Syllabus Fall 2022

ELCT 222 – Signals & Systems

Course Coordinator

Undergraduate Program Committee

Catalog Description

Analysis of continuous-time signals and systems in time and frequency domains, Fourier series and transforms, Laplace transforms; introduction to discrete-time signals.

Course delivery structure:

Lectures

Credit Hours 3

Prerequisite(s) by course

C or better grade in MATH 242 and ELCT 221

Prerequisite by topics

Potential & Voltage, Current & Ohm’s Law, KCL & KVL, Nodal & Mesh Analysis, Thevenin & Norton Equivalent sources, AC Circuits, Differential Equations, Laplace transform methods, Series method.

Required Textbooks and other materials

1. Ulaby, Maharbiz, and Furse, Circuits, Michigan Publishing 2018

or cost-free version of the above books downloadable from https://www.publishing.umich.edu/publications/ee/

1. Ulaby and Yagle, Signals and Systems, Michigan Publishing 2018
2. Analog Discovery Kit 2 available at USC bookstore or from

<https://store.digilentinc.com/analog-discovery-2-100msps-usb-oscilloscope-logic-analyzer-and-variable-power-supply> Note that this kit will be used throughout your program of study in EE

1. Analog parts kit of your choice which was required in ELCT 221.
2. Matlab-downloadable through the University for free to all students. It was also required in earlier courses.

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

Learning Outcomes:

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

1. analyze RL and RC linear circuits and systems in the time and frequency domains
2. find transfer function of linear time-invariant systems
3. sketch frequency response plots (Bode diagrams) for RLC linear circuits.
4. use engineering tools such as Matlab to construct accurate frequency response plots.
5. analyze first-order linear active filters (using operational amplifiers) in the frequency domain.
6. use the techniques of Fourier series, Fourier transforms, and Laplace transforms for the analysis of first- and second-order linear systems.

Learning Outcomes for ELCT222 are equivalent for all delivery methods.

Course Topics:

* First-order RC and RL circuits
* Second-order RLC circuits
* Review of frequency responses, transfer function, bode plot
* First- and second-order linear filter circuits
* Frequency response of first-order linear active filter using OPAMPS
* Laplace transform
* Application of the Laplace transform
* Fourier series
* Fourier transform
* Nyquist theorem and sampling/aliasing

**Technology**

Minimal required student technical skills: general computer literacy

Course Contribution to ABET Student Outcomes:

ELCT 222 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 – course learning outcomes 1–6

Grade Forgiveness

If you are close to a higher grade within 0.5 pts, based on your class participation and other factors, I may, at my discretion, bump your grade up.

Course Outline/Schedule

Topics for each class meeting are listed below. However, circumstances may call for a departure from this schedule. Any changes to the schedule will be made in advance.

|  |  |
| --- | --- |
| **Topic** | **Week** |
| First-order circuits (UMF, Chapter 5) | 2 weeks |
| Second-order circuits (UMF, Chapter 6) | 2 weeks |
| Op-amps, passive and active filters (UMF Chapter 4, Chapter 9) | 0.5 weeks |
| Signals: types of signals, transformations, waveforms (UY, Chapter 1) | 2 weeks |
| Linear time-invariant systems (UY, Chapter 2) | 2 weeks |
| Fourier Analysis: circuit analysis with Fourier transform and applications of Fourier transform (UMF, Chapter 13) | 2.5 weeks |
| Laplace transform and applications (UMF, Chapter 12) | 2 weeks |
| Sampling and modulation (UY, Chapter 6) | 2 weeks |

Course Policies

Attendance Policy

Students are expected to attend each scheduled class meeting, to be on time, and to be prepared for each class session. Attendance will be occasionally recorded during class sessions. Each five recorded absences result in the final course score penalty of five points, i.e., 5 - 9 recorded absences: 5 points reduction, 10 – 14 recorded absences: 10 points reduction etc. If you are absent, you are responsible for learning the material covered in class and for completing assignments that were due or assigned in your absence. If you know of an upcoming absence, please let me know ahead of time so I can give you extensions, or work with you to make sure you succeed.

