

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 experimental exercises. The bulk of the semester will be devoted to independent experiments 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:
Jeremiah Mans (Office: Physics 260e, jimmans@umn.edu, 625-8994)
Office hours: by appointment.
Clem Pryke (Office: Physics 313; pryke@physics.umn.edu ; 624-7578)
Office hours: 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 Section 2
(kinney@physics.umn.edu Office hours: by appointment).
Tanner Prestegard Section 3
(prestegard@physics.umn.edu Office hours: by appointment).
Zvie Razieli Section 4 and Section 5
(razi0001@umn.edu Office hours: by appointment).

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

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

Please bear in mind that some 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 this syllabus although they are subject to change based on the needs of the class. Student presentations that are part of the project will also be made throughout the course. These are described in more detail below. Participation in the student presentations is mandatory.

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

Experiments: All students must complete and write reports on three experimental exercises, 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**. These exercises require knowledge of electronics, computer interfacing and programming, and statistical analysis. Much of this material was covered in 4051. The reports should emphasize data analysis especially the determination of experimental uncertainty and 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, including figures, tables and graphs where the figures, tables and graphs should provide about 50% of the content. Please see the accompanying handout on the course web site. The reports are due at the deadlines given at the end of this syllabus or as posted on Moodle.

Please note that all reports must be submitted to pass the class. A late submission without an acceptable (see University policy) excuse will receive a grade of zero.

Homework: Homework may be assigned but will not be graded 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 experimental team of students must be approved by the class instructors.

Your team will be part of a "research group," consisting of approximately 5-7 research teams. The research group will meet during the semester to carry out safety reviews of all the projects, receive oral progress reports, discuss progress and observations from the project work, and exchange feedback on the preparation of the written project reports. The projects consist of the following components, which are explained in more detail below. On January 21st (Friday of the first week of the semester) you will submit a **Letter of Intent**, consisting of a one-page description of your project. The class instructors will meet as a program committee and determine whether or not to accept your project. If there are questions about your letter we will meet with you for an **Interview** during class time on January 28. You may be required to satisfactorily answer specific questions in writing to receive project approval. On March 4th, you will submit a 7 to 10 page **Technical Design Report (TDR)** for your proposed project. You will start working on your project as soon as your letter of intent is approved to do the experimental design and preliminary measurements necessary for the TDR. You will hand in a draft of the title, abstract,

introduction, and conclusion on February 21. You will receive feedback on this draft through a peer-review process.

Starting March 4th, one or more members of the experimental team will give a 10 minute **PowerPoint presentation** in class. The other members of each team will give a presentation before the end of the semester. Each week, starting with the second project week, each experimental team will fill out a short **weekly progress report** on Moodle. A single **Midterm Project Report** from each team due on April 8th. The Midterm Project report must contain the theory and experimental procedure sections of the final report and will be read and discussed by other members of your research group. Finally, on May 9th, each *student* will hand in his or her **Final Project Report**.

Letter of Intent:

As described above, on January 21 you will be required to submit a Letter of Intent, consisting of a no more than a two-page description of what project you plan to do, what equipment and other resources it will need, why it is interesting to do, and who is on your experimental team. If you did not receive the material describing the various aspects of the project at the end of last semester, please see Jeremiah Mans or Kurt Wick immediately.

Interviews: If necessary, instructors will meet with you on January 28 to discuss the feasibility of your project and your needs based on your letter of intent. Additional meetings will be arranged as needed. At that time you may be required to answer specific questions about your project in writing.

Poster Session:

The poster session describing the results of all projects will be held on Friday, May 6, and the physics faculty and students will be invited to attend.

Oral Presentations:

At least 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 and be accompanied by appropriate projected slides. 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 last 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 but all experimental team members are required to contribute to each presentation.

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 must 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 participate in these presentations.

Project

Web Page: At the end of the semester each group is asked to describe its project on 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 experimental exercises 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. Examples will be provided to understand what is expected both in terms of scope and style. All reports will be limited to maximum 15 pages, double spaced, 12 point font, including figures, tables and graphs where the figures, tables and graphs should provide about 50% of the content. Your final report must be submitted in electronic form as a PDF file. Although you will prepare the experiment, make the measurements, and analyze the data with your team, 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 experimental exercises of the first four weeks. The other 70% of the grade will be based on your project broken down as follows: final report: 30%; technical design report (TDR): 20%; oral presentation and participation, lab effort / participation in group meetings, including lab journal: 20%.

Attendance

Policy: Attendance is mandatory for all classes at which student presentations are being given. Please be prepared to justify any University sanctioned absence.

Lab

Notebooks: You must record every step of your work and all data acquired in a lab-notebook.

Keys: Keys to your project rooms will be signed out to students after the successful completion of your safety review. Your U-Card will give you access to the main lab (Room 65).

We hope you will enjoy the course!

Tentative Agenda – Changes will be announced in class

WEEK	DATE	ACTIVITIES	DUE DATES	LECTURES
1	1/17/2011	MLK		
1	1/19/2011	First Day of Class		Data Analysis
1	1/21/2011		Letter of Intent	Data Analysis
2	1/24/2011			Data Analysis
2	1/26/2011			Data Analysis
2	1/28/2011	Interview s		(no class)
3	1/31/2011		First Lab Due	Data Analysis
3	2/2/2011			Cryogenics (W. Zimmermann)
3	2/4/2011			Project Facilities (K. Wick)
4	2/7/2011			Vacuum Technology
4	2/9/2011		Second Lab Due	Safety Principles
4	2/11/2011		Safety Forms	Data Visualization and Plotting
5	2/14/2011			Effective Scientific Writing
5	2/16/2011			Research Group Safety Review s
5	2/18/2011		Third Lab Due	Research Group Safety Review s
6	2/21/2011	First Week of Projects	Partial Draft of TDR Due	Effective Scientific Writing
6	2/23/2011			Research Group Meetings
6	2/25/2011			Research Group Meetings
7	2/28/2011			Effective Presentations
7	3/2/2011			Effective Presentations
7	3/4/2011		Technical Design Report Due	Initial Student Presentation
8	3/7/2011			Initial Student Presentation
8	3/9/2011			Initial Student Presentation
8	3/11/2011			Initial Student Presentation
9	3/14/2011	Spring Break		
9	3/16/2011	Spring Break		
9	3/18/2011	Spring Break		
10	3/21/2011			Initial Student Presentation
10	3/23/2011			Initial Student Presentation
10	3/25/2011			Initial Student Presentation
11	3/28/2011			Initial Student Presentation
11	3/30/2011			Research Group Meetings
11	4/1/2011			Research Group Meetings
12	4/4/2011			Using Photons
12	4/6/2011			Using Photons
12	4/8/2011		Midterm Project Report Due	Using Photons
13	4/11/2011			Graduate Schools
13	4/13/2011			Research Group Meetings
13	4/15/2011			Research Group Meetings
14	4/18/2011			Final Student Presentation
14	4/20/2011			Final Student Presentation
14	4/22/2011			Final Student Presentation
15	4/25/2011			Final Student Presentation
15	4/27/2011			Final Student Presentation
15	4/29/2011			Final Student Presentation
16	5/2/2011			Final Student Presentation
16	5/4/2011			Final Student Presentation
16	5/6/2011			Poster Session
17	5/9/2011		Final Report Due (11am)	(no class)/Exam Week