Course Syllabus

ELCT 201 – Introductory Electrical Engineering Laboratory

Course Coordinator

 Undergraduate Program Committee

Catalog Description

Laboratory procedures, instrumentation and measurements, report writing, computer use in system design, testing, and troubleshooting. Integrative project-based learning environment including passive, active, electronic and electromechanical systems.

Course overview

This is the first in a series of five integrative experiential learning classes in the EE curriculum. Although the course has only three enforced pre- or co-requisites, its nature as an integrative learning experience means that it will also draw on concepts from many other prior or contemporaneous classes such as calculus, physics, computer programming – even English composition. You will often face the challenges of recalling and applying old knowledge, or of learning new things that have not yet been introduced in your other classes. Lifelong learning and just-in-time learning are key skills in this rapidly evolving field, so consider this class to be just your first warm-up drill!

Course Delivery Structure:

One lecture per week, one in-person laboratory session per week, and additional content available asynchronously on Blackboard. All course lecture presentations, reference materials, and assignments will be available via Blackboard, and all assignments will be submitted via Blackboard.

Credit Hours 3

Prerequisite(s) by course

Prerequisites: C or better in ENGL 102 and C or better in CSCE 211

Pre- or Co-requisite: ELCT 222

Prerequisites by topics

Electrical charges & forces, current & voltage, Ohm’s law, circuit theory, calculus, number systems, algebra, logic design, writing and composition in English

Required Textbooks, Software, or Supplies

* Practical Electronics for Inventors, 4th ed., Scherz and Monk, ISBN 978-1-25-958754-2
 You may already have this from ELCT 101
* Technical Writing for Engineers and Scientists, 4th ed, Finkelstein, ISBN 978-0073-53493-0
 EE students will also use this in ELCT 301, 302, 403, 404
* Circuit Analysis and Design, Ulaby, Maharbiz, and Furse,
 Free, and you should already have it from ELCT 102, 221, 222
* LTspice –
 Free from www.analog.com/en/design-center/design-tools-and-calculators.html
* Gnuplot
 Free from [www.gnuplot.info](http://www.gnuplot.info)
* Safety glasses (provided by EE in your lab tool kit)

All readings/materials comply with copyright/fair use policies.

Additional Items that will be convenient to have, but are not required include:

* Miscellaneous small tools such as needle-nose pliers, wire cutters, wire strippers
* Analog Discovery 2 USB instrument kit.
 You should have already purchased this during ELCT 102
* ADALP2000 Analog Parts Kit
 You should have already purchased this during ELCT 101 or 221

Learning Outcomes

Students who successfully complete the course will at least be able to:

1. Competently use common laboratory instruments, including selecting an appropriate instrument for any specific purpose.
2. Describe common lab hazards and methods to mitigate those hazards.
3. Analyze, build, test, debug, program, measure, and explain the operation of simple analog, digital, and programmable circuits.
4. Communicate the results of lab experiments in formal lab reports and in presentations, with emphasis on proper structure and formatting, and comparison between expected and observed results.
5. Design a simple circuit or system to meet stated specifications, then build and characterize the performance of that circuit or system.
6. Design, build, and present a team-oriented challenge project.

Course Topics:

* Use of lab equipment: multimeters, oscilloscopes, function generators, power supplies.
* Electrical lab safety: safety glasses, soldering, electric shock, electrostatic damage, polarity sensitivity of components such as electrolytic capacitors.
* Methods for constructing and debugging of circuits on soldered and solderless proto-boards.
* Characteristics and applications of passive components (R, L, C) as sensors and filters.
* Characteristics and applications of electronic components such as op-amps, diodes, and transistors
* Reading an electrical component data sheet
* Functional equivalence between hardware (circuit) and software (microcontroller) implementations of functions
* Steps for programming a microcontroller using an integrated development environment
* Standard lab report format and recommended presentation format
* Team oriented challenge project

Course Contribution to ABET Student Outcomes:

ELCT 201 contributes to an achievement of:

Outcome 1 – an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. LO 6

Outcome 2 – an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. LOs 5,6

Outcome 3 – an ability to communicate effectively with a range of audiences. LO 4

Outcome 5 – an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. LO 6

Outcome 6 -- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusion. LOs 1, 2, 3, 4

Fall 2022 information

Instructor, Location, Meeting times

Instructor: Prof. Roger Dougal

Office: Swearingen 3A57

E-mail: dougal@cec.sc.edu

Office Hours: by Outlook or Teams meeting request 9 AM to 6 PM

TAs: Rabab Abdelfattah email: rabab@email.sc.edu
 Ritwik Nag email: rnag@email.sc.edu

