

Syllabus

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Instructor Information

Office: Sequoia Hall 402

Phone: (916)278-6501 (x86501 on campus)

email: ray@csus.edu (<mailto:ray@csus.edu>) (probably best way to contact me)

Office Hours:

- Monday's 3:00 - 4:00 PM SQU 124 (tutoring center)
- Wednesday 3:00 - 4:00 PM SQU 402
- By appointment - I try to adhere to an open door policy as much as possible. You can always stop by my office to see if I'm available.

Course Information

Class Meetings Tuesday Thursday 9:00 - 11:50 AM Sequoia 140

Course Webpage: Canvas <https://csus.canvas.edu> (<https://csus.canvas.edu>)

Course Materials:

- Required: John R. Taylor, *An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements*
- Required: A bound laboratory notebook, "quad ruled" (graph paper)

Description

Physics 175 is a "quasi-capstone" course for physics majors. In this course, students are expected to hone and demonstrate their physics knowledge in a laboratory setting. Emphasis will be placed on developing your laboratory skills, data analysis techniques, and communication (presenting your work

both in both written and oral formats). Data collection and analysis will be done in groups, as is the majority of experiments performed today. It is important to learn how to work efficiently and effectively in such an environment.

Prerequisites

Physics 106, Physics 115 or 145, and six additional units of upper division physics. If you feel that you need to take this class without these prerequisites, please be prepared to explain why.

Course Goals

- To gain experience in a range of laboratory techniques used in a variety of different physical systems.
 - To acquire advanced laboratory skills including collecting and analyzing data, and in performing error analysis.
 - Use your knowledge of physics to make sense of experimental results.
 - Practice communication of scientific results.
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Course Format

Lectures

Although a majority of this class will take place in the lab, there will be two weeks of introductory lectures regarding data analysis, scientific communication, safety, and some activities and homework to prepare you for work in the lab. This work will give you the opportunity to practice data analysis techniques you will need for your lab work, and skills you will need to present your results. Though you can work together (and most likely will for some of the activities), everyone will have to turn in their own completed homework which represents your own work.

Lab

Once we begin the experiments, you will be broken into small collaborations. Each experiment will last for two weeks. The available experiments this semester are:

SQUID	Atomic Spectroscopy
X-Ray Diffraction	Geiger-Mueller Detector
Noise/Signal Extraction	Lifetime of Unstable Particles

Collaborations will rotate through all the experiments for each two-week session

In order to work efficiently in the lab, you need to read over the material for the experiments so that you have an idea about what you will be doing. Additionally, some experiments have pre-lab problems which all members of the collaboration must complete before you begin work in the lab.

Grading

Your grade in the course will consist of the following parts (points subject to change):

Homework (30 points)

There will be four homework assignments, plus a practice informal report and a practice peer review report due as noted on Canvas. Each homework assignment is worth a total of 5 points based on effort:

- 5 - Good effort, correct solutions/reasoning on all problems
- 4 - Good effort, some minor issues on some problems
- 3 - Marginal effort on some problems, or incorrect solutions/reasoning
- 2 - Marginal effort and incorrect solutions/reasoning
- 1 - Minimal effort
- 0 - Did not turn in

Homework is due at the beginning of class on days listed on Canvas.

Late homework will receive a two point penalty until solutions are posted, after which they will not be accepted anymore.

Informal Lab Reports (60 points)

For each experiment you will turn in a report that details what you did in the lab. **Each person will turn in their own informal report.** See separate handout for a guide on writing informal reports. Points will be awarded as follows:

- 3 points - Participation (came to class on-time, helped out in the lab, etc)
- 3 points - Notebook (this includes pre-lab work, and analysis done on the experiment)
- 2 points - Writing (Is the work clearly explained in good english)
- 2 points - Presentation of results (quality of figures/graphs and tables)

Informal reports are due on Canvas by the end of the day, one week after completion of the lab. Late reports are penalized 1/2 point per day for 10 days after which you receive half credit.

Lab Notebooks - We will be using Microsoft OneNote for our lab notebooks this semester. You have access to this for free through the University's Office 365 subscription, and you should receive an email with a link to the notebook. When assigning points for the lab notebook I will be looking for the following information:

1. Pre-lab work (needs to be done before you begin work in the lab)
2. A brief description of each experiment you will be performing in the lab (i.e. what are you trying to measure, and how are you going to measure it). This should include pictures and diagrams of the experiment.
3. All the data you collect in the lab along with descriptions of it (i.e. what are the parameters for the data set).

4. Analysis you perform on the data. If this involves calculations, you can do it on paper, take a picture of it, and upload the picture to OneNote.

