

EE 004 – Linear Circuit Analysis 2, Spring 2020

Course Number, Title, Credit Hours

EE004, Linear Circuit Analysis 2, 3 cr

Semester, Meeting Time and Place

Spring 2020, MWF 12:00-12:50 pm – Votey 254

Instructor Name, Contact Information, Office Hours

Dr. Eva Cosoroaba, ecosoroa@uvm.edu, Votey 375 - TBD

Tutors and other support name(s), contact info, location

https://www.uvm.edu/academicsuccess/tutoring_center This service is free for UVM students. EE004 tutors are available for one-on-one and group sessions. These tutors have taken EE004 and are very knowledgeable. As this is an independent service, I will not know if you use it or not. On the other hand, the more students take advantage of it, the more tutors UVM will hire for this course.

Pre-requisites or co-requisites

Pre-requisite: EE 003 or EE 100 or EE 075; PHYS 125 or PHYS 152

Course Description

This lecture based course covers AC circuit analysis. We will start with steady state AC circuit analysis using phasors. This section includes power calculations and 3-phases circuits. Then we will study the behavior of AC circuits with varying frequency, with special focus on filters (also called “frequency selective circuits”). In the third part of the course, we will use the Laplace transform to determine the behavior of circuits that transition between two steady states. Lastly, we will familiarize ourselves with the Fourier series and transform to analyze circuits with non-sinusoidal inputs. All throughout the semester, we will practice problem solving skills and the use of MATLAB for circuit analysis.

Course Learning Objectives (CLO)

After this course, you will be able to:

- 1) Define fundamental electrical engineering concepts and apply basic electrical engineering laws to circuits
- 2) Use various methods (inspection, intuitive analysis, KVL, KCL, circuit simplification, node voltage, mesh current with phasors and Laplace) to determine currents, voltages, power, energy, efficiency, frequency behavior, transfer functions in steady state AC and/or transient circuits

- 3) Design circuits and amplifier circuits considering environmental and economic factors and justify these design decisions (such as circuit topology and component values) based on circuit analysis results
- 4) Create problem solutions that are clear and easy to follow by other engineers
- 5) Use MATLAB to assist in AC circuit problem solving, Bode diagram plotting and Fourier series analysis.

Alignment with ABET Outcomes

0 - little or no contribution 1 - moderate contribution 2 - high level of contribution

Outcome (1): An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. Contribution: 2 (See CLO 2, 3, 4)

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. Contribution: 1 (see CLO 3)

Outcome (3): An ability to communicate effectively with a range of audiences. Contribution: 1 (See CLO 4)

Outcome (4): An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. Contribution: 0

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. Contribution: 0

Outcome (6): An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. Contribution: 1 (See CLO 3)

Outcome (7): An ability to acquire and apply new knowledge as needed, using appropriate learning strategies. Contribution: 0

EE Criterion (A): The curriculum must include probability and statistics, including applications appropriate to the program name; mathematics through differential and integral calculus; sciences (defined as biological, chemical, or physical science); and engineering topics (including computing science) necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components. Contribution: 2

EE Criterion (B): The curriculum for programs containing the modifier “electrical,” “electronic(s),” “communication(s),” or “telecommunication(s)” in the title must include advanced mathematics, such as differential equations, linear algebra, complex variables, and discrete mathematics. Contribution: 2

Required Course Materials:

Books and availability

- “Electric Circuits”, 11th Edition by James W. Nilsson and Susan Riedel, Pearson with the Modified Mastering Engineering module for homework assignments and additional study help such as videos on how to solve typical circuit problems and study guides. The standalone access card (ISBN 9780134743851) includes the eText and is available at bookstore. It is called “modified” because it integrates into Blackboard.
- If you have taken EE 003 in Fall 2019, the same access card is valid and you do not have to re-purchase the book.

Blackboard or other course sites:

- Blackboard will be used to send announcements, post lecture notes, and additional materials as needed. Make sure to check in regularly.
- The Modified Mastering Engineering site, which is used for twice a week homework assignments, is also accessed through Blackboard. Instructions on how to synchronize BB and Mastering will be provided in the first week of classes.

Attendance Policy and Classroom Environment Expectations:

As per UVM Attendance Policy you are expected to attend all regularly scheduled classes. I will occasionally take attendance. The purpose of attendance taking is for me to get to know you better as well as to take time to notice any unusual behavior. Attendance will not be reflected in your grade, except if you miss a graded in class assignment. (See Assessment and Religious Holiday section of the syllabus).

