

# Physics 141

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**Office hours:** TBA

**WEBPAGE:** <http://d2l.arizona.edu>

**Textbook:** You should purchase the Physics 139/141/161H lab manual from the bookstore.

**Requisites:** Phys 140 and Math 122B are prerequisites. Math 129 is a co-requisite.

## Course Description:

Physics 139/141/161H is an introductory calculus-based physics laboratory course designed to teach students fundamental concepts of physics by performing actual experiments. The students will get hand-on experience using various equipment to collect the data that they need for their experiments. They will analyze the data and submit a report or a worksheet.

Phys 139 is intended solely for students who transferred here but who only have credit for our calculus-based electromagnetism lecture. This class, in combination with PHYS 140, is the equivalent of PHYS 141.

## Learning Objectives:

- Students will design experiments to measure many different physical quantities, and will then perform those experiments.
- Students will analyze data from their experiments and draw conclusions based upon that data.
- Students will write biweekly reports about their experiments and improve their presentation skills.

## Learning Outcomes

At the conclusion of this course, students will be able to:

- Effectively report on experimental results in writing.
- Create a linear plot for data which is naturally described by a power law or an exponential function and be able to extract information from the slope and intercept of that plot.
- Measure the speed of a moving object (such as a car) just by using their cell phone.
- Measure lengths less than 1 mm using a Vernier caliper.
- Use Microsoft Excel to analyze data.

## How Your Grade Is Determined

Item	Points each	Number of items	Total for Category
<b>Weekly Worksheets</b> On weeks when there is not a Formal Report	15	7	105
<b>Formal Reports</b>	50	5	250
<b>Lab Practical</b>	100	1	100
<b>Total</b>			455

As you can see in the table, for 6 of the experiments you will write a formal report and for 6 of the experiments you will turn in a worksheet. There are actually 13 experiments so the 13<sup>th</sup> experiment serves two purposes:

I: You can use this lab to replace one of your earlier grades if there is one you are not happy with. This 13<sup>th</sup> experiment can be done in “worksheet mode” or “formal report mode”. It is your choice so you can attempt to replace whichever previous low grade you want.

II: If you had a legitimate excuse for missing an earlier lab, the 13<sup>th</sup> experiment can be used to replace that lab.

## Grading Scale

$\geq 90.0$	A
80.0-89.999	B
70.0-79.999	C
60.0-69.999	D
$< 60.0$	E

Additionally, a student will automatically **FAIL** the course if there are three or more labs which are not completed. The following are the necessary conditions for a lab to be considered completed:

- The student must attend the lab, be an active participant in the lab activities, and not be disruptive.
- The student must submit in a timely fashion, a lab report and worksheets which must include in-lab notes signed by the TA. Reports and/or worksheets that are turned in more than 48 hours late, earn a grade of zero. In this case, the lab is considered to be not completed.
- The student must submit an electronic version of the text of their lab report to Turnitin.com via the D2L in an acceptable format at the same time as the paper copy.
- The student must not have violated the Code of Academic Integrity for any part of the lab. A lab report that includes a violation of the Code will be considered a lab which was not completed.
- The student must refrain from reckless behavior that endangers her/himself, others or the equipment. The student must not intentionally damage or disassemble the equipment. Students are expected to straighten up their work area before they leave.

**Requests for incomplete (I) or withdrawal (W)** must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.

## **Details about the worksheets, formal reports and the lab exam.**

### **Worksheets**

- No part of the Worksheets except acquiring the data is a “Team Project”! Turning in the same worksheet as your partner will result in a violation of the Code of Academic Integrity. Neither student will receive credit for completing the lab.
- Worksheets must be completed and turned in before leaving the lab.
- Worksheets will only be spot graded, i.e. checked for blanks, graphs, drawings. Also only 2 or 3 of the questions will be graded.
- 3 of the 15 points will be awarded for participation, i.e. your involvement in doing the experiment, cleaning up your work space, and your skills and care with the equipment and general lab behavior.
- 2 of the 15 points will be for the quality of your data.
- You must submit your data to the D2L dropbox before leaving class.
- You may not use someone else’s data. This is a violation of the Code of Academic Integrity.

