Course Syllabus

 ELCT 221 – Circuits

Course Coordinator

 Undergraduate Program Committee

Catalog Description

Fundamentals of electrical and electronic components. Basic network laws. Mathematical and computer tools for network analysis.

Course delivery structure:

Lectures

Credit Hours 3

Prerequisite(s) by course

C or better grade in MATH 142 and ELCT 102 or D or better grade in ELCT 220

Prerequisite by topics

Ohm’s Law, Kirchhoff’s law, power, DC circuit nodal, mesh analysis, DC circuit theorems

Required Textbooks and other materials

1. **CIRCUITS,** Third Edition by Fawwaz T. Ulaby, Michel M. Maharbiz, and Cynthia M. Furs. ISBN: 978-1-934891-19-3

or cost-free version of the book downloadable from
<https://www.publishing.umich.edu/publications/ee/>

Note that this book will also be used in ELCT 221, ELCT 222

2**.** USB instrument**:**

**ADALM2000** **kit** (recommended option) can be purchased online e.g. [www.mouser.com](http://www.mouser.com)
or

**Analog Discovery 2 Kit** - can be purchased at the University book store or online at students-only price: <http://www.ni.com/en-us/shop/select/analog-discovery-2>

3. **Analog parts kit** ADALP2000 by Analog Devices Inc. (or equivalent parts kit) -

can be purchased e.g. from <https://www.digikey.com/products/en?keywords=adalp2000>

**Notes**: (1) students are expected to already have the Analog parts kit purchased for ELCT 101 course

 (2) ADALM 2000 or ADK2 and parts kits will be used in several courses throughout your program of study in EE

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

Course Learning Outcomes:

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

1. solve problems on ac linear circuits using concepts of phasor domain and impedance
2. perform Thevenin transformation and calculate power delivered to the load in linear ac circuits
3. find transfer functions and generate Bode plots for R-L-C circuits in a frequency range
4. use MATLAB (or equivalent) tool for ac circuit analysis using matrix equations, to generate frequency responses and to make graphs of transfer function.
5. use SPICE (or equivalent) simulations to build the schematics and generate frequency responses and graphs of transfer function.
6. build simple RC and RLC circuits and measure their frequency response using USB instrument.

Learning Outcomes for this course are equivalent for all delivery methods.

Course Topics:

* Review: KCL, KVL, DC circuit analysis
* Sinusoidal (AC) Signals
* Capacitors and inductors in AC circuits
* Phasors and complex numbers
* Nodal and Mesh Analysis of AC circuits
* Thevenin and Norton transformations in AC circuits
* Power in AC circuits
* Two-port networks: frequency response, transfer functions, Bode plots
* SPICE simulations of RLC circuits
* Power loss in cables; transformers
* Three-phase circuits

Course Contribution to ABET Student Outcomes:

ELCT 221 contributes to the 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 –5
* Outcome 6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions – course learning outcomes 6

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| **Topic** | **Week** |
| IntroductionReview: Potential, Voltage, Current and Ohm’s Law (Ch.2-1), KCL, KVL (Ch.2-2), DC circuit analysis (Ch. (3-2…3-4) | Weeks 1, 2 |
| Sinusoidal (AC) signals (Ch. 7-1); Capacitors and inductors in AC circuits; Phasors and complex numbers (Ch.7-2); | Week 3,4 |
| AC Circuit analysis using complex variables (Ch.7-3,7-4)AC Circuit analysis using MATLAB | Week 5,6 |
| AC Nodal analysis AC Mesh Analysis (Ch. 7-9) | Week 6, 7 |
| AC Thevenin and Norton techniques (Ch.7-9) | Week 8-10 |
| Power in AC circuits (Ch.8) | Week 10,11 |
| Two-port networks: transfer functions (Ch. 9-1, 9-2,9-4)) | Week 11,12 |
| AC circuit analysis using SPICE | Week 12 |
| Bode plots (Ch. 9-3) | Week 13, 14 |
| Three-phase circuits (Ch. 10) | Week 15 |
| Power loss in cables, magnetically coupled circuits, transformers (Ch.11) | Week 15 |
| Final Exam preview | Week 16 |

Course Communications

The instructor communicates with students directly in the classroom or in the office during appointments. In addition, communication methods include Blackboard announcements, Blackboard Collaborate tools as well as email messages. Per student or instructor request, group or individual face-to-face or online meetings, Q&A and consultation sessions can be arranged.

The results of submitted homework and computer-graded test answers are available immediately on LON-CAPA. The results of test reports and total test results (computer-graded and reports) will be posted within a week after submission in the Blackboard grade center.

Student-to-Instructor (S2I) interaction. Students can contact instructor in the classroom, via email (provided in this syllabus), via Blackboard chat or Blackboard Discussion board.

Student-to-Student (S2S) interactions include email correspondence, Blackboard chat or Discussion board.

Student-to-Content (S2C) Interactions include access to posted lectures on Blackboard, recorded class sessions as well as reading corresponding content of the textbook.

Technology requirements

Every EE class requires routine computer and online skills such as use of Blackboard Learning Management system (LMS), VPN and composition of documents.

In addition, this class has the following requirements:

Students are required to have laptops (tablets) with internet access during every class session. Windows OS is strongly recommended.

Students are expected to have sufficient skills and user credentials to download and install the software required for the course (MATLAB or equivalent, LT SPICE)

Students must be able to access to LON-CAPA LMS to get the assignments and submit the results (homework, tests etc.). Cisco VPN is needed to access LON-CAPA outside the USC campus

Please contact your instructor or UTS if you need help with internet access setup, software installation or usage.

**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 occasionally be 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.

**Missed Tests/Exams/Assignments**

You are expected to make every effort to take required tests, quizzes, and exams as scheduled. Missed tests will receive a grade of 0 points. Make-up tests may be given for legitimate excusable absences, including illness of the student, accident, mandatory court appearance, military duty, or funeral attendance. Documentation of the circumstances will be required. If you know in advance you will miss a test, please notify the instructor in advance. If you are ill or if other extenuating circumstances cause you to miss a test, you must notify the instructor as soon as possible. Email is preferred.

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 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/

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.

Deviations

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