This course participates in the progress report initiative through the Student Success Center (SSC). At key points throughout the semester, the instructor may alert the SSC of students who may not be meeting criteria that’s been established for both attendance and/or course grade performance. Students who receive an alert will get an e-mail, then be contacted via the SSC Call Center, in which they’re encouraged to connect with additional academic support resources.

It is important we protect the health of all classmates, so please do not come to class if you are sick. If you are absent due to a medical issue, your priority is taking care of yourself, and you will not be penalized for any absences related to illness. In the event you are placed under quarantine for being in close contact to someone who has tested positive for COVID-19 or are isolated because you have tested positive, please talk to me so we can work together to ensure you can continue to remain an active participant in class.

Missed assignment results in zero score for that assignment.

Makeup assignment will be allowed only with the instructor approval for an acceptable, documented reason. Acceptable reasons for makeup include severe illness, family emergencies or other unavoidable events of which the instructor must be notified in writing or by email. Format and content for makeup assignments may be different from the original ones.

Plagiarism in Class

Any plagiarism on homework problems or exams, or the use of additional note cards, texts or other information on an exam will result in a course reduction of one letter grade.

Assignment Submission

Assignments are always due at the end of class on the day noted. This will typically be 1 week after the assignment, although this may be depending on the instructor’s discretion. Late assignments will not be accepted.

Makeup Policy

Makeup exams will be allowed only with pre-approval of the instructor or with an acceptable, documented reason. Acceptable reasons for makeup exams include severe illness, family emergencies or other unavoidable events including dangerous weather conditions and car accidents. Exam format for makeup exams may be different than the original exam.

To report emergencies please use the link of the office of the university Ombudsman

<https://cm.maxient.com/reportingform.php?UnivofSCAcadSupport&layout_id=7>

where you can report your emergency and request for possible accommodation. You can upload any documentation using the same link at the bottom of the page. The Ombudsman office can then directly contact me (the instructor) if they find it appropriate.

Expectations for Classroom Behavior

Please be respectful of each other, the instructor, and any guest presenters while in class. 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

The instructor is expected to facilitate learning, to answer questions appropriately, to be fair and objective in grading, to provide timely and useful feedback on assignments, to maintain adequate office hours, and to treat students respectfully.

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),](http://www.sc.edu/policies/ppm/staf626.pdf) Honor Code ([www.sc.edu/policies/staf625.pdf](http://www.sc.edu/policies/staf625.pdf)), Carolinian Creed ([www.sc.edu/policies/staf102.pdf](http://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’s Complicity policy.

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 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](mailto:sasds@mailbox.sc.edu). Discuss with the instructor the type of academic or physical accommodations you need.

**Other Resources**

Writing Center (<http://artsandsciences.sc.edu/write/university-writing-center>)

No matter what you choose to do after your college career, you can’t escape spoken or written communication (emojis won’t help you at work). The University Writing Center is an important resource you should use! It's open to help any UofSC student needing assistance with a writing project at any stage of development. The main Writing Center is in Byrnes 703.

University Library Resources ([www.sc.edu/libraries](http://www.sc.edu/libraries))

* University Libraries has access to books, articles, subject specific resources, citation help, and more. If you are not sure where to start, please Ask a Librarian! Assistance is available at [www.sc.edu/libraries/ask](http://www.sc.edu/libraries/ask).
* Remember that if you use anything that is not your own writing or media (quotes from books, articles, interviews, websites, movies – everything) you must cite the source in IEEE format (<https://ieeeauthorcenter.ieee.org/wp-content/uploads/IEEE-Reference-Guide.pdf>).

Recommended Study Habits

* Read the assigned material before class.
* Bring thoughtful questions to class for discussion.
* Prepare for the exams in study groups.
* Take notes during class discussions and while completing reading assignments.

**ATTENDANCE POLICY**

Deviations

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