Maseeh College of Engineering and Computer Science
Department of Mechanical and Materials Engineering
Post Office Box 751 503-725-4290 tel
Portland, Oregon 97207-0751 503-725-8255 fax
Engineering Building Suite 400 info@me.pdx.edu
Web: http://www.pdx.edu/mme

Portland State UNIVERSITY

Course: ME 121 An Introduction to Systems and Control, Winter 2020
Credits: 3
Required/Elective: Required for the BSME degree
Prerequisites: ME120 Introduction to Engineering
Meeting times:
Section 001: Mon/Wed at 10:00 – 11:50 (Recktenwald)
Section 002: Mon/Wed at 14:00 - 15:50 (Gall)
Web sites: http://me121.mme.pdx.edu/doku.php?id=start and http://d2l.pdx.edu
Instructors:
Dr. Gerry Recktenwald, Section 1, gerry@pdx.edu
Dr. Elliott Gall, Section 2, gall@pdx.edu
Tutor: Connor Morrow comorrow@pdx.edu Office Hours Fridays, 2-4 PM, EB365

Course Description

ME 120, ME 121 and ME 122 constitute an introduction to skills, modern tools, teamwork, design methodology and professional practices of typical engineers. In ME 121, students learn to use mass and energy balances to design temperature and salinity controller for a closed loop water system. They develop stronger programming skills (building on skills developed in ME 120), sensor input, sensor calibration, and on/off control of heaters and solenoid valves. They use written and oral communication as part of assignments and class projects.

Textbook and other required course materials

There is no textbook. Reading materials and class notes will be provided on the class web site. Students are required to have their own laptop computer that they bring to class. Specifications for the laptops are given below. Students must have the microcontroller project kit from ME 120 called the SparkFun Inventor's Kit for Arduino. Students are required to buy a 20x4 character LCD panel available at the Portland State Bookstore (or online).

Course grading

Assessment item	Percentage of final grade
Homework	10%
Quiz	10%
Online quizzes (10)	5% total
Midterm	20%
Fish tank project	20%
Leadership and Peer review	10%
Final examination	25%

Program requirements: Admission to the BSME program requires a grade of C or better in ME120, ME121 and ME122. Additional GPA requirements also apply as described in the PSU Bulletin.

Late Policy

Homework must be submitted at the beginning of class on the day it's due. Any work turned in late will be graded as:

- Maximum of 80% of the grade if turned in less than 2 hours after beginning of class
- Maximum of 50% of the grade if turned in the same day (before 11:59pm)
- 0% if turned in after the due day.

Homework must be printed prior to class. Instructors **will not** be printing homework on your behalf.

Computer Requirements

Students are expected to bring their Sparkfun Inventors Kit, laptop, and hand tools from ME120 to class. The laptop, electronics kit, and tools are required to complete homework assignment, in-class exercises and in-class quizzes and exams. The laptop and tools are also used in ME 122 (and ME120) so the cost of these purchases for is amortized over the full academic year.

Students are required to have their own laptop computer. Laptops running the latest versions of Windows, or Macintosh (see important note below) operating systems are acceptable. Regardless of the operating system chosen, students are expected to be able to maintain and use their computers to complete the homework assignments in the class. The instructors and Teaching Assistants cannot offer tutoring or support for operating system maintenance. Students will need to have a recent version of an Office suite (such as Microsoft Office, OpenOffice etc.). Students will need to run spreadsheets (eg. Excel), and presentations (eg. PowerPoint) during in-class exercises and presentations. Students will need to demonstrate proficiency with Excel during quizzes and exams. Students may need to use Solidworks to complete homework assignments.

The Maseeh College has two general purpose computing laboratories, one in Engineering Building (EB) room 325 and the other in Fourth Avenue Building (FAB) 55-17. See cat.pdx.edu/labstatus and cat.pdx.edu/students/labs.html for more information. Solidworks and Microsoft Office are installed on the computers in the EB 325 lab.

Please note that currently Solidworks does not run natively on MacOS. Dassault Systèmes (the publisher of Solidworks) has stated that they have no intention of releasing a MacOS version of Solidworks in the foreseeable future.

Toolkit

Students will need to use the hand tools they obtained for ME 121 to complete homework assignments and in-class exercises. Students are expected to bring the tools to class. The list of tools is specified on the ME 121 website. Students will need to purchase a small DC power supply and other miscellaneous supplies to complete the fish tank project. Other supplies will be provided and are covered in the course fee.

Liability Release

Students will be working with hand tools, power tools and electronic equipment during class, and as part of completing homework assignments and projects. This equipment is typical of that used by practicing engineers and engineering technicians in the normal course of performing their job duties. Students will be provided instruction in the safe use of these tools and equipment. As a condition of taking the class, students must agree to sign a form that

releases Portland State University and its staff from liability for injury caused during the use of the equipment.

