Physics 4150 – Laboratory Research Methods

Instructor: Dr. Birgit Mellis
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Class Schedule: 16 weeks starting Jan 12, 2015

Office Hours:

Office Hours:
Mon: 10:00am-12:00pm
Tue: 3:30pm-5:30pm
Wed: 10:00am-12:00pm
Fri: 10:00am-11:00am
Other times: by appointment

Time and Place:
Each week a minimum of three hours of laboratory work, literature research, data analysis etc. have to be completed. Times and dates may vary according to schedule of students and instructor.

Regularly meetings (at least once weekly) in instructor’s office. Each student is responsible for setting up a dedicated weekly meeting time with the instructor in order to discuss their progress and next steps in the project!

Course Description:
Physics 4150 is an advanced course following the University or General Physics I courses and their accompanying Laboratories. It is designed for students who have a profound interest in the field. Students participate in ongoing faculty and departmental research programs. An initial project may be continued or a new project undertaken for additional credit. Students will work on a project alone or in a small team. Students have to read literature, collect and analyze data and present their results in form of a final comprehensive research report. (Format see next page). In addition to this report the research can be presented in form of a poster or oral presentation.

Prerequisites:
PHYS 2333/2111 University Physics I and Laboratory or PHYS 1331/1111 General Physics I and Laboratory or permission of instructor

Course Objectives:
Students will gain experience in working on advanced research projects, in operating sophisticated laboratory research equipment. They will develop experiments, collect, and analyze data and thereby hone their critical thinking skills. Students will gain experience in working as part of a scientific team and will become proficient articulating, discussing and presenting their results.
Grading:

This is a Pass/Fail course. In order to pass the course the student will have to fulfill the following requirements:

- Regular, weekly meetings with instructor.
- A minimum of 3 hours a week of time spent on the research project. This time includes the student: working in the lab, doing literature research, reading the appropriate background material for the project and/or analyzing experimental data.
- A final comprehensive written formal lab report about the research project needs to be submitted in the last week of classes (by Dec 8th).

Failure to accomplish all requirements will result in a Fail Grade for the course.

Attendance:
weekly attendance and a minimum of three hours laboratory work is mandatory

Research Report Guidelines:

The research report is a formal paper (including tables, figures, graphs, etc.) that reports the purpose, results, interpretation, and theory behind what was done during the course. The results are not graded. The report must be typed using 1.5 line-spacing and a 12 point font size (Arial). **BOTH an electronic and a paper version of this report have to be submitted.**

All reports should have the following format (details and points for each piece of the report are provided), clearly separate these sections from one another by using the section titles (given in bold print and underlined) to distinguish each section:

- **Title page.** This should have the title of the report, your name, the time frame in which the research was performed, and the date the report is turned in.

- **Abstract.** A short statement of what you did and what the results were. It summarizes all essential information. For an example, look up a research article in one of the journals.

- **Introduction.** This section is a very important part of the report. Here you are to discuss the theory behind the techniques and the overall goal of the experiments included in your report. The discussion does not have to be limited to the immediate experiment, but to the topic of the experiment.

- **Procedure and Equipment.** This should include a concise summary of the procedure and a list of special equipment used. Procedures should be given completely with enough detail that anyone could duplicate it. A section on safety must be included here, this should explain about the safety precautions taken with chemicals, lasers and other equipment you are using in your research.

- **Data and Conclusions.** The data should be given in picture, graphic and/or tabular form, whichever is needed to show what the results are. The findings need to be accompanied by a thorough discussion of the data along with a discussion of any errors.

- **References.** List all sources used to write the paper. Use the proper format for references (see citations in journals). At the very least, five different references must be included in the report.