

# Lab Syllabus

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## Goals:

To apply what you learn in the lecture, you will need some skills and concepts that are best learned in the laboratory. These skills include model building, data collection and data analysis, laboratory record keeping, and formal reporting of results. You will also need enough statistics to perform elementary hypothesis testing. These skills apply to quantitative work in many fields, including the health- and life-sciences, math, and engineering. Although these activities should improve your understanding of the lecture material, our principle goal is to turn theory into practice.

Most students in introductory physics courses have had lab experience in chemistry and other disciplines. We build on that experience. Your teaching assistants will not be as specific about their requirements as your chemistry teaching assistants may have been. You will often be expected to figure things out on your own in consultation with your lab partner. You will be graded by the rubrics, which can help to provide some guidance, and the written instructions **will not prompt you** to provide all required information. Since you will be working more independently, you will be required to document your work more carefully, with less input from your teaching assistant.

To accomplish these goals, you will be expected to:

- Apply physics in a variety of physical settings.
- Build simple mathematical models.
- Design experiments.
- Document your experimental work, results, and data analysis in lab notes and notebooks.
- Evaluate and compare results using uncertainties.
- Employ representative software packages for data collection and analysis.
- Document your experimental methods, results, and data analysis in a lab notebook.
- Evaluate and compare results using uncertainties.
- Communicate your work in writing (short and long formal assignments).

## Student responsibilities

- **Read the syllabus.** The regulations/guidelines in this syllabus take precedence over any oral commitments that may be made. The lab director is responsible for the final interpretation of these policies.
- **Arrive at your lab on time.** Many important instructions are given in the first 5 minutes of lab. It is vital to be on time to lab. In rare cases, room assignments may be adjusted to accommodate special requirements of a particular lab. Notice will be posted when this happens. Arrival to lab more than 15 minutes late without prior authorization will reduce your final grade by 2% through loss of Exit Ticket.
- **Make sure that all submitted work is your own.** Academic dishonesty is not tolerated and is grounds for failing the course. Should a student have access to legacy lab notes, sufficient changes have occurred in recent semesters that this will be immediately apparent. When working with your lab partner, you may discuss what to include in your notebook, but you must then write those things in your own words.
- Before each lab:
  - **read the lab manual** and related course material, particularly if the material has not already been covered in lecture. Chapters in the freely available OpenStax textbook are referenced for further investigation, YouTube MOOC offerings can also help get you up to speed. Check out MIT OpenCourseWare as well as EdX and Coursera.
  - You are expected to use the week prior to lab familiarizing yourself with all material required for the lab.
  - Some rubric categories require that you complete the work being graded prior to attending lab, this typically means preparing the introduction section for the lab and writing up a Lab Agenda which outlines how you expect the lab to run for the week.
- Bring your Lab Intro and Agenda, calculator, pen/pencil, lab notebook, and scratch paper to lab each week.
- Come prepared to perform mathematical calculations based on the level of math appropriate for the course. This includes calculus, algebra, geometry, and trigonometry. All labs also conduct statistical work, which is not covered in any prerequisite courses for these labs. Students may wish to utilize Khan Academy or other resources for help with statistics.
- Do not bring food, tobacco, or beverages into a lab room.

### What is expected of you during each lab

In lab, you are not required to get to the "end" of the experiments. The goal isn't for you to perform some given action. The goal of the experiment is to get experience with and exposure to experimental techniques and data analysis.

Be deliberate with your approach to all parts of the lab. Doing parts one through three out of a seven part lab incredibly well is better than doing all 7 parts sloppily. And both will be graded on the merits of the work which was completed by the partners. So long as you are making an effort to advance/improve during the full three hours in the lab, you will be capable of obtaining the same experience and advancement as others in the room.

With an introductory experience in performing experimental science, you will not uncover great

secrets which rock the foundations of science as we know it. You will not become a high quality researcher. You may however develop habits and approaches which can serve you well on the path to accomplish such feats. Our goal is to have you learn how to observe carefully and record important details, how to design an experiment to test a hypothesis, what the difference is between a hypothesis and a prediction, to train you to be aware of assumptions, to pay attention to accuracy and precision, to quantify and account for error. And finally, our goal is also to help you learn how to communicate the results of your research to others.

## Final lab grades

Lab and Lecture components of this four credit course are only loosely linked. Due to the open ended nature of scientific investigation, the Lab component is evaluated on a Pass/Fail basis. Final grade for the course will be determined completely by performance in Lecture activities. However, a failure of either the Lab or the Lecture will count as a failure of both, and each component will need to be re-taken if the student desires a passing grade (or just takes the course to obtain a better grade).

**A student fails the lab if they score under 70%.** Labs are weighted so that the start of the semester contributes very little to your final grade, and the end of the semester contributes heavily to your final grade. This is designed to permit students to develop familiarity with the expectations of the course.

Each lab has 5 to 15 rubric categories assigned for evaluating the student work. Each rubric can be scored as either No Effort for zero points, Progressing for one point, Expectation for 3 points, or Scientific for 4 points. The maximum score for each lab is calculated based on acquiring Expectation in each Rubric category, meaning that students who put in the work to get evaluated as Scientific acquire extra credit.