### **Formal reports**

- No part of the formal report except planning the experimental setup and acquiring the data is a “Team Project”! Turning in a similar report to your partner will result in a violation of the Code of Academic Integrity. Neither student will receive credit for completing the lab.
- Details about what is required in each lab report will be described by your TA each week
- You must submit your data to the D2L drop box before leaving class.
- You may not use someone else’s data. This is a violation of the Code of Academic Integrity.
- Formal reports are due at the beginning of the next lab. A paper copy must be submitted in class and an electronic version turned into the D2L dropbox. The report is not considered turned in until both tasks are completed.
- Lab reports (paper and electronic) will be considered late ten minutes after the start of class.
- If the lab report is late by less than 4 hours, its grade is reduced 10%.
- If a lab report is late by more than 4 hours but less than 24 hours, its grade is reduced 25%.
- If a lab report is late by more than 24 hours and less than 48 hours, its grade is reduced 50%.
- If a lab report is late by more than 48 hours, its grade is ZERO. The student will also not receive credit for completing the associated lab.

## Lab practical

- This exam covers common lab skills and the ability to perform common laboratory tasks. You will be using equipment that you used throughout the semester.
- This occurs at the very end of the semester.
- You'll perform this exam by yourself. In other words, you will not have your lab partner to help you.

## Return of graded material

- Lab Reports, quizzes and worksheets should be returned to the students at the next lab meeting after they are turned in. If this is not happening, please contact the lab coordinator, Rohit Singh [rohitsingh@email.arizona.edu](mailto:rohitsingh@email.arizona.edu).

## Attendance

- Attendance is required and students must attend their own scheduled lab section.
- Missing a lab without an acceptable documented excuse, will reduce your final lab grade.
- Additional points may be lost if the lab report is late because you missed the lab at which the report was due!
- Being late, leaving early or leaving in the middle of the lab (for example to chat on a phone) may result in lost participation points or even being ruled absent.
- Lab quizzes are given at the start of the lab. Quizzes by students who arrive late are due when the rest of the class' quizzes are collected. Students arriving after the quizzes are collected get a ZERO on that quiz.
- If you leave without getting your TA to sign and date your notes, you will be considered absent.

## Incompletes

As per University policies, an incomplete is available only to those students who have completed the bulk of the course (75%) and have a passing grade on the completed material. A written agreement as to how the incomplete will be removed must be filed with the Academic

## Help and Computers

The first place to go for help is your TA's office hours. If you cannot make those office hours, try making an appointment. On most weekdays, help is available in the Physics consultation room, PAS 372. Graduate students will try to help you staff this room, but they will not do your homework for you.

Students enrolled in a Physics class, have access to the computers in PAS 272 during weekdays except when a class is using the room. The Physics Department provides these computers.

## D2L

- It will be assumed that all students will be familiar with D2L. D2L will be used as an official channel of communication from the instructors to the students as well as a way students can track their grades.
- If you take this course, you are agreeing to submit your papers online to a plagiarism-prevention program called TurnItIn.com. This is done through a dropbox on D2L.
- You should note that TurnItIn.com – always without your name and any personal information – will retain your paper as part of their database so that students who plagiarize from it can be detected.
- If you have questions or problems with TurnItIn.com, contact the D2L help site.
- Students are required to submit only the text portion of their lab reports.
- This text must be submitted in a format that TurnItIn.com can read: Plain Text (\*.txt) or Word formats (\*.doc or \*.docx).
- If a report is submitted in a format that cannot be read by TurnItIn.com, the report will be considered not submitted.
- The end time on the D2L dropbox is **NOT** the time the report is due. Reports are due at the beginning of your lab section.