This is a 3 credit hour course and the outside of class amount of work will therefore be an average of 6-9 hours a week. This work includes lecture prep, quiz and test studying as well as homework. I expect roughly 1 hour for lecture review and 1-2 hours homework or quiz prep per class meeting.

How to prepare for the lecture:

- Make sure your notes are up-to-date and complete. Compare them to my notes, which I post on Blackboard after each class meeting or with colleagues and fill in what is missing.
- Thoroughly read previous meeting notes and corresponding textbook sections. Highlight importance concepts and questions.
- Use the materials available in the “Study Area” of Mastering Engineering.
- Get clarifications on your from the instructor during office hours and from colleagues, if you choose to form a study group.
- Work on homework problems. Even though you submit them online, I suggest working the out with pen and paper. (See more details in the Assessment section)
- Study for quizzes and tests using the provided study guides.
- Read the section of the textbook corresponding to the upcoming lecture. Consult the Module Schedule on Blackboard for details on readings and assignment schedule to plan your study week.

How to be most effective the classroom:

- Arrive early and get situated. Open your notes where we left of last time and get a writing utensil ready before the instructor arrives.
- On quiz or test days, have your writing utensil and calculator ready (and note sheet for test day). You will be provided paper with the quiz/test questions on it.

- Refrain from conversation with colleagues during instructional time.
- Engage in active learning exercises. As significant body of research has shown that active learning improves understanding and retention of new concepts. The way you participate is the way it will ultimately benefit you.
- Do not use phones in the classroom. If you need to make an urgent call, please leave the classroom as quietly as possible and distance yourself from the door far enough to not be heard from the classroom. Return promptly and quietly.
- Laptops and tablet can only be used for note taking, if that is your preference over paper. To prevent your and your neighbors becoming distracted close any other tabs, applications or programs except the note taking software before class starts.
- Remember, if there is anything going on currently in your life that prevents you to paying the attention the lecture requires, consider not coming. If that is the case, there are resources on campus that can help, which are listed further below in this document.

Grading Criteria/Policies:

Grade components:

- Online Homework (through Mastering Engineering on Blackboard) – twice a week, 15%
- Hand-in Homework (BB submission) – every other week, 20%
- Quiz (10 minutes, in class) – once other week, 20%
- Module Test (50 minutes, in class) – 3 over the semester, 20%
- Final Exam (2hr 45min) – Dec. 10th, 1:30pm - 4:15pm, 25%
- Extra Credit (See Assessment section)

Late policy: To help you get into the habit of getting your work done early and planning for circumstances that might delay your work, no late work is accepted. If you are unable to meet the submission deadline for a valid reason, you must reach out and make arrangements for a due date extension with the instructor before the original due date. After-the-fact extensions are not granted.

Grading schema: There is no curving in this course. Your grade reflects your work and effort you are willing to put into this course. It does not depend on how well or bad your colleagues are doing. I therefore encourage you to collaborate in a productive way within the bounds of academic integrity. See the Academic Integrity section further below. Table 1 shows the grade average to letter grade conversion used.

TABLE 1 - GRADE AVERAGE TO FINAL LETTER GRADE CONVERSION

Score	97+	93+	90+	87+	83+	80+	77+	73+	70+	67+	63+	60+	60-
Letter	A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F

Assessments (Graded Work):

Online Homework: are due online through Mastering Engineering on Blackboard every Monday and Friday of the week at the end of the day (11:59 pm), with exceptions for University closings and Module Tests. See the Module Schedule on Blackboard for details.

The online interface allows this type of homework to be a learning experience more than an assessment. Problem hints and links to related videos and test book sections are included to make it easy to get to the most relevant material. Using these does not affect your score at all. The following settings are used by the online grading system:

“Number of tries per question is 6. Some credit is lost for each incorrect answer.

- *Multiple choice and true/false (1 correct answer): Deduction per incorrect answer before last answer option is an equal %, based on number of answer options minus one*
- *“Select all that apply” multiple-choice answers: Partial credit if you correctly answer some portions and run out of tries. No credit if answer attempts remains (you don't complete the question).*
- *For all other questions: You lose 3% per incorrect answer.*

Hints can help you correctly answer the main Part question, avoiding credit loss for wrong answer attempts.

Hints do not affect your score.

Lose all credit for a question if you run out of answer attempts or request the answer.

Late assignment items: receive no credit”

After the due date, you can access the problems and re-solve them for more practice. Each homework will be assigned a percent score and the overall Online Homework score is the average of these percentages.