Title IX Reporting Obligations

Portland State is committed to providing an environment free of all forms of prohibited discrimination and sexual harassment (sexual assault, domestic and dating violence, and gender or sex-based harassment and stalking). If you have experienced any form of gender or sex-based discrimination or sexual harassment, know that help and support are available. PSU has staff members trained to support survivors in navigating campus life, accessing health and counseling services, providing academic and on-housing accommodations, helping with legal protective orders, and more. Information about PSU's support services on campus, including confidential services and reporting options, can be found on PSU's Sexual Misconduct Prevention and Response website at: http://www.pdx.edu/sexual-assault/get-help or you may call a confidential IPV Advocate at 503-725-5672. You may report any incident of discrimination or discriminatory harassment, including sexual harassment, to either the Office of Equity and Compliance or the Office of the Dean of Student Life.

Please be aware that all PSU faculty members and instructors are required to report information of an incident that may constitute prohibited discrimination, including sexual harassment and sexual violence. This means that if you tell me about a situation of sexual harassment or sexual violence that may have violated university policy or student code of conduct, I have to share the information with my supervisor, the University's Title IX Coordinator or the Office of the Dean of Student Life. For more information about Title IX please complete the required student module Creating a Safe Campus in your D2L.

Access and Inclusion for Students with Disabilities

PSU values diversity and inclusion; we are committed to fostering mutual respect and full participation for all students. My goal is to create a learning environment that is equitable, useable, inclusive, and welcoming. If any aspects of instruction or course design result in barriers to your inclusion or learning, please notify me. The Disability Resource Center (DRC) provides reasonable accommodations for students who encounter barriers in the learning environment.

Accommodated Testing: All accommodated tests should be scheduled during the first week of term through either the SHAC Testing Services or the CEE & MME (CEME) Testing Center. The CEME Testing Center requires all bookings to be requested at least 7 days prior to the exam date. The center may not be able to proctor your exam if notice is less than 7 days. CEME Testing Center requires a copy of your DRC accommodation letter to complete your booking. All proctored exam dates and times must be approved by your instructor prior to booking.

SHAC Testing Services: Schedule through https://www.pdx.edu/shac/testing-services

CEME Testing Center: Email cemetesting@pdx.edu

Note: The CEME Testing Center will only proctor exams for students who have DRC accommodations and/or emergency situations (with instructor approval).

Learning Objectives:
The following table lists the learning objectives for the course, and the corresponding ABET Program Outcomes. Students who successfully complete the course will be able to demonstrate the learning objectives. ABET is the Accreditation Board for Engineering and Technology (www.abet.org) that establishes nationwide standards for engineering programs. The table shows how the specific goals of this class relate to the larger objectives of the BSME program, and hence the ABET Program Outcomes. A list of ABET Program Outcomes is available at http://www.me.pdx.edu/programs/undergrad/objectives.php.

	Learning Objectives: Students must demonstrate the ability to:	
1	Be able to analyze DC circuits with Ohm's law, and Kirchoff's voltage and current laws	a
2	Be able to build and debug electrical circuits on a breadboard	a,b
3	Be able to write and debug programs for the Arduino microcontroller platform that read data from sensors and control transistors, relays, solenoid valves and heaters.	a,k
4	Be able to read hand sketches and machine drawings	a, c, k
5	Be able to use SolidWorks to make three-dimensional solid models, dimensioned part drawings, and assembly drawings.	c, k
6	Be able to safely and effectively perform drilling operations with a manual milling machine.	k
7	Be able to fabricate flow loop components and assemble those components in to a working flow system controlled by solenoid valves	k
8	Be able to perform mathematical analysis and plotting with Excel and MATLAB	b, k
9	Be able to calibrate sensors and obtain calibration curves using least squares curve fits.	b
10	Be able to make presentations and short written reports in a professional format.	g

11	Be able to work in teams to complete projects that involve fabrication, assembly and testing of electromechanical systems.	d
12	Be able to apply mass and energy balances to closed and open flow systems.	a, c, e

Topics Covered

The following list shows the topics covered in each class meeting. Note that this schedule may change during the term as necessary to insure student learning.

1. Course organization, project overview, tools and equipment review, fabrication of conductivity sensor, introduction to MATLAB
2. Saltwater chemistry, fabrication of PVC fish tank, plotting with MATLAB
3. Saltwater chemistry, fabrication of platform for the fish tank assembly, MATLAB scripts
4. Saltwater mixtures, conditional code execution ("if" constructs) in Arduino code
5. Finish fabrication of flow loop, begin calibration of conductivity sensor
6. Quiz 1. Calibration of conductivity sensor, least squares fitting with MATLAB
7. Wiring harness for LCD display, Arduino programming for LCD display
8. Mass balances, Arduino programming for LCD display, transistor switching 9. Cascaded switching of relays and solenoid valves, introduction to algorithm for controlling Salinity
10. Programming for control of fish tank salinity
11. Debugging and performance testing of salinity control program
12. In-class verification of salinity control
13. Fabrication of thermistor probes, voltage divider circuit for thermistor measurements
14. Calibration of thermistor probes, least squares analysis of thermistor calibration data
15. Fabrication of heaters, introduction to energy balances and heater control logic
16. Arduino program for heater and salinity control
17. Debugging and performance testing of fish tank control programs
18. In-class verification of fish tank performance.
19. In-class verification of fish tank performance, Course review.

