

Course name	GEOS 440: Fundamentals of Environmental Science Instrumentation
Semester	Fall, 2018
Instructor	Dr. Shane D. Mayor
Meetings	Lectures: Mondays and Wednesdays from 11:00 to 11:50 AM in Holt 113. Lab: Fridays from 2:00 to 4:50 PM in PHSC 225.
Office hours	Mon. & Weds. from 1:00–2:30 and Fri. from 1:00–2:00. (Please e-mail me to let me know you are coming. If not in office, check PHSC 128 or PHSC 217.)
Office	Physical Science Building (PHSC), room 117
Mailbox	Department of Geological and Environmental Sciences office (PHSC 217)
Phone	530–898–6337
E-mail	sdmayor@csuchico.edu
Teaching assistant	Kyle Rocha-Brownell, kyledbrownell@gmail.com , Office: PHSC 128.
Class webpage	http://physics.csuchico.edu/~sdmayor/teaching/GEOS440_F18/index.html
Prerequisites	GEOS 250 and PHYS 202B or PHYS 204B or PHYS 204C.
Required Book	Harrison, R. G., <i>Meteorological Measurements and Instrumentation</i> , ©2015, Wiley Blackwell, 257 pages. (Available on-line as free e-book through University Library.)
Required Hardware	Arduino data acquisition kit. Available for purchase at the first lab. (Access to a PC or a Mac with USB port and network connectivity is also required.)
Recommended Books	Banzi, M. and M. Shiloh, ©2015: <i>Make: Getting Started With Arduino</i> , 3rd Edition, 246 pages. Link
	Monk, S. ©2016: <i>Programming Arduino: Getting Started with Sketches</i> , 2nd Edition. 176 pages. Link
Related Books	Brock, F. V. and S. J. Richardson, ©2001: <i>Meteorological Measurement Systems</i> , Oxford University Press, 290 pages.
	DeFelice, T. P., ©1998: <i>An Introduction to Meteorological Instrumentation and Measurement</i> , Prentice Hall, 229 pages.
	Fritschen, L. J. and L. W. Gay, ©1979: <i>Environmental Instrumentation</i> , Springer-Verlag, 216 pages.
Course Overview	Instruments are critical to making <i>quantitative</i> observations, and observations are critical to the scientific method. The subject of environmental instrumentation is vast and constantly changing as new technologies emerge. In this course, through a combination of lectures and hands-on projects, you will be (1) introduced to the process of assembling and characterizing an electronic instrument of your own, (2) forming a hypothesis and testing it by collecting data, and (3) writing reports and giving presentations on your results.

Attendance	Attendance is mandatory, a record of attendance will be made, and it will be a factor in the determination of course grades. Attendance in this course is more important than usual due to technical nature of the subject. Valid excuses for absence include illness, accident, or death in the family. Official documentation, such as a note from a physician, is required.
Extra credit	<p>Opportunity #1: Hand in a lab notebook at the end of the semester for <i>up to</i> 10% of the total number of points in the course. Submitted notebooks will be evaluated for neatness, accuracy, thoroughness, integrity, etc. Show your notebook to me (and hand me an ink pen) during lab so that I may sign it for evidence that you are updating it weekly. (See <i>Lab notebooks</i> below for more.)</p> <p>Opportunity #2: Use L^AT_EX to type any written report associated with the above projects and receive <i>up to</i> 10% of the assignment value per report. To take advantage of this offer, you must “do it yourself” and bring it to my attention (e-mail me or write an obvious note in the report).</p>
Course Grade	Course grades will <i>tentatively</i> be based upon attendance, performance on the projects described below, and perhaps a few assignments or quizzes. Note: Attendance is likely to be a significant part of your grade (43 meetings x 2 points each = 86 points). Letter grades will be assigned based on the total of number of points accumulated. For example, $\geq 97\%$ A+, 93% A, 90% A-, 87% B+, 83% B, 80% B-, 77% C+, 73% C, 70% C-, 67% D+, 63% D, $< 63\%$ F. The instructor reserves the right to adjust the number of factors, the weighting, the total number of points, and the grade scale as he deems necessary.
<u>Tentative Projects</u>	Subject to change. Details on each forthcoming.
Project 1	Assemble a data acquisition system and connect and characterize a temperature sensor. This requires purchasing an Arduino data acquisition kit which will be made available at the first lab. The project will involve soldering components which you can do during lab time with university tools and uploading programs from a PC or Mac. You will also connect a temperature sensor, collect some experimental temperature data, evaluate the system’s accuracy, precision, response time, and write a lab report. Due date: 28 September 2018.
Project 2	Select a different sensor of interest (not the temperature sensor(s) with your kit), purchase or borrow one (some may be available from the GEOS Department), connect it to your Arduino data acquisition system, and program it to acquire data. Develop tests to characterize your chosen sensor’s performance. You may not share the same sensor with other students. You must obtain or write Arduino code to sample the signal from your sensor and write the data to the memory card of your data acquisition system. You must write a lab report and give a brief presentation on your instrument to the class. Due date: TBD.
Project 3	Form a hypothesis about how a physical system in your area of interest behaves. Design an experiment and use your instrument (resulting from Projects 1 and 2) to collect data in order to test your hypothesis. (Note: You should make, purchase, or borrow a <i>weatherproof enclosure</i> for your data acquisition system to prevent damage to it if it must be left outdoors.) You must use a computer and software of your choice to read and plot the data from your instrument. Write a lab report and give a brief presentation on your experiment and results to the class. Due date: TBD.

