

Syllabus: Physics 142 Laboratory

- **Required Materials**

1. *Physics 142 Laboratory Manual, digital format provided by lab instructor.*
2. Pen and calculator.

- **Official Course Description**

Prerequisite: Physics 141. Continuation of Physics 141. Electricity, magnetism, optics, relativity, atomic and nuclear physics. Lab fee required.

- **Laboratory Objectives**

1. Give you experience at relating physics concepts to human-based and real-world applications.
2. Strengthen your understanding of and intuition for basic physics concepts in electricity and magnetism, optics, atomic physics, and radiation.
3. Develop your skills at collecting and analyzing data and formulating meaningful conclusions based on this data.
4. Enhance your ability to communicate results and ideas through scientific writing, graphical models, and functional models.
5. Introduce you to various computer-based tools for studying sciences.
6. Practice your skills at working cooperatively within a group to achieve solutions to given problems.

- **Changes to Syllabus**

This syllabus is subject to change. Any changes will be approved by the lecture professor and will be announced and posted in the laboratory room.

Laboratory Requirements and Procedures

- If you have previously completed the Physics 142 labs, you may discuss your situation with your lecture professor. Some (but not all) Physics 142 lecture professors will allow you to re-use your past lab grade and be excused from attending the labs this semester. If this is the case, this is an arrangement between you and your lecture professor. You would still be required to register for a lab section and pay the required tuition and lab fees.
- All work for this laboratory will be completed in lab during the scheduled lab times. Your logbook must be submitted to the instructor before you leave the lab each lesson. Late work will not be accepted. Your laboratory instructor will grade each lesson report according to the *Grading Guidelines*.
- In the workplace, supervisors don't generally use letter grades or percentages to rate an employee's performance. Instead, they use verbal scores (such as competent and commendable) and comments. To help prepare you for that, your work for each lab will be

rated in a similar fashion. At the end of the semester, a formula will be used to calculate your final percent. See the *Grading Guidelines* section of this syllabus for more information.

- If you have a question about a score given for a lab, you should discuss this with your lab instructor. Please do not discuss personal grading issues during lab time. You should discuss concerns privately with your lab instructor at the end of lab or at a time outside of lab. If you feel a score is inappropriate, you should explain why, **in writing**, and give this written explanation to your lab instructor within one week of when you received the score. **Scores will not be reconsidered after the one-week time has passed.**
- Attendance at all laboratory meetings is mandatory. **Only the Lab Manager can grant an excused absence to a Physics 142 student.** One unexcused absence will reduce a student's lab score by $\frac{1}{2}$. Two unexcused absences will result in a failing grade for lab. More than two unexcused absences will result in a failing grade for the entire course.
- Having experience working successfully in teams is highly valued by scientific and technical careers. Therefore, part of the intention of the laboratory experience is to give you practice working with different people. You will start working in groups the first day, and you will be assigned different lab partners twice during the term, after quiz #1 and again after quiz #2.
- Each group will submit one Group Lab Report. It is important that EACH group member participate in the experiment, but only ONE "scribe" should record data and answer questions in such a way that each group member agrees. At the end of lab, each group member must peruse the report and agree to its contents.
- The scribe for each experiment must be a different group member each lab. Every member of a group should be the scribe at least ONCE before the quiz. In the case that a group has all members having been a scribe in the previous experiment (during a group change), the TA will decide which student is the first scribe.
- During quizzes, a group may share the group lab notebook to assist them in answering quiz questions, however they may NOT share answers from a group member's quiz, or any student's quiz.
- When you are the scribe, be sure to write neatly in your logbook and organize your work so that it is presented clearly. If the instructor cannot read your work, then he/she doesn't have to grade it! If you make a mistake, just cross it out with one or two lines and rewrite your response. You will not be graded down for things being neatly crossed out.
- Be sure to answer carefully and fully (using sentences) all questions in the laboratory handouts. Careful, well-thought-out answers will be worth more throughout the lessons than a lot of brief, unexplained answers. One-word answers such as "yes," "bigger," or "4.2" are meaningless and will be graded accordingly.
- Always write an "Accuracy and Implications" discussion to complete each lab. Each group member must assist the scribe when writing concluding statements. **No group member should leave until the lab report is complete and approved by all members.**
- Clean up your work area and arrange the equipment neatly before leaving. Your station must be ready for the next students. Report equipment problems to the lab instructor.

