Sonoma State University  
School of Science and Technology  
Department of Engineering Science  
EE 110–Introduction to Engineering Laboratory, Spring 2018

Instructor Contact Information
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General Course Information
Class Days/Time: Mondays, 4:00-6:50 PM  
Classroom: Salazar 2003  
Co-requisite: None

Course Description
EE 110: Introduction to Engineering Laboratory (1). Laboratory: 3 hours. This course is designed to introduce principles of engineering to the students and expose them to the electronics and computer lab environment. The students are given opportunity to design and build some simple analog and digital circuits and make measurements using various types of lab equipment.

Course Format and Instructional Methods:
This course utilizes instruction and laboratory materials developed by Dr. Saeid Rahimi. The course will be taught using multiple instructional methods. These methods will include oral presentations, group discussion, and hands-on activities. Typically, course topics will be introduced via a short oral presentation followed by hands-on lab activities. This course will also utilize Moodle, SSU’s learning management system, where you will interact with your classmates and with the instructor. Within the course Moodle site you will access the learning materials and syllabus; discuss issues; submit assignments; participate in online group activities; and share your projects. Refer to the course calendar/schedule and assignment instructions for information on where and when to submit your work.

Course Objectives and Student Learning Outcomes
The objectives of the course are to provide the students:
- The opportunity to become familiar with the basic ideas of electronic components.
- Familiarity with actual and virtual test and measurement instruments.
- Familiarity with microcontroller basics.
- Familiarity with tools, components and parts that will be useful in more advanced courses.
- An overview of some of the topics that the students will encounter in more advanced courses.
**Required Texts/Readings**

**Textbook**


Optional References:

**Instructor’s Material:**
Laboratory exercises will be posted on Moodle.

**Other Equipment/Material Requirements/Software**

**Laptop Computers:** Students are required to have a laptop computer for use in the lab and at home. Students will download drivers for some electronic instruments on their computers in the beginning of the semester.

**Discovery Scope:** Students can borrow a Digilent Discovery Scope (DS) from the department. A DS (about the size of a calculator) functions as a virtual set of test and measurement instruments including a power supply, a multimeter, a function generator and an oscilloscope. These units will be loaned to the students so they can perform parts of their experiments at home. Students are required to return the units to the department during the last laboratory session. Discovery scopes can be connected to the students’ desktop or laptop computers via a USB cable (provided). The PC or laptop provide power to the DS and function as a display. The details of software installation and use of the Discovery scopes will be given during the second laboratory session. In the event that a student loses or damages their device, he/she will be responsible for purchasing and returning a working unit back to the department.

**Arduino Boards and Components:** Student must purchase (online) an Arduino UNO R3 board (experiments 10 through 12). Students will also purchase parts containing a breadboard, electronic components and wires. Kits containing the board and parts can be purchased online for less than $50 (see the Arduino kit offered by Vilros). Since the breadboards included in the kits may be a little too small, students may choose to obtain larger breadboards separately.

**Tools and Meters:** Students should also purchase a multimeter (about $15 online). Purchasing some basic tools (soldering iron, pliers, wire cutters, etc…) is optional. Information about tools and parts will be provided during the first session of the lab.

**Lab Notebook:** An inexpensive bound lab notebook with graph papers and page numbers. To get credit for your work each laboratory exercise must be signed by the instructor.

**Text and Materials Costs:** The total estimated cost of the textbook, lab notebook, tools and supplies will be under $100. Students are encouraged to search online for best prices.

**Online Videos:** Students can find a large number of videos about various topics of the course on YouTube.
# Tentative Course Schedule