Lab notebooks	You are strongly urged to purchase and take notes every week in a lab notebook. These technical notes will help you throughout the semester. Hand the lab notebook in at the end of the semester for extra credit. You must keep notes in only one notebook. Spiral bound, graph-ruled, notebooks are available at the University Bookstore. Extra credit points will be based upon how thorough and neat your notes are. (Lab notebooks written at the end of the semester will not be accepted.)
Time	In addition to the Friday afternoon labs, you are required to spend a substantial amount of time out of class working on your projects. This can be done at a time and location of your choosing. Consider: additional time will be required to learn about your sensors, experiment with them, troubleshoot problems, collect and analyze data, write reports, and prepare presentations.
Drop & Add	You may drop (or add) without obtaining permission until Friday, September 7. From September 8 to September 21, you must obtain permission from the instructor to drop. After Friday, September 21, you will need a serious and compelling reason to drop and your request must be approved by the Department Chair and the College Dean. Students adding after classes have started are responsible for obtaining a syllabus and lecture notes and making up any missed quizzes and assignments.
Etiquette	<p>Please do not eat in lecture or lab. The noises and smells may be a distraction for your peers. Plan your day so that you have adequate nourishment before class. Please silence mobile phones and put them away. Texting and surfing the web while in class is rude. Please do not hold conversations with neighbors during lecture. Also, please be mindful of the volume of your voices when in lab: voices carry and professionalism is important.</p> <p>Please come to class or lab on time. Walking in several minutes late is a distraction for everyone. We understand if it happens due to unforeseen events or higher priority appointments, but chronic lateness projects a lack of maturity and respect, and it will be taken into account for your course grade.</p>
Plagiarism	Plagiarism is a serious violation of academic integrity and when detected will result in a failing grade for the course and an incident report submitted to the Office of Student Judicial Affairs. For more information on plagiarism, please see the university's Academic Integrity webpage . If you still have a question about what plagiarism is and how to avoid it, please contact the instructor by e-mail or visit during office hours.
Disabilities	If you need course adaptations or accommodations because of a disability or chronic illness, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with the instructor as soon as possible, or see me during office hours. Please also contact the Accessibility Resource Center (ARC) as they are the designated department responsible for approving and coordinating reasonable accommodations and services for students with disabilities. ARC will help you understand your rights and responsibilities under the Americans with Disabilities Act and provide you further assistance with requesting and arranging accommodations.

Fall 2018 GEOS 440 meeting dates, significant events, and *tentative* schedule.

1	Mon.	27	Aug.	Lecture: Review syllabus, answer questions, etc.
2	Weds.	29	Aug.	Lecture: Project 1 explanation
3	Fri.	31	Aug.	Lab: Purchase kits, practice soldering
	Mon.	3	Sept.	Labor Day. No class.
4	Weds.	5	Sept.	Lecture:
5	Fri.	7	Sept.	Lab:
Also, last day to add or drop without permission from instructor.				
6	Mon.	10	Sept.	Lecture:
7	Weds.	12	Sept.	Lecture:
8	Fri.	14	Sept.	Lab:
9	Mon.	17	Sept.	Lecture:
10	Weds.	19	Sept.	Lecture:
11	Fri.	21	Sept.	Lab:
Also, last day to add or drop without a serious and compelling reason.				
12	Mon.	24	Sept.	Lecture:
13	Weds.	26	Sept.	Lecture:
14	Fri.	28	Sept.	Lab: Report on Project #1 due at 5 PM.
15	Mon.	1	Oct.	Lecture:
16	Weds.	3	Oct.	Lecture:
17	Fri.	5	Oct.	Lab:
18	Mon.	8	Oct.	Lecture:
19	Weds.	10	Oct.	Lecture:
20	Fri.	12	Oct.	Lab:
21	Mon.	15	Oct.	Lecture:
22	Weds.	17	Oct.	Lecture:
23	Fri.	19	Oct.	Lab:
24	Mon.	22	Oct.	Lecture:
25	Weds.	24	Oct.	Lecture:
26	Fri.	26	Oct.	Lab:
27	Mon.	29	Oct.	Lecture:
28	Weds.	31	Oct.	Lecture:
29	Fri.	2	Nov.	Lab:
30	Mon.	5	Nov.	Lecture:
31	Weds.	7	Nov.	Lecture:
	Fri.	9	Nov.	Veterans Day. Campus closed.
32	Mon.	12	Nov.	Lecture:
33	Weds.	14	Nov.	Lecture:
34	Fri.	16	Nov.	Lab:
	Mon.	19	Nov.	Thanksgiving break. Campus closed.
	Weds.	21	Nov.	Thanksgiving break. Campus closed.
	Fri.	23	Nov.	Thanksgiving break. Campus closed.
35	Mon.	26	Nov.	Lecture:
36	Weds.	28	Nov.	Lecture:
37	Fri.	30	Nov.	Lab:
38	Mon.	3	Dec.	Lecture:
39	Weds.	5	Dec.	Lecture:
40	Fri.	7	Dec.	Lab:
41	Mon.	10	Dec.	Lecture: Student presentations
42	Weds.	12	Dec.	Lecture: Student presentations
43	Fri.	14	Dec.	Lab: Student presentations
44	Mon.	17	Dec.	Final Exams Week

Note: This is a *tentative* schedule and the exact dates and agenda items are subject to change. Students are responsible for coming to class to learn about any changes in the schedule, course content, and grading policy. Instructor reserves the right to modify this syllabus at any time.