## ACADEMIC INTEGRITY STANDARDS

Students who are **retaking** this class may NOT submit reports containing material from their own previously written lab reports or worksheets. This is considered a violation of the “Code of Academic Integrity.”

Each individual student is required to write his or her **own unique and individual** lab report. This means that two students should not work from a common draft. Duplication and or plagiarism will be treated as a violation of the “Code of Academic Integrity” and reported to the Dean of Students.

See the Dean of Student’s website for the complete Code of Academic Integrity.

## EACH STUDENT MUST INDIVIDUALLY (NOT A TEAM EFFORT):

- Write the text, including the procedure section.
- Plot the graphs including information as to how the slope was extracted.
- Do the analysis of data.
- Draw the figures of the setup, free body diagrams, etc.
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## “BORROWED” IMAGES

Students must make their own diagrams. Even with attribution, images from other sources will be marked as wrong.

## “BORROWED” TEXT

Any text that is not the student’s own must be shown in quotes and a valid attribution given to avoid charges of plagiarism. Put quotation marks around the quoted material and place the attribution within parentheses, immediately after the quote. Even with attribution, the student

may be marked down for not using his or her own words. If you quote something, then explicitly explain the quote in your own words. This applies to quoting the lab manual.

## **SANCTIONS**

General list of possible sanctions:

- In all cases, notice will be sent to the Dean of Students.
- Attendance required at a plagiarism workshop.
- Loss of credit for the entire report. This will then result in you being considered sent on that day. Students may not makeup this lab.
- Loss of credit for the report and a further reduction of the final course grade.
- Failing grade for the course.
- Permanent notation on the student's transcript.
- Suspension or expulsion from the University.
- Anyone helping another student cheat will receive the same sanctions.

## **Grading of a "Typical" Lab Report**

The actual division of points will vary from experiment to experiment. Sometimes there are many graphs and drawings but little theory. This is not an English or an Art class, but the TA must be able to quickly decipher what is written or drawn, otherwise it is wrong.

(Points shown are for a typical 50 point report.)

Each section of the report is to be titled, for example the abstract should be titled "Abstract."

### **TITLE PAGE 1 Point**

Experiment's title plus student's name, Lab partner's name, TA's name.

Course and section numbers, date and time of paper and electronic submission.

### **ABSTRACT 3 Points**

What were you trying to do? How did you try? What were your results (numbers)? This section should be 3-6 sentences.

### **INTRODUCTION 4 Points**

Explicitly state the goal of the experiment, what you are trying to do and show.

Relate the experiment to previous measurements and physical concepts.

### **THEORY & DERIVATIONS 8 Points**

What needs to be measured?

Derive the equation(s) that convert your raw data into the final results. Derivations of equations should include text helping to describe and motivate the math operations. Give the name of the law associated with equations as appropriate.

Equations throughout the report should be numbered.

### **DESCRIPTION of the PROCEDURE 4 Points**

What did you physically do and why? This should not be a copy of the lab manual. This should include what went right or wrong, tricks, hints, and limitations. How you overcame any problems. How measurements were made. This section almost always requires one or two drawings of the equipment setup.

## **RESULTS and SAMPLE CALCULATIONS 4 Points**

Final numbers and an indication of the calculations needed to get them. The sample calculation should show the entire process of starting with the original measured data and ending with the final results.

## **CONCLUSION and DISCUSSION 10 Points**

- Develop a logical case for your conclusions.
- Were the goals of the experiment met?
- Was it a “good” experiment? Given the equipment are the final numbers reliable?
- What went right or wrong? And how do these things affect the measurements?
- What were the **uncertainties** and how did they affect your final values?
- Do NOT say “human error, be explicit!
- If you claim a terrible measurement was good you should expect to be marked down.

## **TABLES, DRAWINGS, and GRAPHS 10 Points**

### ▪ **TABLES**

- Tables should be numbered and labeled, for example as “Table 4.”
- In your text, you should refer to your tables by these labels.
- Tables should have column labels with units.
- Each table should have a caption which explains what the table is and what is important, and if there is a graph of the data in the table.
- In your text, you should refer to each table at least once.