Changes will be announced in class and/or on Moodle

<table>
<thead>
<tr>
<th>Lab No.</th>
<th>Date</th>
<th>Lab Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab 0</td>
<td>1/22</td>
<td>Orientation and Introduction to Electronic Components and Equipment, Digilent Discovery Scope Hardware and Software, Arduino Boards and Circuit Drawing/Simulation Applications (Multisim, Circuit I/O, etc.)</td>
</tr>
<tr>
<td>Lab 1</td>
<td>1/29</td>
<td>DC Concepts and Measurements standard equipment; Sign Up for Discovery Scope (DS), Download DS software.</td>
</tr>
<tr>
<td>Lab 2</td>
<td>2/5</td>
<td>DC Measurements: Series and Parallel Resistor Combinations and Current Measurements</td>
</tr>
<tr>
<td>Lab 3</td>
<td>2/12</td>
<td>DC Measurements: Circuit Laws and Voltage Dividers</td>
</tr>
<tr>
<td>Lab 4</td>
<td>2/19</td>
<td>AC Concepts and Measurements (Standard Laboratory Equipment)</td>
</tr>
<tr>
<td>Lab 5</td>
<td>2/26</td>
<td>AC Concepts and Measurements: Introduction to Capacitors</td>
</tr>
<tr>
<td>Lab 6</td>
<td>3/5</td>
<td>Introduction to Rectifying Diodes (Write lab report)*</td>
</tr>
<tr>
<td>Lab 7</td>
<td>3/12</td>
<td>Introduction to Transistors (write lab report)*</td>
</tr>
<tr>
<td></td>
<td>3/19</td>
<td>Spring Break</td>
</tr>
<tr>
<td>Lab 8</td>
<td>3/26</td>
<td>Introduction to Operational Amplifiers (write lab report)*</td>
</tr>
<tr>
<td>Lab 9</td>
<td>4/2</td>
<td>555 Timer (write lab report)*</td>
</tr>
<tr>
<td>Lab 11</td>
<td>4/16</td>
<td>Arduino Sketch 2 Project title due</td>
</tr>
<tr>
<td>Lab 12</td>
<td>4/23</td>
<td>Arduino Sketch 3 Project proposal with the title and description due, order parts!</td>
</tr>
<tr>
<td>Lab 13</td>
<td>4/30</td>
<td>Part 1: Arduino Sketch 4 Part 2: Multisim Circuit Simulation Project discussion</td>
</tr>
<tr>
<td>Lab 14</td>
<td>5/7</td>
<td><strong>Final Project Presentation</strong></td>
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<tr>
<td></td>
<td></td>
<td><em>No Final Exam</em></td>
</tr>
</tbody>
</table>
Lab Reports & Lab Notebook

The details of work including circuit diagrams, data and results must be recorded in the lab notebook. Students are required to turn in a total of four complete laboratory reports. The format of lab reports will be described during the first two sessions. The reports are due at the beginning of the following lab session. Late lab report will not be accepted.

Project

Students are strongly advised to start planning for their final projects in mid-semester. First explore the Internet and find interesting and practical electronic circuits and applications relevant to each laboratory topics and the topic of their final lab presentation. Students are encouraged to search for their final project topics on or before April 16. Project components and parts will be ordered after approval. The necessary electronic components and materials may be obtained from local or online electronic stores. Students should allow 1-2 weeks for delivery of project parts and components purchased online. Students will bring their “rough” projects to class on April 30 for demo and troubleshooting. Formal project presentations are scheduled for May 7.

Resources for Project:
http://www.instructables.com/id/Arduino-60/
http://www.circuitstoday.com/simple-electronics-projects-and-circuits
http://www.buildcircuits.com/all-projects/basic-electronic-projects/
http://www.allaboutcircuits.com/
www.electronicsclub.info

Course Requirements & Grading Policy

<table>
<thead>
<tr>
<th>Attendance &amp; Preparedness (having equipment, tools, parts)</th>
<th>25%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Notebook (notes, experiment details signed by instructor)</td>
<td>25%</td>
</tr>
<tr>
<td>Labs and Reports (total of 4 reports)</td>
<td>25%</td>
</tr>
<tr>
<td>Final project (success, details, report)</td>
<td>25%</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>≥93.0%</td>
</tr>
<tr>
<td>A-</td>
<td>≥90.0%</td>
</tr>
<tr>
<td>B+</td>
<td>≥87.0%</td>
</tr>
<tr>
<td>B</td>
<td>≥83.0%</td>
</tr>
<tr>
<td>B-</td>
<td>≥80.0%</td>
</tr>
<tr>
<td>C+</td>
<td>≥77.0%</td>
</tr>
<tr>
<td>C</td>
<td>≥73.0%</td>
</tr>
<tr>
<td>C-</td>
<td>≥70.0%</td>
</tr>
<tr>
<td>D+</td>
<td>≥67.0%</td>
</tr>
<tr>
<td>D</td>
<td>≥60.0%</td>
</tr>
<tr>
<td>F</td>
<td>&lt;60.0%</td>
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</table>

Late Work: When accepted, late work must be handed in directly to the instructor (may not be emailed, placed under a door or left in a mailbox). 5% penalty if turned in later the same day. After that, a 10% penalty applies to the first late day and 20% for each additional late day after the first. For example, if the assignment is due Tuesday and you turn it in Friday (3 days late), you lose 10% + 20% + 20% = 50%. Later work may not be accepted after the solution the solution has been posted.
**Makeup for Missed Laboratory Sessions:** Except in case of a documented medical or family emergency (an emergency recognized by the University policies), if accepted, 25% penalty will be applied.