Hand-In Homework: is due every other Wednesday at the end of the day (11:59pm), with exceptions for University closings and Module Tests. A scanned version is due on Blackboard.

Hand-In Homework includes, but is not limited to: design problems and discussion thereof, proper write-ups of Online Homework problem solutions using the 5-step method, summary and discussion on Practical Perspective sections of the text book, Matlab assignments and other problems that are not supported by the Mastering Engineering environment. Solutions are provided as soon as the deadline passed.

The Hand-In Homework is graded 2/3 for completion and 1/3 for correct answer. The overall Hand-In Homework grade will be the average of all Hand-In Homework.

Quiz: is held every Wednesday at beginning of class. It is closed books and no notes. Calculators are permitted when needed. You will be told exactly what will be on it on Monday and it will be marked in the class notes of the day. Can be used to check for relevant prerequisites.

The overall quiz grade is calculated as follows, where n represents the number of total quizzes:

$Q_{avr} = \frac{\sum_{i=1}^n Q_i}{n-1}$ to account for a possible missed or low quiz. The average is capped to 100%.

Module Tests: are comprehensive test on the Course Learning Objectives, relevant to Modules 1-3. Module 4 related material is tested during the Final Exam. Study guides will be made available before each test. You are allowed a two-sided handwritten note sheet and calculator. No books or smart technology.

Grades will be shared through Blackboard and all midterms will be returned to the students. The overall Module Test grade will be the average of the three tests. The lowest of the three Module Test grades is replaced by the Final Exam grade, if latter is higher. This policy set in place to benefit those who either missed a Module Test or have improved over the course of the semester.

Final Exam: tests over the entire material of the course. A study guide will be made available. You are allowed 2 two-sided handwritten note sheet and calculator. No books or smart technology.

Exam grades will be shared through Blackboard and students may schedule an appointment to see their work. Final exams will not be returned to the students.

Extra Credit: earns you 3 points to your grade average before it is converted to a letter grade, with exceptions of scores 59.99 or lower. To earn it, read one of the three books below and participate actively in the book discussion scheduled for the last weeks of classes. Note that students from all my lecture courses are invited to participate in the discussions as well as EE faculty. A list of instructions of what/how to prepare (which includes pulling out quotes and discuss ideas in writing) will be posted on BB.

If you have already read one of the books on this list, please read another one. If you read all of them, let's talk about another option for you. This is a challenge for both you and me. I have not read the books below but want to (now have to!) as I think they all bring a valuable perspective to the table. The first is a novel or biography style narrative of a group of people whose work has made a difference in the field of science and/or technology. The second book is non-fiction that can change our view on certain aspects of engineering, science or tech. The third book is a book on personal and professional development and one can never have enough strategies to be more efficient and effective in their work.

- *Hidden Figures: the American dream and the untold story of the Black women mathematicians who helped win the space race* by Margot Lee Shetterly (368 pages, 3.96/4 stars on Goodreads, 58235 ratings) – **discussion:** Tuesday April 14, 6pm, location TBD.
- *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy* by Cathy O'Neil (259 pages, 3.87/5 stars on Goodreads, 12753 ratings) – **discussion:** Wednesday Apr. 22nd, 6pm, location TBD.
- *What the Best College Students Do* by Ken Bain (289 pages, 3.75/5 stars on Goodreads, 532 ratings) – **discussion:** Thursday Apr. 30th, 6pm, location TBD.

All books are available through our University Library or the Fletcher Free Library in downtown Burlington, either directly or through interlibrary loans. Feel free to “read” the audiobook version of any of the three books, just make sure it is an unabridged version.

Course Evaluation:

All students are expected to complete an evaluation of the course at its conclusion. The evaluations will be anonymous and confidential, and the information gained, including constructive criticisms, will be used to improve the course. A midterm evaluation might be conducted.

Student Learning Accommodations:

In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact SAS, the office of Disability Services on campus. SAS works with students and faculty in an interactive process to explore reasonable and appropriate accommodations, which are communicated to faculty in an accommodation letter. All students are strongly encouraged to meet with their faculty to discuss the accommodations they plan to use in each course. A student's accommodation letter lists those accommodations that will not be implemented until the student meets with their faculty to create a plan.