Journal Article (60 points)

After the third experiments, each collaboration will select one of the labs they performed and prepare a journal article for submission to the Journal of the Advanced Undergraduate Physics Laboratory Instruction (JAUPLI). This is an actual journal that can potentially publish your work. The article is to be written by the entire collaboration. Report guidelines will be posted on canvas. The timeline for submission is as follows:

1. Initial submission (5 points) - due two weeks after the completion of the third lab. This should be a completed article, and should satisfy all the formal report guidelines. However, I will not be grading it in depth, but will check that it satisfies the submission guidelines. Reports that do not meet submission criteria will be "returned without review." The collaboration will have to revise and resubmit, and will lose two points off of the initial submission grade. Late reports will receive a two point penalty.
2. Final Submission (50 points) - The initial submission will be sent out to review, and will be reviewed by a advanced lab student at another institution. The review is double blind meaning the reviewers do not know your name (so don't put your names on the paper!), and you do not know their names. Once you receive the reviews, Collaborations will revise their papers based on the comments they receive from the reviewer. When turning in the final paper, collaborations must also submit a response letter detailing what changes they made in response to the reviewers. The submission, and letter, will be due on the date and time that the final exam is normally scheduled for.
3. Peer Review (5 points) - In addition, you will be expected to give back to the community by being a reviewer for papers written by students at other universities. You should expect to perform two peer reviews over the course of the semester. In this review you will give constructive feedback about how well the submission satisfies the guidelines, and how the authors can make the report better. Just as before, these are double blind reviews. The reviews will be graded based on how useful they are to the authors. Reviews must be submitted within a week of receiving the request. Late reviews will receive a two point penalty. If you do multiple reviews, your grade for this portion of the class will be an average of the score you receive for each review.

Presentation (20 points)

Groups will give a 20 minute presentation on their formal report experiment. It should be designed in the model of a talk to an audience of people with a strong background in the general field of your experiment, not who have not actually performed the experiment. Think of it as a presentation at a conference of professionals, they know enough to ask good questions, but not enough to answer the questions. There is one presentation per group, but it should be divided amongst each group member (i.e. one group member does the introduction/background while the other does the results/analysis).

Final Grades

The final grade will be based on a professional judgment of your work throughout the term with considerations for the performance of the class as a whole. Letter grades will be assigned based on the

performance of the class as a whole, but will roughly follow the typical scale of A: 90%-100%; B: 80% - 90% etc. These numbers can be revised downward, but not upward. I.e. if everyone gets greater than 90% then everyone gets an A.

Additional Course Policies and Information

Conduct

Please conduct yourself in a safe, professional manner in this class. The department has approved safety policies which we will review. Everyone must sign that they understand the policies before you may begin work in the lab. Unsafe conduct in the lab could result in suspension or dismissal from the course (along with grade penalties). Additionally, there is absolutely no eating or drinking in any of the labs. If you need a coffee or food break, you may eat in 140 (though not in the faraday cage or on the lab benches). Failure to abide by this rule will result in loss of participation points for that lab.

Attendance

As this is a laboratory-based course you must attend the class everyday, and actively participate in the experiment. Your partner is depending on you as many experiments require two sets of hands and eyes, and absences can set everything back. Even if you have finished your experiment (some are designed to only take one week), you must still come to class to work on analysis. Attendance will be taken every day, and is part of the informal report score.

Academic Honesty Statement

The Department of Physics and Astronomy has unanimously approved the following statement:

The faculty of the Department of Physics and Astronomy will not tolerate academic dishonesty. Falsification of data, copying, unauthorized collaboration, plagiarism, alteration of graded materials, or other actions (as described in, but not necessarily limited to the CSUS Policy Manual) will be promptly reported to the Office of Student Affairs. The offending student will be penalized on the assignment in question. Serious infractions will result in course failure and a recommendation for administrative sanctions.

Note that although you will be working in groups to complete the labs and you will be sharing data, you must keep your own notebook and write your own informal reports. Formal reports must be original work of the group only. Make sure to cite any outside information or figures that you used. And while I encourage you to work together on the homeworks, the solutions you turn in to me must represent your work, and not be copied from another student. If you have any questions regarding this, please come and speak with me about it. When in doubt of an action to take, ask!

Students with Disabilities

If you have a disability and require accommodations, you need to provide disability documentation to SSWD, Lassen Hall 1008, 916-278-6955. Once registered students should schedule an appointment

with me to make appropriate arrangements. All discussions will be confidential.

Basic Needs Support

If you are experiencing challenges in the area of food and/or stable housing, help is just a click, email or phone call away! Sacramento State offers basic needs support for students who are experiencing challenges in these areas. Please visit our Basic Needs website to learn more about your options and resources available. <https://www.csus.edu/basicneeds/> [\(https://www.csus.edu/basicneeds/\)](https://www.csus.edu/basicneeds/)

Mental Health Support

All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful. Student Health & Counseling Services at The WELL is here to help: call **(916) 278-6461** and visit their website at <https://www.csus.edu/shcs/> [\(https://www.csus.edu/shcs/\)](https://www.csus.edu/shcs/)

Gender Violence Resources

CSUS is committed to providing an environment free of all forms of discrimination and sexual harassment, including sexual assault, domestic and dating violence, and genderbased stalking. If you (or someone you know) has experienced or experiences genderbased violence (intimate partner violence, attempted or completed sexual assault, harassment, coercion, stalking, etc.), know that you are not alone. CSUS has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, helping with legal protective orders, and more. If you wish to speak to someone confidentially, you can contact the CSUS confidential advocate at: (916) 278-5850 or contact WEAVE's 24- hour hotline (the primary provider of crisis services for survivors of domestic violence and sexual assault in Sacramento County) at: (916) 920-2952. You could also contact the counseling center at: (916) 278-6252.

This syllabus is intended to give students guidance in what should be expected during the semester, and will be followed as closely as possible. However, the instructor reserves the right to modify, supplement, and make changes as the needs arise. Any changes will be announced in class or by email.