As another component of your grade, each week you must complete an "Exit Ticket" before leaving lab for the day. This primarily consists of "put everything how you found it" level of cleaning up your own lab station, but one important item to be aware of is that it includes "Required Level of Effort" as a check. Required Level of Effort covers four checks:

1. Complete the pre-lab assignment
2. Arrive on time (no more than 15 minutes tardy without prior authorization)
3. Complete the lab (stay and work productively the full 3 hours, or reach the end of all lab instructions and exploration of any issues noted during lab)
4. Work well with your partner.

Working well with your partner is determined at the TA's discretion. A warning will have been issued during the lab session before a student is refused their Exit Ticket due to working poorly with their lab partner. Each Exit Ticket counts as 3% of the final grade.

Although each lab partner in a group will report the same data, *your data analysis, discussion of results, and conclusions must be your own.* The Rubrics should be your guide for ensuring that your work is adequate prior to submitting it. In the last 30 minutes of class, before you leave your lab session and submit your work, review what you have recorded and evaluate yourself using the

rubrics. There should be no mystery about what marks you will see when graded work is returned in the next week.

Questions regarding feedback on lab assignments need to be discussed with your teaching assistant within two weeks of receiving the evaluated material (earlier at the end of the semester). Final lab assessments (pass/fail) will be posted on Blackboard 1 week after makeup lab. Errors that affect your physics course grade will be corrected after final grades are submitted to the Registrar, if necessary.

## Summary:

You pass the lab portion of the class if you score a 70% or better in lab. Lab scores are comprised of the following:

- 36% - Exit Tickets (3% each lab)
- 30% - Lab 10, 11, & 12 Rubrics (10% each)
- 21% - Lab 7, 8, & 9 Rubrics (7% each)
- 10% - Lab 4, 5, & 6 Rubrics (3.33% each)
- 3% - Lab 1, 2, & 3 Rubrics (1% each)

Note that Labs 1-3 Rubrics are worth less than the Exit Ticket for the lab. These labs are your time to ask many questions about the Rubrics and work on understanding how to complete the future labs for yourself.

## Attendance Policy

A make up session is available for the final 3 (highly weighted) labs only, and that session is at your normal lab time the session following the twelfth lab. Ensure that your schedule is set to avoid missing any of the final 3 labs. Save your one make up opportunity for unplanned emergency/medical use.

There are no make up opportunities offered for the earlier labs. The make up lab session cannot be used to redo a lab previously attended.

**Do not attend lab if you are ill with something contagious.** Review your Lab Manual and discuss via email with your TA or peers to learn what you can of any new concepts from that missed week. If illness results in missing one of the graded lab sessions, notify your TA as soon as possible to ensure you have material available during the make up session at the end of the semester.

Students with Access Center accommodation for Flexible Attendance need to meet with the Lab Director within 2 weeks of being assigned the accommodation to discuss how it may impact the attendance policy for these labs.

**Exam Conflicts** - If one of your other classes schedules an exam outside of normal hours and it conflicts with your lab session, *the instructor of that other class is required to arrange an alternative time for the exam* with you. This is set forth in WSU Academic Regulation 80 as of Spring 2016. Do not penalize your grade in lab just to take an exam, inform your professors of the regulation if they are unaware of it, and they will arrange an opportunity for you to take the exam without

missing lab. But informing your professor of the conflict and arranging an alternate exam is your responsibility.

**Students are not permitted to attend any lab section other than the one for which they are registered.**

## **Academic Integrity**

Academic integrity is the cornerstone of higher education. As such, all members of the university community share responsibility for maintaining and promoting the principles of integrity in all activities, including academic integrity and honest scholarship. Academic integrity will be strongly enforced in this course. Students who violate WSU's Academic Integrity Policy (identified in Washington Administrative Code (WAC) 504-26-010(3) and -404) will receive no points for the lab in which the violation occurs and a further 5% reduction to their final evaluation in the lab, will not have the option to withdraw from the course pending an appeal, and will be reported to the Office of Student Conduct.

Cheating includes, but is not limited to, plagiarism and unauthorized collaboration as defined in the Standards of Conduct for Students, WAC 504-26-010(3). You need to read and understand all of the definitions of cheating: <http://app.leg.wa.gov/WAC/default.aspx?cite=504-26-010>. If you have any questions about what is and is not allowed in this course, you should ask course instructors before proceeding.

If you wish to appeal a faculty member's decision relating to academic integrity, please use the form available at <https://conduct.wsu.edu>.

## **Disability accommodations**

Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in the lecture or lab, call or visit the Access Center in the Washington Building, Room 217 (Phone: (509) 335-3417, e-mail: [Access.Center@wsu.edu](mailto:Access.Center@wsu.edu), URL: <http://accesscenter.wsu.edu/> ). All accommodations MUST be approved through the Access Center. Notify both your lecture instructor and the lab director during the first week of lecture concerning any approved accommodations. Late notification may cause the requested accommodations to be unavailable.

