

Welcome to PHYS4052 - Methods of Experimental Physics II

Introduction: The second semester of the Phys4051/2 sequence consists of three components. In the first 4 weeks you will carry out several experiments. The bulk of the semester will be devoted to independent projects that will allow you to put into practice many of the skills that you have acquired over the last semester. Because these projects are such an important part of the Phys4052 course, some time in the first weeks will be spent on getting ready for them. The third component will be the lectures in which we will cover statistics and various topics in experimental physics.

Prerequisite: Completion of Physics 4051.

Staff: The faculty members for this course are:
Shaul Hanany (Office: Physics 333, 626-8929)
Office hours: Friday 4:30 – 5:30 PM and by appointment
Paul Crowell (Office: Physics 349, 624-4828, crowell@physics.umn.edu)
Office hours: Wednesday 2:30 pm – 3:30 PM and by appointment

Technical assistance for the laboratory is provided by:
Kurt Wick: (Physics 69, 624-2831, wick@umn.edu)

The teaching assistants are:
Joe Kinney Sections 2 and 3
(Physics 56, 624-7008, kinney@physics.umn.edu) Office hours: by appointment).
LiDong Pan Section 5
(Physics 75, 624-1876, pan@physics.umn.edu) Office hours: by appointment).

Information and Communication: Please don't hesitate to ask questions or communicate your concerns. Your best mode of communication with the professor is either during class, in the office hour or by email.

Information, announcement, material will be posted on the class WebCT. The WebCT for the course should appear in your courses at <http://www.myu.umn.edu>

Please bear in mind that important information and announcements made in class may not be posted on the web site.

You can also find some resources and material at: <http://mxp.physics.umn.edu>

Lectures: Three lectures are on M, W, F, 11:15 - 12:05, in 133 Physics. Topics that are covered in the lectures are in the syllabus at the end of this note. Student presentations that are part of the project will also be made throughout the course. These are described in more detail below. Attendance in the student presentations is mandatory.

Lab Tours: Depending on popular demand and on availability, we may have tours of research laboratories in the building and perhaps some University facilities. The schedule will be posted at a later date.

Experiments: All students must complete and write reports on three experiments, which will be assigned from the following group: "Ball Dropper," "Noise," "Diffraction" and "Measurement of the Verdet Constant of Water" (See the lab manual chapters 1 through 6.) Students are expected to work in pairs for these experiments, but **each student must write his or her own separate report, including his or her analysis**. The experiments require knowledge of electronics, computer interfacing and programming, and statistical analysis. Much of this material was covered in 4051. The experiments this semester are different than before in that you are expected to work out much of the details of the experiment on your own. The report should include a brief introduction, sections on your data collection and analysis and a conclusion. All reports will be limited to maximum 10 pages, double spaced, 12 point font. Please see the accompanying handout on WebCT. The reports are due at the deadlines given in the syllabus (see end of this handout).

Please note that all reports must be submitted to pass the class. An unjustified late submission will receive a grade of zero.

Homework: There will not be additional homework other than the lab reports and your project.

Project: A project is a self contained body of experimental research, development and analysis that you will conduct throughout most of the semester. In most cases you will work together with a single partner. Each team of students is assigned an advisor who is one of the class instructors.

The projects consist of the following components, which are explained in more detail below. On January 23 (Friday of the first week of the semester) you will be required to submit a **Letter of Intent**, consisting of a one-page description of your project. If we have questions about your letter we will meet with you for an **interview** during class time on January 30. On March 2nd, you will submit a 7 to 10 page **project description** for your proposed project. You will start working on your project on February 23. Between March 2nd and spring break, one participant in each project will give a 10 minutes **oral presentation** in class. The other member of each group will give a presentation at the end of the semester. Starting with the second project week, you should fill out a short **weekly progress report** on WebCT. The **Midterm Project Report** (due on April 6) is voluntary and is an opportunity to get initial feedback on your final report. You (or your group) can write up the sections covering theory, experimental setup and results if you have them. Submit the report and you will get feedback that could improve your final report. No grades will be assigned for this report.. Finally, on May 8, each *student* will hand in his or her **Final Project Report**.

Letter of

Intent: On January 23 you will be required to submit a Letter of Intent, consisting of a one-page description of what type of project you plan to do. If you did not receive the material describing the various aspects of the project at the end of last semester, please see Shaul Hanany or Kurt Wick immediately.

Interviews: If necessary, instructors will meet with you on January 30 to discuss the feasibility of your project and your needs. Additional meetings will be arranged as needed.

Project Description: Once your LOI has been approved, each student will submit on March 2nd a full project description for the experiment to be carried out later in the course. In order to ensure the success of these projects, we will lay considerable stress on the quality of the project description. We will distribute instructions and guidelines for writing a successful project description.