- Your final lab score will be based on the quality of your lab work and written reports (85%) and quiz scores (15%). All quizzes and lessons will count towards your final lab score. **The group lab report will be the grade each group member receives for each experiment, so be sure to come to a group consensus in answers in your group lab report.**
- The TA reserves the right to down grade any individual student's lab score if that student is not participating in the experiment and/or lab report answers.
- Final scores will be reported to the lecture professor at the end of the term. Please refer to the Physics 142 course syllabus to see how the lab score will be factored into your overall course grade.
- In order to maintain grading uniformity among sections, the Lab Manager or lecture professor has the option of scaling the lab instructors' scores. No lab scores will be scaled down.
- Any student caught copying another student's work or using lab reports from previous terms will automatically receive a zero for that experiment or quiz. In addition, your lecture professor and/or the Department Chair will be notified for further possible action.
- Students are expected to maintain a positive educational environment for all students in this class as outlined in the Students' Rights and Responsibilities section of the Undergraduate Bulletin.
- **Absences and Scheduling a One-Time Makeup Lab**
 1. If possible, students needing to make up a lab should contact the Lab Manager. You do not need to ask the lecture professor or the secretaries in the main office. If you have trouble contacting the Lab Manager, you may try contacting your lab instructor.
 2. The Lab Manager will give students permission for a make-up lab in any section if there is room for that person. There will be no make-ups offered once an experiment is put away.
 3. If a student has permission to do a makeup lab in a different section, the Lab Manager will notify both the regular instructor and the instructor of the makeup lab.
 4. When a student makes up a lab, he/she **MUST** turn in his/her lab papers to the make-up instructor before leaving the lab room. Be sure to write the name of the regular instructor on the papers before turning them in. The regular instructor will grade the lab.
 5. When making up a lab, the student attending a different section is responsible for their **OWN** lab report. The make-up student will work in a group, but they must submit their individual lab report to the makeup TA.
 6. If a student shows up unexpectedly to a lab asking to do a makeup, the instructor **MAY** let that student stay **one time** if there is sufficient room. However, in general students **MUST** contact the Lab Manager before scheduling a makeup if possible. If a student repeatedly shows up unannounced to lab sections in which they are not registered, then his/her lesson grades will be lowered on each occasion.
 7. If you miss all the lab sections while the experiment is being performed, you can discuss your situation with the **Lab Manager**. Only the Lab Manager may excuse a lab absence. An excused absence form will need to be filled out and can be downloaded from Canvas.

8. In the unlikely event of an emergency, you may be required to provide appropriate documentation to the **Lab Manager** when requesting a lab excuse.
- **Professional Ethics**
 1. Students will behave in a professionally responsible manner in class.
 2. Students will make every attempt to be to class on time and be ready to work.
 3. Students will treat the scientific tools and processes with care and respect.
 4. Students are expected to maintain a positive educational environment for all students in this class as outlined in the Students' Rights and Responsibilities section of the Undergraduate Bulletin.
 5. Students are expected to utilize the computers in this laboratory room in accordance with the policies as outlined in the Student Code of Conduct and Disciplinary Procedures section of the Undergraduate Bulletin.

Grading Guidelines for Physics 142 Labs:

At the end of each laboratory period, each group is to submit the group report to your lab instructor for grading. Your instructor will read through your work and make comments as to areas that need improvement and areas that are especially good. Each lesson will then be assigned one of the following "grades": Excellent, Impressive, Good⁺, Good, Good⁻ or Weak. The group lab report grade will be the grade for each group member, for each experiment, so be sure to come to a consensus for answers to the lab report.

Excellent: The quality of the lab report is (practically) perfect.

Impressive: The quality of the lab report is impressive. The physics concepts have clearly been thought through and were carefully applied. The experimental techniques and data collection were completed carefully. The data analysis was done precisely with all graphs and values labeled. Questions were answered in detail with all reasoning justified and explained. The wrap-up discussion shows a great overall understanding of the big idea of the lab activities and all results are based on the work done in lab, exceptional presentation, and lab work and report were very complete.

Good [+ // -]: The quality of the lab report is good. Report may include some small misunderstandings or have some missing units or labels. Some physics concepts have been identified. Measurements may be a little sloppy, but overall the experiment was completed correctly. Graphs were completed and represented the data collected. The wrap-up discussion represents a summary of the results obtained, acceptable presentation, and lab work and report were overall complete.