Evidence of serious and compelling reasons, supported by the appropriate documents, is required for missing a lab. Students are required to perform the missing laboratory experiments on their own at home (using their Discovery Scopes), or in the lab at their own convenience. They can ask questions about the missing labs during office hours or during help sessions given by the course tutor. The details of experiments will be described in the lab notebook and must be signed by the instructor for credit. Students will receive a zero for each unjustified absence and will fail the course for more than two unjustified absences.

**Regrades:** A re-grade request on an assignment or part of an assignment must be submitted in writing. Such request must be submitted within seven days of the return of the graded assignment. The request must include clear justification, the problem number(s), and the graded assignment.

**Returned Assignments:** If you were unable to collect an assignment when it was returned, you must collect it during the next available office hours. 10% penalty will be applied on any assignment not collected until after the Final Exam.

**Classroom Protocol**

To create an appropriate environment for teaching and learning, students must show respect for their instructors and fellow students. Listed below are a few guidelines for classroom behavior. Students are expected to follow these guidelines to ensure that the learning environment is not compromised.

**Attendance:** You are expected to be in class the entire class time. Please do not enter late or leave early, except due to an emergency or with an advance permission from the instructor.

**Absences:** You are expected to attend all classes. If you know you are going to miss a class, inform the instructor. Take the responsibility of learning the materials. Instructors are not responsible for re-teaching the material you missed due to an absence or being late. Meet with the instructor when you can to find out if there were any important announcements in the class.

**Computer Use:** Unless stated by the instructor for a class, use of computers, laptops, tablets or cell phone are not permitted.

**Cell Phone Use:** Unless stated by the instructor for a class, use of cell phone are not permitted. You may not receive or send text messages or calls. Cell phones must be “turned off” or placed in “airplane” or “do not disturb” mode. If you need to use your cell phone for any reason, you must leave the classroom.

**Active Participation:** Students are expected to actively participate in the class. You may not sleep, eat, drink or carry on side conversations in class. You may not work on assignments or study materials unrelated to the current class topic. You may not take pictures or audio or video recordings in class.

**Attitude:** Students are expected to maintain civil attitude in class. You may not use inappropriate or offensive commentary or body language.
Moodle

Moodle is SSU's Learning Management System (LMS). Moodle is the place where you will find the course syllabus, read posted announcements in the news forum, participate in online class discussions with classmates, submit your assignments online and view the materials for this course. To access the Moodle course use your SSU Seawolf ID and password to log into SSU's Online Services Portal https://login.sonoma.edu. Click on the Moodle link. When you get to the Moodle site home, click on the “My Courses” menu located on the top navigation. Click on the link for this course (classes are listed by course name and number). Note: The Login link is also conveniently located at the top of the Sonoma State University homepage http://www.sonoma.edu and many other university pages.

Visit Learning with Moodle http://www.sonoma.edu/it/students/moodle.html to review frequently asked questions about using Moodle and also to view a list of technical recommendations.

Moodle Help and Student Computing Resources

Moodle and General IT Help Desk

Contact the IT Help Desk http://www.sonoma.edu/it/helpdesk/ if you need assistance with Moodle or other information about computing and information technology at SSU. Three ways to contact the IT Help Desk are:

- Call: 707-664-4357
- Email: helpdesk@sonoma.edu
- Visit Location: Schulz 1000

Plugins

Download Plugins http://www.sonoma.edu/about/plugins.html lists plugins that may be needed to access some content on or linked from SSU websites and Moodle. (If applicable, list any other plugins that may be needed to access/use publisher materials).

General Student Computing

Review the information posted at Student Computing http://www.sonoma.edu/it/students. There you will find computer use guidelines and a list of available computer labs.

Library Research Guides and Subject Librarians

The University Library can help you find information and conduct research. You can make an appointment with a subject librarian, get help online, or drop by the library during open Research Help hours: http://library.sonoma.edu/about/hours/detailed. (Insert the URL address for the Research Guides http://libguides.sonoma.edu/ provided by your subject librarian, contact information for the Subject Librarians http://library.sonoma.edu/research/subjectlibrarians/, and any applicable Information for distance learners http://library.sonoma.edu/services/distancelearners/.)
University Policies

There are important University policies that you should be aware of, such as the add/drop policy; cheating and plagiarism policy, grade appeal procedures; accommodations for students with disabilities and the diversity vision statement. See Important Policies and Procedures for Students http://www.sonoma.edu/uaffairs/policies/studentinfo.shtml.

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. How to Add a Class http://www.sonoma.edu/registration/addclasses.html has step-by-step instructions. Registration Information http://www.sonoma.edu/registration/regannounce.html lists important deadlines and penalties for adding and dropping classes.