Contact SAS: A170 Living/Learning Center; 802-656-7753; access@uvm.edu
www.uvm.edu/access

Religious Holidays:

Students have the right to practice the religion of their choice. If you need to miss class to observe a religious holiday, please submit the dates of your absence to me in writing by the end of the second full week of classes. You will be permitted to make up work within a mutually agreed-upon time. <https://www.uvm.edu/registrar/religious-holidays>

Academic Integrity:

Discussions between students are encouraged, as these deepen the understanding of class topics, but dishonesty in all its forms is not tolerated. The four types of academic dishonesty are: plagiarism, cheating, collusion and fabrication. All types will be reported. All of the work you submit must be your own. You can discuss possible solutions with colleagues but you cannot give or receive exact answers to problems. If you are ever unsure about what does or does not constitute dishonesty in a specific case, please come see me and we can talk about it. Visit the UVM code of Academic here: <https://www.uvm.edu/policies/student/acadintegrity.pdf>

Grade Appeals:

All graded work should be reviewed promptly by the students. Any questions in regards to potential grading errors should be brought to the attention of the instructor within one week's time after the assignment is reviewed in class or solutions are posted. Clearly document in writing what you believe the error to be and attach that to the original work. After one week's time, no score adjustments will be made.

If you would like to contest a final grade, please follow the procedures outlined in this policy: <https://www.uvm.edu/policies/student/gradeappeals.pdf>

General Grading:

For information on general grading and GPA calculation, go to <https://www.uvm.edu/registrar/grades>

Code of Student Rights and Responsibilities:

<http://catalogue.uvm.edu/undergraduate/academicinfo/rightsandresponsibilities/>

FERPA Rights Disclosure:

The purpose of this policy is to communicate the rights of students regarding access to, and privacy of their student educational records as provided for in the Family Educational Rights and

Privacy Act (FERPA) of 1974.

<http://catalogue.uvm.edu/undergraduate/academicinfo/ferparightsdisclosure/>

Promoting Health & Safety:

The University of Vermont's number one priority is to support a healthy and safe community:

- Center for Health and Wellbeing: <https://www.uvm.edu/health>
- Counseling & Psychiatry Services (CAPS): Phone: (802) 656-3340
- C.A.R.E.: If you are concerned about a UVM community member or are concerned about a specific event, we encourage you to contact the Dean of Students Office (802-656-3380). If you would like to remain anonymous, you can report your concerns online by visiting the Dean of Students website at <https://www.uvm.edu/studentaffairs>

Final Exam Policy:

This course final exam is scheduled for Thursday, May 7th, 10:30-13:15 in Votey 254. Additional details about the final exam (see Assessment section) will be provided closer to the date. General University final exam policy outlines expectations during final exams and explains timing and process of examination period. <https://www.uvm.edu/registrar/final-exams>

Alcohol and Cannabis Statement:

As a faculty member, I want you to get the most you can out of this course. You play a crucial role in your education and in your readiness to learn and fully engage with the course material. It is important to note that alcohol and cannabis have no place in an academic environment. They can seriously impair your ability to learn and retain information not only in the moment you may be using, but up to 48 hours or more afterwards. In addition, alcohol and cannabis can:

- Cause issues with attention, memory and concentration
- Negatively impact the quality of how information is processed and ultimately stored
- Affect sleep patterns, which interferes with long-term memory formation

It is my expectation that you will do everything you can to optimize your learning and to fully participate in this course.

Semester Schedule:

Subject to change. For the most recent schedule, check Blackboard

W1	Mo	Jan 13	Intro to 004
	We	15	
	Fr	17	
W2	Mo	20	<i>MLK Day – No classes</i>
	We	22	
	Fr	24	
W3	Mo	27	
	We	29	Module 1: AC Circuits and Power (Ch. 9, 10, 11)
	Fr	31	
W4	Mo	Feb 3	
	We	5	
	Fr	7	
W5	Mo	10	
	We	12	
	Fr	14	
W6	Mo	17	<i>Presidents Day – No classes</i>
	We	19	
	Fr	21	
W7	Mo	24	
	We	26	
	Fr	28	
W8	Mo	Mar 2	
	We	4	Module 2: Frequency Selective Circuits (Ch. 14, 15)
	Fr	6	
W9	Mo	16	
	We	18	
	Fr	20	
W10	Mo	23	
	We	25	
	Fr	27	
W11	Mo	30	
	We	Apr 1	
	Fr	3	
W12	Mo	6	
	We	8	Module 3: Transient Circuit Analysis (Ch. 12, 13)
	Fr	10	
W13	Mo	13	
	We	15	
	Fr	17	
W14	Mo	20	

	We	22		Module 4: Special Topics in Circuits (Ch. 16, 17, 18)
	Fr	24		
W15	Mo	27		
	We	29		
	Fr	May 1	Source Summary and Prep for Final	