VIP: Hands-on Sensors

Contents

Meeting Time & Place

Monday, 13:00 - 13:50 on Zoom Links to an external site..

Instructor Information

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Office hours

Office hours coincide with the Research Computing Department office hours, which can be found on this calendar

NOTE: I will be in Raptor Research Center 127 for the Wednesday office hours. Send me an email to let me know if you are coming.

Welcome

Welcome to the course! We're looking forward to getting to know you this semester. To get started, please familiarize yourself with this syllabus and our Canvas site. I developed this course to provide a welcoming environment and effective learning experience for all students. If you encounter barriers in this course, please bring them to my attention so that I may work to address them, and reach out to me at any time if you have questions about course content or assignments.

Course Description

Note on Course Content and Idaho Law Under Idaho law (Section §67-5909D), some university courses with content related to diversity, equity, inclusion, or critical theory may be subject to certain

restrictions. However, the law affirms and does not limit free discussion in the learning environment.

Like all Boise State courses, this course supports open inquiry, intellectual honesty, and respectful engagement with a range of perspectives, all of which are consistent with student rights and responsibilities described in the Student Code of Conduct (Policy 2020).

Some courses may include content that touches on concepts related to diversity, equity, inclusion (DEI), or critical theory or concepts some may consider to be related to these concepts. If these topics are included, it is because they are relevant to the learning outcomes for this course and are explored to support critical thinking, deeper understanding, and respectful engagement with different perspectives. As part of any course, you may be asked to apply or explain ideas that come from a particular perspective. However, you are not required to adopt such perspectives as your own. The law does not "limit the free discussion of ideas in a classroom setting" and does not bar the discussion of DEI concepts in all courses.

Our learning environment is a space for open dialogue and thoughtful discussion, including complex or challenging topics. Everyone is expected to engage with curiosity, listen respectfully, and contribute in ways that support a productive and welcoming learning environment. Boise State and the Idaho State Board of Education affirm the importance of free expression and academic inquiry. As outlined in SBOE Policy III.B: "Membership in the academic community imposes on administrators, faculty members, other institutional employees, and students an obligation to respect the dignity of others, to acknowledge the right of others to express differing opinions, and to foster and defend intellectual honesty,

freedom of inquiry and instruction, and free expression on and off the campus of an institution." Disruptive behavior that interferes with the learning environment will not be tolerated and may result in removal from this course, in line with university policy (See Policy 3240 Maintaining Effective Learning Environments).

In this course, I will foster critical discussion and analysis, and a respectful consideration of a wide range of ideas, in accordance with the Faculty Code of Rights, Responsibilities, and Conduct (Policy 4000). You are encouraged to think critically, question ideas, and form your own conclusions. As always, you have the freedom to choose courses that align with your academic goals—if you have concerns about course content, please talk with your instructor or advisor. Refer to the academic calendar for important deadlines related to course withdrawal.

To learn more about the law and its impact at Boise State, visit the Provost Office's Information Regarding Section 67-5909D page.

Hands on Sensors

This course aims to involve students in the scientific research process by implementing solutions for research projects using small-scale compute. These computers are inexpensive, modular, portable, and extensible to provide a wide variety of options for data collection, analysis, and automation. Students will interact with Principle Investigators, design solutions for those PI's research problems, and implement part or all of the solution using the compute resources and sensors. Students will interactive with Boise State researchers, and help design and implement solutions for those researcher's specific problems. Along the way, students will learn fundamentals of research, project management, documentation, coding, and basics of computer hardware.

Course Learning Outcomes

After successful completion of this course, students will be able to:

- Communicate with research investigators and staff efficiently.
- Define and decompose research problems for efficient, ongoing development of solutions.
- Use programming languages to implement solutions for research problems.

Program or University Learning Outcomes.

The University enriches it's student base by:

- Exposing students to critical thinking and problem solving.
- Exposing students to the basis of computational thinking and problem decomposition in a computational world.
- Familiarizing students with coding, allowing them to interact with a wide array of compute resources available.

Course Format

This is a hybrid course that will meet via zoom on a weekly basis. There will be some face to face meetings, and meetings at designated places on campus (the MakerLab, researcher's offices, etc.).

This VIP mostly involves the scientific research process. The solutions we provide to research problems/questions will involve small-scale computers and sensors, as well as the supplementary information and data required for that project to be maintained going forward. Students will be expected to work with other students, faculty, and Research Computing staff to solve research problems. There are many aspects to these problems and solutions include documentation (of the problem and the solution), recording the process so as to not repeat failures, and writing analytical software, web interfaces, and other software to incrementally approach a viable solution for each problem.