Peer Mentor: Daniella Mallari email: dmallari@email.sc.edu

Lecture: Wed 2:20 – 3:35 PM in rm 2A21 Swearingen

Lab section 1: Tue 3:30 – 6:30 PM in 2D36 Swearingen

Lab section 2: Thurs 3:30 – 6:30 PM in 2D36 Swearingen

Effort

This is a three-credit class so an average student in an average week should expect to spend about nine hours engaged in learning activities. (This follows the universal academic norm of approximately two hours out of class for each hour in class.) Our Monday lectures will account for one-to-two hours per week and your lab session will account for three hours per week, so, as a baseline, you should plan to spend another four to five hours per week on activities such as preparation for upcoming lab sessions, writing lab reports, studying for tests, or completing assignments. That’s approximately one hour per day if distributed throughout the week, or one-half day if concentrated into a single session. Because every student’s background is different, different students will require different amounts of time to achieve the Learning Outcomes – some will require more, and some will require less. Review your own situation and adjust your learning hours as appropriate. Although not all students will develop the same level of competence on each Learning Outcome, still, every student should attempt to achieve the highest possible level of performance on every Learning Outcome within a reasonable number of learning hours.

Assignments

Assignments will consist of readings, preparation for laboratory activities, in-laboratory activities, reports, tests, and presentations. All assignments and their due dates will appear on Blackboard, and all assignments will be submitted via Blackboard. The course calendar (further below) shows the expected number of assignments and when they will be due. We will attempt to return graded submissions within one week.

Course grade computation

|  |  |
| --- | --- |
| **Graded Item** | **Weights** |
| Pre-lab submissions | 10% |
| In-lab submissions | 10% |
| Lab Reports | 50% |
| Test 1 | 10% |
| Test 2 | 10% |
| End of Semester Team Project  | 10% |
| Total | 100% |

Course Grading scheme

|  |  |
| --- | --- |
| Score | Grade |
| 90.0 - 100 | A |
| 85.0 – 90.0 | B+ |
| 80.0 – 85.0 | B |
| 75.0 – 80.0 | C+ |
| 70.0 – 75.0 | C |
| 65.0 – 70.0 | D+ |
| 60.0 – 65.0 | D |
| score < 60.0 | F |

Grading of assignments

Generally, the rubric that will be used to grade any assignment (such as a project report) will be available on Blackboard before the assignment is due. Assignments that are not submitted on time through Blackboard will normally be scored zero points. Late submissions will only be allowed with the instructor’s approval (via email, preferably in advance) for a documented and acceptable reason. Assignments are generally made with long lead times (several days), so there are few acceptable reasons for missing a due date. In general, an assignment that is submitted *n* days late will be scored according to the rubric for the assignment, then the rubric grade will be multiplied by (1-0.05*n*). Missed tests or lab practicums must be made up. Format and content of makeup assignments may be different from the originals.

Course Schedule

The planned semester calendar is shown below, but “plans are made to be changed”. Consider dates to be approximate. Assignment due dates shown in Blackboard will be the definitive due dates. If a due date is not clear or appears to be wrong, please ask for clarification. Any significant changes to the semester calendar will be published on Blackboard.



Attendance Policy

You are expected to attend and participate in the weekly lecture and in the lab session each week. Attendance in lecture and lab sessions will be recorded. You should always be on time and prepared. Missing a roll call will be recorded as a missed attendance, regardless of whether you arrive later. (But it is still worthwhile to arrive later because the rest of us will still be learning!) Absences for a number of University-approved situations, including, but not limited to illness or injury, participation in University-sponsored events, required military duty, or observance of a religious practice or holy day will be excused with appropriate documentation as described in the Undergraduate Bulletin. If you will not be in class due to one of the University-approved excusable situations, you must contact the instructor as early as possible to discuss a plan for obtaining and submitting documentation to excuse the absence.

This class has only 14 lectures and 14 lab sessions. After one unexcused absence from lecture, each additional absence will result in a 3% penalty on your semester grade. If you miss a lecture, you will have to review the lecture presentation (available on Blackboard after the class session) to self-learn whatever material was covered.

After one unexcused lab session, each additional absence will also result in a 5% penalty on your semester grade. Regardless of the grade penalty, you still must complete the missed lab activities and submit any associated lab report, otherwise you will earn a zero on each item. Depending on availability of space, you may be able to make up your work during another lab session during the same week, otherwise you will have to do it outside of regular lab hours.