Computer and E-mail Accounts

If you haven't done so already, please go to the CADLab located in EB 325 to activate your engineering account. If you need help in using this account, please see the attendant or send an e-mail to support@cecs.pdx.edu You should regularly check your CECS e-mail account (yourname@cecs.pdx.edu). Important information and announcements are delivered to that e-mail address. If you wish, you can forward your CECS email to another email account that you check regularly.

Code of Conduct

The PSU Student Conduct Code prohibits all forms of academic cheating, fraud, and dishonesty. Details can be found on the PSU web page for the code of student conduct, http://www.pdx.edu/dos/codeofconduct. Allegations of academic dishonesty may be addressed by the instructor, and/or may be referred to the Office of Student Affairs for action. Acts of academic dishonesty may result in a failing grade on the exam or assignment for which the dishonesty occurred, disciplinary probation, suspension or dismissal from the University. Questions about academic honesty may be directed to the Office of Student Affairs: http://www.ess.pdx.edu/osa/).

Classroom Rules and Behavior Expectations

The classroom is a professional space and professional conduct is expected. Please silence your cell phone and refrain from text messaging during class and exam times. Treat your fellow students and the instructor with respect and please use appropriate language at all times. Additional rules may be added at the instructor's discretion.

Ethics and Professionalism

As future professional engineers you should plan to take the FE Exam (see the Oregon State Board of Examiners for Engineering and Land Surveying at www.osbeels.org), and you should be familiar with the ASME Code of Ethics (http://files.asme.org/ASMEORG/Governance/3675.p df), which includes the following:

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by: 1. Using their knowledge and skill for the enhancement of human welfare; 2. Being honest and impartial, and serving with fidelity their clients (including their employers) and the public; and 3. Striving to increase the competence and prestige of the engineering profession.

Campus Resources

As a PSU student, you have numerous resources at your disposal. Please take advantage of them while you are here. A small sample is listed below:

- MME Website: http://www.pdx.edu/mme
- Career Center: http://www.career.pdx.edu/
- Center for Student Health & Counseling: http://www.shac.pdx.edu/
- The Writing Center: http://www.writingcenter.pdx.edu/
- PSU Disability Resource Center: 435 SMU - The PSU Disability Resource Center is available to help students with academic accommodations. If you are a student who has need for test-taking, note-taking or other assistance, please visit the DRC and notify the instructor at the beginning of the term.

Student Groups and Professional Organizations

Participation in student and professional groups can be a valuable part of your education experience. Membership gives students opportunities to get to know fellow students better, meet and network with professionals, collaborate in solving real engineering problems, learn about internship or job possibilities, socialize and have fun. Consider becoming active with a student organization, such as the following: American Society of Mechanical Engineers Student Group (ASME): http://web.cecs.pdx.edu/~asme/

- Society of Automotive Engineers: Viking Motorsports: http://vms.groups.pdx.edu/
- Engineers without Borders: http://www.ewbpsu.org/ Most professional organizations have monthly meetings and encourage student participation by providing discounts for lunch and dinner meetings. These meetings provide opportunities to network with potential future employers, learn about scholarships, and increase your technical knowledge. Take a look at these organizations as a starting point:
- American Society of Mechanical Engineers (ASME) Oregon Section: http://asmeoregon.wordpress.com/
- Society of Automotive Engineers, Oregon Chapter: http://www.oregonsae.org/
- Society of Women Engineers (SWE) Columbia River Section - http://www.swe-columbia-river.org
- Engineers without Borders, Portland Chapter: http://www.ewbportland.org/

Library and Literature Research

Ubiquity of the Internet makes it very tempting to think that all necessary resources for a term project will be available in full text after typing in a few words at google.com. This is not the case. You will often need to go to the library, use library search tools and read physical books and articles contained in refereed/archival journals. Be sure to make use of the Vikat library catalog accessed via the PSU library home page at http://www.lib.pdx.edu/. Also available on the library home page are Full Text Electronic Journals and a list of on-line Databases. Databases to try are EI Compendex (http://www.ei.org/ev2/ev2.home) and Lexis-Nexis. Access to these databases is free for PSU students, but you must be using a computer on campus or via a proxy over an Internet connection. To log on to the PSU proxy server use https://login.proxy.lib.pdx.edu/login.

Campus Safety

Student safety is paramount. The Campus Public Safety Office is open 24 hours a day to assist with personal safety, crime prevention and security escort services. Call 503-725-4407 for more information.

For Campus emergencies call 503-725-4404.