Pre- and Corequisites

None

Required Materials

All required materials will be provided, and if time and funds allow, students may request the purchase of more equipment. There will be a small library of reference materials available to students (some books, some electronic formats).

Assessments

Reflections

Reflections will be turned in the second week, mid-semester, and during finals week. Reflections are meant to where the students are at in regard to skills and understanding of the goals of the course. They should be a few paragraphs, and describe personal progress or roadblocks.

Projects

Projects will be created as research problems are identified. Students are expected to make progress on the project that they choose to work on for the semester.

Progress is defined as going through some process of trial and error. Success is not necessarily a working prototype, but may be a well-documented process of what was tried, and if it did not succeed, making sure that we (the VIP and future students) don't go down the same path. See the projects page for more information on available projects.

Project Journal

Students will keep a project specific journal tracking progress and roadblocks as the semester progresses. This as meant to be a running history of what has worked, why things were done

(or not done) in a specific manner, and a reference for future students. This document will live along side the project itself, and will be likely be referenced throughout the project code and documentation. Journal entries are meant to document the process for future and current students, and is similar to a formal laboratory notebook.

Participation

Participation during class is crucial because it is an important avenue for learning. This participation grade serves as a way to credit you with the effort and work you are putting into the class in and out of the classroom. However, I understand that we all have different levels of comfort regarding speaking in class. Participation will thus be counted as speaking to the whole group, in smaller groups, and completing in-class activities. If you are fully engaged in at least two of those three activities, you will earn full points. If you have questions/concerns about being able to participate in class, I encourage you to contact me.

Grading Policy

The grading scale for this course is:

Grade	Grade Score
A+	97–100%
A	93–96%
A–	90–92%
B+	87–89%
B	83–86%
B–	80–82%
C+	77–79%
C	73–76%
C–	70–72%
D+	67–69%
D	63–66%
D–	60–62%
F	0–59%

Expectations for Student Success

Our goal is that every student is successful in this course, but I need your help to achieve that. In order to do your part to ensure your success in this course, please:

- Attend class. We will be using class time to practice and apply what we are learning, so it is important for your and your fellow students' learning that you are present and participatory. You can miss two class periods without it affecting your grade. If you have to miss beyond

two classes, please email us as soon as possible to discuss ways to help you participate in classroom activities asynchronously as appropriate.

- Ask questions. Learning is all about asking questions, so always feel free to do so in this class.
- Be respectful of your fellow students. While working together to build this community, we ask all members to:
- Share their unique experiences, values, and beliefs, if comfortable doing so.
- Listen deeply to one another.
- Honor the uniqueness of their peers.
- Create a respectful environment in this course and across the campus community.
- Check announcements or e-mails regularly. Announcements will serve as courtesy reminders and also point you to any new materials or changes.
- Do the pre-class assignments. In order to make the most of our class time, it is important that all students complete the pre-class assignments so we can jump into our application activities.

Expectations for Us

In support of our goal that every student be successful in this course, you can expect that we:

- Will be available to answer questions throughout the course. I encourage you to visit me during Student Hours to ask any questions about the course material or to further your curiosity in the subject matter. You may also email me with questions or concerns or ask to meet via Zoom or on campus outside of the Student Hours, and I will do my best to accommodate your needs.
- Will provide regular feedback on your work in a timely fashion. I will return completed work to you, with feedback, within one week of the due date.
- Will continuously work on improving your learning experience through my own class observations and based on your feedback. You will have the opportunity to provide feedback to me at the midpoint of the semester, and via the end of course evaluations.

This Class Welcomes Everyone

Students in this class represent a rich variety of backgrounds and perspectives. The (program/dept) is committed to providing an environment where similarities and differences are respected, supported, and valued. While working together to build this community, we ask all members to:

- share their unique experiences, values, and beliefs, if comfortable doing so.
- listen deeply to one another.
- honor the uniqueness of their peers.

- appreciate the opportunity we have to learn from each other in this community.

use this opportunity together to discuss ways in which we can create a welcoming and respectful environment in this course and across the campus community.