### ▪ **FIGURES**

- For most experiments, there should be a schematic drawing of the setup.
- This is not the same as a photograph, but rather is a picture showing the relationship of the equipment, often with dimensions and notes.
- Figures are not to be “borrowed” from anywhere!
- As needed there should be free body diagrams.
- Figures (drawings) should be numbered and labeled, for example as “Figure 2.”
- In your text, you should refer to your figures by these labels
- Each figure should have a caption that explains what the figure is and what is important in the figure.
- In your text, you should refer to each figure at least once. Often this would be an expansion of the caption.

### ▪ **GRAPHS**

- Each graph should use at least half of the sheet of graph paper.
- Graphs should have labeled axes with units, and as appropriate: the errorbars, best fit line, range of fit lines, and indications of what values were used to extract the slope.
- Data points should not be connected dot-to-dot. Instead show a best-fit line.
- Graphs should be numbered and labeled, for example as “Graph 3.”
- In your text, you should refer to your graphs by these labels.

- Each graph should have a caption that explains what the graph shows about the data. Also the caption should identify the table that contains the plotted data.
- In your text, you should refer to each graph at least once. Often this would be an expansion of the caption. You should use your graphs to support your conclusions.

▪ **If computer graphs are allowed:**

- The student is responsible for seeing that all of the above requirements are met.
- Each graph should cover most of a half page of paper.
- Unnecessary items like  $R^2$  should not be displayed.
- The background should be white.
- There should be reasonably spaced vertical and horizontal gridlines.
- Slopes should still be determined manually using the rise-over-run method.

**WORKSHEET**  
**PARTICIPATION**  
**QUALITY OF DATA**

**1 Point**  
**3 Points**  
**2 Points**

### Grading Chart

Course \_\_\_\_\_ Section \_\_\_\_\_ Student's Name \_\_\_\_\_  
 Experiment \_\_\_\_\_

Item	Out of	Score	Comment
Title	1		
Abstract	3		
Introduction	4		
Theory and Derivations	8		
Procedure	4		
Results & Sample Calculations	4		
Conclusion and Discussion	10		
Tables, Drawings and Graphs	10		
Worksheet	1		
Participation	3		
Quality of Data	2		
Total	50		



## **Absence and Class Participation Policy**

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>.

Absences pre-approved by the UA Dean of Students (or Dean Designee) will be honored. See: <https://deanofstudents.arizona.edu/absences>

As was described above, if you have a legitimate excuse for missing one lab experiment you can make that up using the 13<sup>th</sup> experiment. If you were to miss a second experiment (again with a legitimate excuse) you should meet with Dr. Singh to discuss possible options.

## **Classroom Behavior Policy**

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.).

In addition, since you are in a laboratory there are a number of other rules that you are expected to follow.

1. No food or beverage, other than water, is allowed in the laboratory room
2. Shirt and shoes must be worn in the laboratory.
3. Roller skates and roller blades may not be worn in the laboratory.
4. Bicycles and skateboards are not allowed in the laboratory.
5. Cell phones must be off except for use as calculators or cameras to record setups.

## **Threatening Behavior Policy**

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See <http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

## **Accessibility and Accommodations**

**Our goal in this classroom is that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact the Disability Resource Center (520-621-3268) to establish reasonable accommodations. For additional information on the Disability Resource Center and reasonable accommodations, please visit <http://drc.arizona.edu>.**

If you have reasonable accommodations, please plan to meet with me by appointment or during office hours to discuss accommodations and how my course requirements and activities may impact your ability to fully participate.

**Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.**

### **Code of Academic Integrity**

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: <http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>

### **UA Nondiscrimination and Anti-harassment Policy**

The University is committed to creating and maintaining an environment free of discrimination; see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

### **Subject to Change Statement**

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.