include a printout of the MATLAB output, with the main results circled or highlighted. The best way is to add the printout as an appendix, repeating the main results in the text.

Course requirements

9 lab reports
3 homework sets
4 pop-up quizzes during the lecture class
1 oral presentation, 25 minutes. Students will work in pairs on the presentation.

Course grade

Lab reports: 80 points each
Homework: 80 points each
Quizzes: 40 points each
Final presentation: 100 points

Total points = 1220. I will drop the lowest assignment score, either a lab or homework. You may not drop a quiz grade. Your final percentage is the sum of all your points from the course divided

by 1140.

Grades will be assigned according to the scale

A = 90% 100%
B = 77% 89%
C = 65% 76%
D = 50% 64%
F = anything below 50%

Course Policies

Reading assignments

Please come prepared to the lab. Read the relevant chapter from your lab manual and physics textbook, if necessary. You must be familiar with the physical concepts and experimental goals. Have a plan – you can even record it in your notebook – of what to do and what to measure.

Homework

Homework will be posted in Blackboard. It is your responsibility to obtain a copy. In any assignment requiring MATLAB, you must include a printout of the results with the main answer circled or highlighted. Partial credit is given for homework, so make sure to show the steps you used to solve the problem; an incorrect answer with some part of the method correct will receive some credit. The correct answer without the work that shows how you obtained that result will receive NO credit. Homework solutions can be handwritten, but write clearly.

Lab reports

To receive credit for a lab, you must attend the lab, take data, and hand in a written report within one week after you do the experiment (normally at the beginning of the next lab.) Do NOT email your report to me or the TA; we will delete such emails upon receipt. To turn in the report, you must do *both* of the following:

1) Upload an electronic version to the course blackboard (this must be done first).

2) Submit a hardcopy for grading, normally at the beginning of the next lab.

If either the hard copy or electronic copy is missing, you will receive a zero for the lab, or it may be late if you submit it after warning.

Reports must be typed on a word processor and should conform to the format supplied at the beginning of the semester and the sample at the end of the Lab Pack. It must be spell-checked and written in clear English. (Publishers return a manuscript without review if it is full of language errors.) You may talk to your classmates regarding the lab reports but each of you must submit your own original text, graphs, analysis, and report.

Copying someone else's work is cheating. SafeAssign will be used to check the lab reports submitted electronically for plagiarism. Reports must be uploaded to Blackboard before turning in the hardcopy. If you submit a late report, it must be uploaded to Blackboard on the same day the written report is turned in. Failure to do so will result in a score of 0 for that lab.

To Upload a Document to ***SafeAssign***:

- Open your browser
- Log into Blackboard

- Go to the Blackboard page for this course
- Go to Course Information
- Select Lab reports
- Scroll down to the specific report (ie. Atwood's machine)
- Click on View/Complete
- Upload your document. This is done like an email attachment, using Browse, select. Documents must be in the .doc or .docx format and the name must include the file extension. Files in pdf format are not acceptable.
- You may upload only one report for each lab.
- For certain labs, such as oscillations and thermal properties, you need to submit printouts of graphs obtained during the lab session. For these labs, you may omit those printouts from your electronic copy as long as you turn them in with the written report.

Important note: After submitting your lab report to the Blackboard, a screen should appear indicating your submission was successful. If you do not see this screen, that means your report hasn't been received and you need to re-submit it.

Late assignments (both homework and lab report) must be turned in to the physics office, room 220 in the Physics Building, and marked with the date and time by the person receiving them. The score will be reduced according to the formula:

$$\text{Final Score}(t) = \text{Original Score} * 2^{-t/7},$$

where t equals the number of (full or partial) calendar days that the assignment is late. (According to this formula, a one-week late assignment receives 50% credit. That is still much more than zero!) The grade of the assignment is rounded up to the nearest integer.

Exams: This course has no midterms or final exam beyond the four pop-up quizzes.

Make-up lab policy: Make-ups will be allowed only for a documented medical or legal problem or a death in your immediate family. The instructor must be notified as soon as it is possible, preferably before the lab is missed. Going out of town on a recreational trip does not constitute a valid reason for requesting a make-up.

Oral presentations: You will give a 25 minute talk based on one of the labs. You and your partner will propose an addition to the lab of your own design, describing the purpose, theory, apparatus, and possible errors for the procedure. You don't have to do the measurement you propose (though you can earn extra credit if you do). We'll discuss how to make such presentations in lecture. The goal is to give you experience in presenting scientific results and answering questions in front of others. No matter what job you do in the future, you can benefit from learning how to present a topic in a clear and concise form.

"Incomplete" is given only in exceptional cases. In order to be considered for an "I", you must have completed 9 of the 12 assignments, took the quizzes during that period and have C or better standing at the time of incapacitation.

Academic Integrity

"By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the

highest standards of honesty. Cheating could result in disciplinary action that may include, but is not limited to, suspension or dismissal." More on the requirements of academic integrity can be found at http://www.umbc.edu/gradschool/procedures/integrity.html

BlackBoard

Assignments, lab notes, and announcements will be posted in BlackBoard. Take a look at the course BlackBoard page a day or two before the next lab, or if you suspect that guidance should be available in a given situation, such as inclement weather. We will also enter your grades into Bb so that you will be aware of your standing in the course at any time.

Disabilities

If you have any condition such as a physical or learning disability, which will make it difficult for you to carry out the work as described or which will require academic accommodations, please notify me ASAP, but definitely during the first two weeks of classes.

Course schedule

Week #	Dates	Activity	Assignment
1	Jan 29-31	Lecture on error analysis; Learn how to enter data on MATLAB and make an errorbar plot	**Hw#1**
2	Feb 5-7	Lecture on error propagation, practice on MATLAB	**Hw#2**
3	Feb 12-14	Lecture on least squares fitting, use of supplied MATLAB codes	**Hw#3**
4	Feb 19-21	Group A: Atwood's machine Group B: The Ballistic Pendulum	**LR#1**
5	Feb-26-28	Group A: The Ballistic Pendulum Group B: Atwood's machine	**LR#2**
6	Mar 5-7	Group A: Simple Harmonic Motion Group B: Angular Momentum	**LR#3**
7	Mar 12-14	Group A: Angular Momentum Group B: Simple Harmonic Motion	**LR#4**
8	Mar 19-21	Spring Break	**None**
9	Mar 26-28	Group A: Velocity of Sound Group B: Heat Capacity and Latent Heat	**LR#5**
10	Apr 2-4	Group A: Heat Capacity and Latent Heat Group B: Velocity of Sound	**LR#6**
11	Apr 9-11	Group A: DC Circuits and Ohm's law Group B: The Current Balance	**LR#7**
12	Apr 16-18	Group A: The Current Balance Group B: DC Circuits and Ohm's law	**LR#8**
13	Apr 23-25	Both Groups: The Ratio of e/m for the Electron	**LR#9**
14	Apr 30-May 2	Student presentations	**None**
15	May 7-9	Student presentations	**None**

16	May 14	Closing lecture, no lab	**None**