Weak: The quality of the lab report is weak. The report may contain some significant mistakes or misunderstandings. Experimental techniques may have been careless, and results suffered. Important information or aspects of the analyses may be missing. Relevant graphs may have some formatting errors or

omissions. The wrap-up discussion is simply a statement of the result or is missing. Presentation is disorganized, and the work is incomplete compared to the rest of the students.

All scores (including zeroes) will count toward your final lab grade. You may use the following equation to calculate your current lab grade. It is possible that some scores will be "scaled up" at the end of the semester. No grades will be "scaled down."

Estimated grade (out of 100%) =

$$85\% \left[\frac{(\#Exc)(10) + (\#Imp)(9.5) + (\#Gd^+)(9) + (\#Gd)(8) + (\#Gd^-)(7) + (\#Wk)(6)}{(\# \text{ of completed labs})(10)} \right] + 15\% \left[\frac{\text{Total quiz score}}{\text{Max possible quiz score}} \right]$$

Guidelines for Writing a 142 Lab Report in Your Logbook

Experimental logbooks are a crucial component of all technical work. Whether you are an engineer hoping to obtain a patent, a scientist hoping to publish your research, or a health professional documenting a patient's condition, accurate and detailed lab notes are essential. One goal for the physics 142 course is for you to develop your skills of recording and communicating scientific information through writing. Therefore, each laboratory period you will be required to complete and turn in a write-up in a bound logbook. This write-up should include all information necessary so that anyone (you, the lab instructor, or someone not even in the class) can read it and follow what happened. You should include all relevant information along with your measured data, calculations, conclusions, etc. It is this form of 'reporting' that you will work to master during this term in your lab write-ups.

Your lab instructor will highlight some of the important details that should be included in all write-ups. The following can serve as a helpful guide.

Basics:

All work should be recorded *in pen* in your logbook. If you should make a mistake, simply draw one or two lines through it. This will make sure that your logbook represents an accurate record of all scientific work you complete in this course. You won't be graded down for having information neatly crossed out. Be sure to write neatly if you expect your work to be graded!

Example of a mistake: ~~42 cm~~ 24 cm

Presentation:

It is important for you to record your information neatly and in an organized manner. Therefore, part of your grade for each report will include points for overall presentation. This does not mean that you are required to write everything "super neatly," but you do need to have items clearly labeled, organized in a way that someone else can follow your work, and neat enough so that your lab instructor can read it!

Information:

The following information should be included for each lesson:

- Lab title
- Date of the lab

- Your name
- Name of your partner(s)
- Name of the computer you are using, and
- Name of all saved data files.

Experimental Data: Carry out your procedures carefully to get the best results. Sloppy work will give you sloppy results. **All** measured quantities should be written down. Place the numbers in tables where helpful and label all quantities. Every recorded number must include the appropriate units.

In addition, be sure to include headers or descriptors that state what part of the lab is being done. Although you do not need to record all of the experimental techniques described in the lab manual, you should record enough information so you or your instructor can understand how the data was collected.

Data Analysis: **Calculations** - Include a sample of any mathematical calculations you perform on your data including any equation(s) that you entered into a spreadsheet. You do not need to show the same steps over and over if you are using a calculator or spreadsheet for your calculations.

Graphs - You will often analyze your results in the form of a graph. All graphs should be properly labeled, titled, and drawn neatly with the aid of a ruler or graphing software.

Inserts - You will often have information to insert into your logbook (e.g., computer printouts). These should be taped into the book to continue the flow of your experimental work. Be sure to identify and label all such material so that it is clear what information has been included.

Questions: Answer all numbered questions completely and clearly. You do not need to rewrite the questions but be sure you include enough information in your answer so someone reading it (like your instructor) will know to what you are responding. One-word answers are never a good idea.

Wrap-Up Discussion at End of Each Lab:

Accuracy: Your report should include a brief discussion of how your results or techniques could have been improved. Do NOT simply say "Experimental error" and do not make excuses for sloppy work. Answer the question, "If I were to repeat this experiment, what could I do differently to improve my results?"

Implications: At the end of your report, write a concluding statement about the "big idea" of your work. Do not just restate a final number but summarize the general physics concepts that were used and the implications of these concepts. This is often the most important part of your lab report so be sure to put time

and thought into writing a useful statement. Try to answer the question, "What did all of this mean?"

Participation:

Each lab student is expected to participate in all aspects of the lesson, to contribute to the group's work, and to allow and encourage the active participation of the other group members. Effective group work is one of the skills most sought after by employers and health practitioners and this laboratory course should provide you with experience in working as a group member. You can expect to change your partners during the term.