Poster

Session: The poster session will be held on Friday, May 8, and the physics faculty and students will be invited to attend.

Weekly
Progress

Reports: In order to track your progress, you must complete an electronic weekly project report in which you will briefly indicate the work you have accomplished, along with any other relevant comments. The reports will form the basis for weekly discussions with your project advisor. The weekly report forms can be found on WebCT.

Oral Pre-

sentations: Two oral presentations will be given by each group. The first presentation will be given in the first few weeks of the projects. It should last 10-15 minutes. In it you will need to explain the theory and goal of your project, how your group plans to carry out the measurements and how you plan to do the data analysis. The second presentation will be given in the final two weeks of the semester. The second presentation is 15-20 min. long. This presentation should cover the theory, goals, and experimental setup as well as results, analysis and conclusions.

Each student is required to give one of these presentations. Students may decide which partner will do the first presentation and which one the second.

These presentations will be given in Phys133 during scheduled class hours and will involve the use of computer generated presentation materials. PowerPoint or similar tools may be used and the presentation files must be submitted in ppt or pdf format at least 2 hours prior to the presentation.

All students must attend these presentations.

Project

Web Page: At the end of the semester each group is asked to describe its project in a dedicated a web page, which will be hosted on our server. This web page is useful for students of future classes.

Reports: In addition to the 'lab reports' for the experiments in the first four weeks, you will be writing a 'project report'. The project report assembles all the information about your project including theoretical background, goals, experimental set up, results, analysis and conclusions. The final project report is due on May 9. The report should be presented in the format of a scientific paper in the style of *Physical Review* or *Physical Review Letters*. Please have a look at papers published in these journals to understand what is expected both in terms of scope and style. Please submit the report as if you submit a paper. All reports will be limited to maximum 10 pages, double spaced, 12 point font. Your final report must also be submitted in electronic form as a PDF file. Although you will prepare the experiment, make the measurements, and may analyze the data with your partner, the entire report should be prepared and submitted individually.

Final

Exam: There is no final exam.

Grades: 30% of the final grade will be based on the lab reports from experiments of the first four weeks. 70% of the final grade will be based on your project, including letter of intent, project description, progress reports, oral presentations, and final report.

Attendance

Policy: Attendance is mandatory for all classes at which student presentations are being given. Please be prepared to justify your absence. There is a penalty of 5% of your final grade per absence for unjustifiable absences.

Lab

Notebooks: You must enter a record of every step of your work and all data acquired in a bound lab-notebook. Both students in a pair may use the same book so that all records are available to both.

Keys: Keys to your project rooms will be signed out to students during your first meeting with the instructors, otherwise, your U-Card give you access to the main lab (Room 65).

We hope you will enjoy the course!

Schedule:

DATE	DEADLINES	DUE DATES	LECTURES
1/19/2009	MLK		
1/21/2009	First Day of Class		Data Analysis
1/23/2009	LOI		Data Analysis
1/26/2009			Data Analysis
1/28/2009			Data Analysis
1/30/2009	Interviews		No Lecture
2/2/2009		First Lab Due	Shop Policies
2/4/2009			Writing Project Description
2/6/2009			Writing Project Description
2/9/2009			Writing Project Description
2/11/2009		Second Lab Due	Lock-In Amplifier
2/13/2009			Lock-In Amplifier
2/16/2009			Effective Presentations
2/18/2009			Effective Presentations
2/20/2009		Third Lab Due	Effective Presentations
2/23/2009	First Week of Projects		Grounding & Preamps
2/25/2009			Grounding & Preamps
2/27/2009			Grounding & Preamps
3/2/2009	Project Description Due		Cryogenics
3/4/2009			Cryogenics
3/6/2009			Cryogenics
3/9/2009			Initial Student Presentation
3/11/2009			Initial Student Presentation
3/13/2009			Initial Student Presentation
3/16/2009	Spring Break		
3/18/2009	Spring Break		
3/20/2009	Spring Break		
3/23/2009			Initial Student Presentation
3/25/2009			Initial Student Presentation
3/27/2009			Initial Student Presentation
3/30/2009			Initial Student Presentation
4/1/2009			Effective Scientific Writing
4/3/2009			Effective Scientific Writing
4/6/2009	Midterm Report		Effective Scientific Writing
4/8/2009			Vacuum
4/10/2009			Vacuum
4/13/2009			Microscopy
4/15/2009			Motion Control
4/17/2009			TBD
4/20/2009			Final Student Presentation
4/22/2009			Final Student Presentation
4/24/2009			Final Student Presentation
4/27/2009			Final Student Presentation
4/29/2009			Final Student Presentation
5/1/2009			Final Student Presentation
5/4/2009			Final Student Presentation
5/6/2009			Final Student Presentation
5/8/2009	Final Report Due		Poster Session