As laboratory work is quite different from standard classwork, and we have no examinations, few accommodations apply to labs. Be sure to mention to your TA if you feel one of your accommodations should apply and is not being met.

## **Safety resources**

General information on campus safety is posted in the Campus Safety Plan. Information on how to prepare for potential emergencies is posted on the Office of Emergency Management web site. Safety alerts and weather warnings are posted promptly at the WSU Alerts site. Urgent warnings that apply to the entire University community will also be broadcast using the Campus Outdoor

Warning System (speakers mounted on Holland Library and other buildings) and the Crisis Communication System (e-mail, phone, cell phone). For this purpose, it is important to keep your emergency contact information up to date on the MyWSU system. To enter or update this information, click the “Update Now!” link in the “Pullman Emergency Information” box on your MyWSU home page).

Safety information that applies to the laboratories appears in the Lab Manual. Your teaching assistant will also present any safety information that applies to the current laboratory at the beginning of the laboratory. Students are expected to conduct themselves responsibly and take no unnecessary risks in the course of their work. Students who disobey the safety instructions of the teaching assistant will be directed to leave the room. All accidents and injuries must be reported promptly to your teaching assistant.

An Emergency Guide is posted by one door of each lab room. Classroom and campus safety are of paramount importance at Washington State University, and are the shared responsibility of the entire campus population. WSU urges students to follow the “Alert, Assess, Act,” protocol for all types of emergencies and the “Run, Hide, Fight” response for an active shooter incident. Remain ALERT (through direct observation or emergency notification), ASSESS your specific situation, and ACT in the most appropriate way to assure your own safety (and the safety of others if you are able).

Please sign up for emergency alerts on your account at MyWSU. For more information on this subject, campus safety, and related topics, please view the FBI’s Run, Hide, Fight video and visit the WSU safety portal. Each lab room door can be locked from inside in case of a lock down.

## **Possible changes**

The lab director reserves the right to correct errors in the syllabus and to modify lab schedules and room assignments. The lab director has delegated some authority to modify assignments and due dates to your teaching assistant. This helps ensure that you are graded according to the criteria stated during your lab meeting.

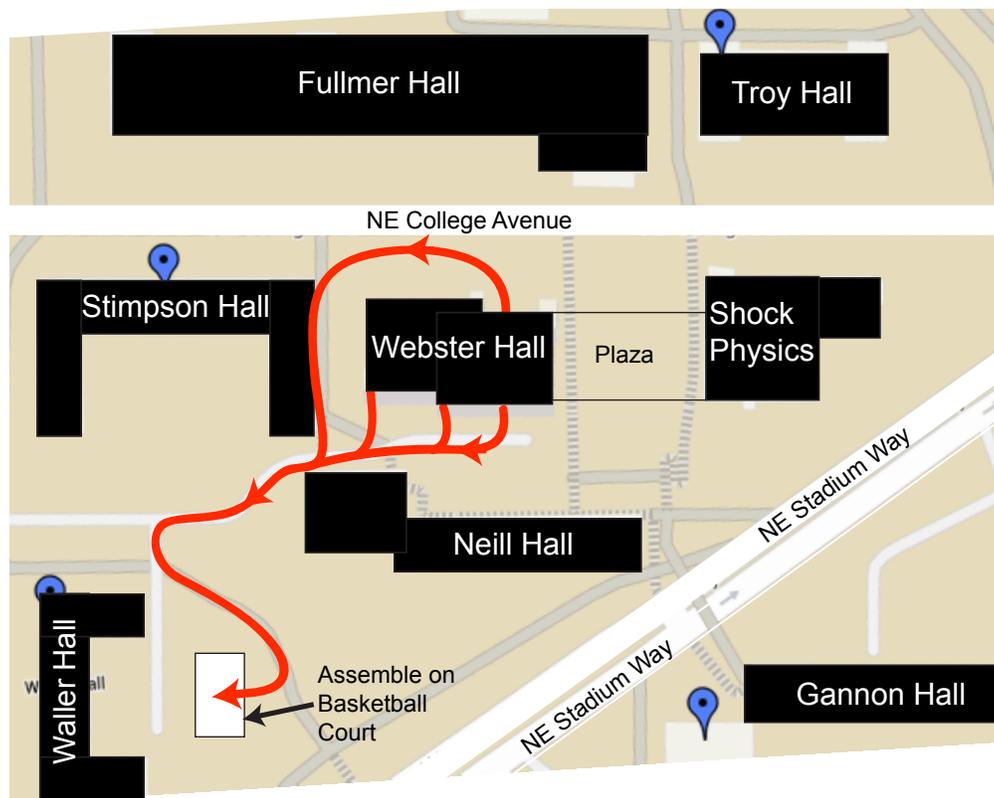


Figure 1. Physics and Astronomy assembly point. In case of a fire alarm, exit the building and gather at the basketball court behind Waller Hall. Use the stairs. Do not use the elevators in case of fire. A department representative will tell us when it is safe to re-enter the building.