Campus Policy on Disability Access for Students

If you are a student with a disability, and think you may need academic accommodations, please contact Disability Services for Students (DSS), located in Salazar Hall, Room 1049, Voice: (707) 664-2677, TTY/TDD: (707) 664-2958, as early as possible in order to avoid a delay in receiving accommodation services. Use of DSS services, including testing accommodations, requires prior authorization by DSS. See SSU’s policy on Disability Access for Students http://www.sonoma.edu/uaffairs/policies/disabilitypolicy.htm.

Emergency Evacuation (Optional/suggested statement)

If you are a student with a disability and you think you may require assistance evacuating a building in the event of a disaster, you should inform your instructor about the type of assistance you may require. You and your instructor should discuss your specific needs and the type of precautions that should be made in advance of such an event (i.e. assigning a buddy to guide you down the stairway). We encourage you to take advantage of these preventative measures as soon as possible and contact the Disability Services for Students office if other classroom accommodations are needed.

Academic Integrity

Students should be familiar with the University’s Cheating and Plagiarism policy http://www.sonoma.edu/UAffairs/policies/cheating_plagiarism.htm. Your own commitment to learning, as evidenced by your enrollment at Sonoma State University and the University’s policy, require you to be honest in all your academic course work. Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person’s ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified.
Additional Resources

SSU Writing Center
The SSU Writing Center, located at Schulz 1103, helps SSU students become better writers and produce better written documents. The knowledgeable and friendly tutors can help you with a wide array of concerns, from generating good ideas and organizing papers more clearly to learning citation formats and using semi-colons correctly. Visit the http://web.sonoma.edu/writingcenter/ for more information on how to schedule time with a tutor.

Counseling and Psychological Services (CAPS)
CAPS is a unit of the division of Student Affairs of Sonoma State University. CAPS offers confidential counseling to students experiencing personal problems that interfere with their academic progress, career or well being. The CAPS website http://www.sonoma.edu/counselingctr provides information only. If you would like to talk with someone or make an appointment, please call (707) 664-2153 between 8 a.m. - 4:30 p.m., Monday-Friday.
ABET Requirements:

Course Learning Objectives (CLOs):
In this course students will:
A. Learn basic electronic concepts, breadboard and electronic components, and writing lab reports.
B. Learn to use traditional laboratory equipment, including power supplies, function generators and oscilloscopes.
C. Simulate traditional test and measurement instruments using digital instruments connected to students’ laptops.
D. Learn some basic input/output experiments using microcontrollers.
E. Learn about project design, including cost, timetable, construction, and operation of circuits.

<table>
<thead>
<tr>
<th>Course Learning Objectives (CLOs)</th>
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</thead>
<tbody>
<tr>
<td>Objectives</td>
<td>Assessment Method</td>
</tr>
<tr>
<td>A-E</td>
<td>1-2</td>
</tr>
</tbody>
</table>

Course Outcomes (COs):
At the conclusion of this course, students will be able to do the following:
1. Articulate concepts of Ohm’s law, voltage, current and power.
2. Read, understand, and articulate specifications of basic electronic components.
3. Articulate principles of operation of diodes, transistor switches and amplifiers.
4. Design, test, and analyze basic electric circuits
5. Design circuits using microcontroller
6. Write lab reports and communicate technical knowledge

<table>
<thead>
<tr>
<th>Student Learning Outcomes vs. Course Learning Objectives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Support Level (0-5) 0=No support, 1=lowest support, 5=highest support)</td>
</tr>
<tr>
<td>ABET Student Outcomes</td>
</tr>
<tr>
<td>(a) an ability to apply knowledge of mathematics, science, and engineering</td>
</tr>
<tr>
<td>(b) an ability to design and conduct experiments, as well as to analyze and interpret data</td>
</tr>
<tr>
<td>(c) an ability to design a system, component, or process to meet desired needs</td>
</tr>
<tr>
<td>(d) an ability to function on multi-disciplinary teams</td>
</tr>
<tr>
<td>(e) an ability to identify, formulate, and solve engineering problems</td>
</tr>
<tr>
<td>(f) an understanding of professional and ethical responsibility</td>
</tr>
<tr>
<td>(g) an ability to communicate effectively</td>
</tr>
<tr>
<td>(h) the broad education necessary to understand the impact</td>
</tr>
</tbody>
</table>
of engineering solutions in a global and societal context

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice | B, C, D, E | 2

**Assessment Methods:**

Assessment of the student learning

1. Lab reports and lab notebooks
2. Final project demonstration and presentation

Course quality Assessment

1. Student survey of the course
2. Peer instructors feedback