- recognize opportunities to invite a community member to exhibit more respectful speech or behavior—and then also invite them into further conversation. We also expect community members to respond with gratitude and to take a moment of reflection when they receive such an invitation, rather than react immediately from defensiveness.
- keep confidential any discussions that the community has of a personal (or professional) nature, unless the speaker has given explicit permission to share what they have said.

As your instructors, our goal is to make sure that our learning environment is effective for everyone. This means, in part, that each student is encouraged to share perspectives relevant to the course material and that our class activities and discussions are conducted in a way that supports everyone's learning.

Student Well-being

If you are struggling for any reason (e.g., family emergency, financial/basic needs, mental/physical health concerns, caregiving responsibilities, etc.) and believe these struggles may impact your performance in the course, I encourage you to reach out to me if you are comfortable doing so, and I will refer you to an appropriate university resource. You may also reach out directly to the outreach team in the Office of the Dean of Students at (208) 426-1527 or email studentoutreach@boisestate.edu for support. The Student Life Essentials page is also a great place to find helpful resources. If you notice a significant change in your mood, sleep, feelings of hopelessness or a lack of self worth, consider connecting immediately with Counseling Services (1529 Belmont Street, Norco Building) at (208) 426-1459 or email healthservices@boisestate.edu.

Course Policies

Academic Integrity

Academic Excellence is a Shared Value at Boise State, and part of your responsibility in pursuing academic excellence includes avoiding cheating, plagiarism, and any other kind of academic misconduct. If I find a student responsible for academic misconduct in our class, the outcome of their choice to not fully engage in their learning might range from a 'revise & resubmit' up to an 'F (failure) for the course.' For more info, please read The Student Code of Conduct (Policy 2020), Section 7: Academic Misconduct Complaints, Violations, Processes and Sanctions.

Artificial Intelligence (AI) Use in This Course

In this course, I want to see your thoughts, understand your reasoning, and hear your voice. However, there are moments in this course where you might find it useful to use generative AI tools in support of your learning.

You may use generative AI tools for specified activities and assignments if their use supports, rather than undermines, your learning. While generative AI can help to advance your learning, its usefulness depends on the purpose of each activity or assignment. You will find guidelines for generative AI use in the instructions for each assignment; please read them very carefully, as these guidelines differ by assignment.

If you use ChatGPT, Gemini, Grammarly, Midjourney, or other AI tools in support of your work in this course, cite any ideas, text, images, or other media generated by the tool using the instructions and format of the Modern Language Association (MLA), American Psychological Association (APA), Chicago Manual of Style, or other citation style as appropriate. When you use a tool in an assignment, include a brief, clear description of how you used it. If you use generative AI, you must not let this tool replace your thinking and work. In fact, it's your responsibility to ensure you are fully engaging in learning and submitting authentic work. To learn more about how to learn successfully and avoid academic misconduct behaviors, please review the Student Code of Conduct with special attention to Section 8: Procedures for Academic Misconduct.

If you're unsure of whether or when to use generative AI tools in this course, please reach out to me. I'm eager to learn about how we might use them in new ways to meaningfully advance your learning and prepare you for your future beyond Boise State.

Communicable Disease Policy

Boise State has a Communicable Disease Policy (Policy 9270) that guides everyone working and learning in our community. The policy has two key implications:

Any illness covered by the policy must be reported to Boise State Public Health by the impacted individual,

Faculty are required to accommodate any student impacted by any illness covered by the policy as directed by Boise State Public Health.

Late Work Policy

Due dates for every assignment are provided on the course syllabus and course schedule (and posted in Canvas). Unless otherwise stated, assignments are due on those days. However, I recognize that things can happen that are out of your control. In these instances, please reach out to me ahead of the due date, or as soon as possible afterwards, so that we can make a plan for you to submit the assignment as close to the original due date as possible. If an assignment is not submitted within two weeks of the due date, and you have not contacted me about when you will be submitting it, I will enter the assignment as Incomplete in Canvas until such time that we discuss the missing assignment and agree on a course of action.

Tentative Course Schedule

Week	Subject
Week 1	Syllabus Review, course layout and expectations
Week 2	Holiday - no meeting
Week 3	Introduction to Research Problems/Schedule PI meetings
Week 4	Introduction to Raspberry Pi
Week 5	Hardware handout
Week 7	Introduction to Programming
Week 8	Sensors
Week 9	MakerLab (on campus)
Week 10	Spring Break
Week 11	Project Work
Week 12	Project Work
Week 13	Project Work
Week 14	Project Work
Week 15	Project Work
Week 16	Project Wrapup