Near the end of the semester, students should be prepared to make fair contributions to their team project. If a team includes students from more than one lab section, the team can choose which session to meet so as to best accomplish the project.

Course Communications

**Student to Instructor**

The instructor will present prepared material during each lecture session. Students are encouraged to ask questions or otherwise actively participate so that the “lecture” will become more of a “discussion”. During lab sessions, TAs or Peer Mentors will be available to offer guidance and answer questions. Outside of class or lab sessions, the preferred means of communication is via email from your USC email account. Individual communications can be scheduled via Teams or face-to-face in the instructor’s office.

**Student to Student**

Most of the lab projects will be performed individually. Students are encouraged to discuss problems with nearby classmates to try to find a solution before requesting help from a TA or Peer Mentor. During the Team Project, students are expected to fully participate in their own team’s activities. Team members may wish to communicate with their team mates outside of the lab hours via Teams, email or other channels.

**Student to Content**

All written materials and class presentations will be available on Blackboard or in the textbooks. Primary engagement with hands-on content will occur during the lab sessions.

Expectations for Classroom Behavior

Please be respectful of each other, the instructor, and any guest presenters. We are all here to learn! Any disrespectful or disruptive behavior may result in your referral to the Office of Student Judicial Programs.

Expectations of the Instructor

I am sure that you expect me to facilitate your learning, to answer questions appropriately, to be fair and objective in grading, to provide timely and useful feedback on assignments, to be available in person or online via email and by video upon request and to treat all students respectfully. I will do my best to live up to those expectations.

Technology Requirements

You are pursuing an engineering degree, and this is a technical class, so it has somewhat high expectations for technical skills. Beyond the usual web-interactive skills, you will be expected to:

* proficiently use a word processor to write reports, and to save files in pdf format for submission of homework assignments.
* Transfer computer files between a computer or instrument and a usb memory device.
* Install and use LTspice circuit simulation software on your own computer
* Install and use gnuplot graphics plotting software on your own computer (optional, but useful)

Academic Integrity

As a student of the University of South Carolina, you agree to comply with the University Code of Conduct (www.sc.edu/policies/ppm/staf626.pdf), Honor Code (www.sc.edu/policies/staf625.pdf), Carolinian Creed (www.sc.edu/policies/staf102.pdf), and all Other policies of the University of South Carolina.

You assume full responsibility for the content and integrity of the academic work you submit. The guiding principle of academic integrity shall be that your submitted work, examinations, reports, and projects must be that of your own work. Prohibited behaviors include plagiarism, cheating, falsification, and complicity.

Lectures and course materials (which is inclusive of presentations, tests, exams, outlines, and lecture notes) may be protected by copyright. Homework solutions may be copyrighted by the publisher. You are encouraged to take notes and utilize course materials for your own educational purpose. However, you are not to reproduce or distribute this content without expressed written permission from the instructor. This includes sharing course materials to online social study sites like Chegg, CourseHero and other services. Students who publicly reproduce, distribute or modify course content may be in violation of the university’s Honor Code policy on Complicity.

Deviation from these expectations will result in referral to the Office of Academic Integrity. Students found responsible for violating the Honor Code will be subject to non-academic penalties by the Office of Academic Integrity, as well as an academic penalties ranging from a zero on the assignment to a failing grade in the course.

When a student is uncertain as to whether his/her conduct would violate the Honor Code, it is the responsibility of the student to seek clarification from the instructor or the Office of Student Conduct and Academic Integrity [www.sc.edu/academicintegrity](http://www.sc.edu/academicintegrity)

Accommodating Disabilities

The University of South Carolina provides high-quality services to students with disabilities, and we encourage you to take advantage of them. Students with disabilities needing academic accommodations should register with and provide documentation to the Student Disability Resource Center in Close-Hipp 102 or 803-777-6142, TDD 803-777-6744, email sasds@mailbox.sc.edu. Discuss with the instructor the type of academic or physical accommodations you need. See <https://www.sa.sc.edu/sds/>.

Please do this as soon as possible. All course materials can be made available in alternative format upon request.

Recommended Study Habits

* Read the assigned materials - such as the textbook, lab project instructions, or equipment manuals, before the related lecture or lab session.
* Think about how you will apply the information from the readings during the lab session or as you write a report. Bring thoughtful questions about these topics to class for discussion.
* Take notes during class discussions and while completing reading assignments, even though the lecture presentation slides will be provided to you. Writing your own notes helps you learn.

Deviations

Minor deviations from the syllabus are a normal part of any adaptive teaching and learning process.