EE 220-01E - Circuity Theory - 24705
3 (2:30, 2:30) [Credit Hours (Lecture, Lab)]

COURSE SYLLABUS: Spring 2024

INSTRUCTOR INFORMATION

Instructor: Gerald Patrick Carter, Distinguished Lecturer
                         Electrical Engineering Program
                         Department of Engineering and Technology
Office Location: AGET 216
Office Hours: TR 9:00 AM – 11:30 AM or by appointment
Office Phone: 903-886-5706
Office Fax: 903-886-5960 (inform instructor when fax is sent)
University Email Address: patrick.carter@tamuc.edu
Preferred Form of Communication: **e-mail**
Communication Response Time: within 48 hours (weekdays)

COURSE INFORMATION

Class Meeting Schedule: Meets 1/17/2023 through 5/12/2023
Class Meeting Dates: Tuesday and Thursday 2:00PM – 4:30PM
Classroom: AGIT 214. Lectures and Labs will be Face-to-Face.

Course Format: This course contains lectures and Lab sessions. Unless otherwise directed by the instructor, the Lectures will be conducted on Tuesdays and Lab sessions will be on Thursdays.

Materials – Textbooks, Readings, Supplementary Readings

Textbook Required (Free download):

- Fawwaz T. Ulaby, Michel M. Maharbiz, & Cynthia M. Furse, *Circuit Analysis and Design*, 2018, Michigan Publishing, ISBN 978-1-60785-483-8 (hardcover), ISBN 978-1-60785-484-5 (electronic)
- Download free textbook from https://cad.eecs.umich.edu/

The *syllabus/schedule are subject to change.*

- There are multiple student resources on this website as well. It is highly recommended that you download and utilize the available resources for your study efforts.
- There are also videos and other resources available from two universities that use this book:
    - https://cad.eecs.umich.edu/berkeley_videos.html
    - https://utah.instructure.com/courses/473597

Laboratory Manual:

- To be provided electronically by the instructor.

Optional References:

- J. W. Nilsson and S. Riedel, *Electric Circuits*, 11th Edition, 2018, Pearson, ISBN- 13: 978-0134746968.
- C. Alexander and M. Sadiku, *Fundamentals of Electric Circuits,* 6th Edition, 2106, McGraw-Hill Education, ISBN-13: 978-0078028229.

Software Required:

- Microsoft Office - MS Word, Excel, PowerPoint
- Multisim (electronic circuits simulation program)

Course Description

This course introduces the theory and principles of DC/AC circuit analysis. Topics include electrical circuit laws, network theorems, operational amplifiers, RLC networks, topology of electrical networks, sinusoidal steady-state analysis, AC power analysis, multiphase circuits, magnetically coupled circuits, transformer, and introduction to frequency domain analysis. The course has an associated Laboratory experiments set, which will require the use of simulation software (e.g. Multisim and PSpice) and hardware equipment.

Prerequisites: MATH 2320 with a minimum grade of C, MATH 2414 with a minimum grade of C, PHYS 2426 with a minimum grade of C.

Learning Outcomes of Instruction:
1. Determine parameters such as node voltages, branch currents, and electric power in electric circuits using Ohm's law and Kirchhoff's current and voltage laws.
2. Analyze AC and DC circuits using mesh analysis, nodal analysis, superposition, Thevenin, Norton, and source transformation techniques.

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3. Determine natural and step responses of RC, RL, and RLC circuits.
4. Identify appropriate circuit analysis techniques for analyzing DC/AC circuits.
5. Design and analyze op-amp circuits.
6. Analyze AC circuits using the frequency domain approach.
7. Calculate AC powers in ac circuits.
8. Use appropriate software tools PSpice/ Multisim for AC/DC Circuits analysis.
9. Use Laboratory instruments such as multimeters, oscilloscopes, function generators, power supplies, etc.
10. Perform experiments to validate the fundamentals of electric circuit theory.

COURSE REQUIREMENTS

Minimal Technical Skills Needed

- Microsoft Office - MS Word, Excel, PowerPoint
- Multisim (electronic circuits simulation program) and/or Spice (simulation program for integrated circuits emphasis).

Instructional Methods

The instructional methods will include lectures, discussions, problem-solving, Lab exercises and reports, and simulations using software. Instructions will be based on the course textbook and the Lab manual. Course materials, announcements, and lecture notes will be posted on the course website.

Student Responsibilities or Tips for Success in the Course

. **Attendance:**

Assuming the student is well and in compliance with TAMUC Pandemic Response Policy, attendance is a requirement for this course. If the student is ill or has been exposed, the student should not attend and should let the instructor know as soon as possible to support coordination and excused absence from lectures/labs.

Students must attend classes, participate in class work and discussions, and perform required course assessments supporting the anticipated learning objectives, such as Lab experimentations. Students are expected to regularly log into the course website to download course materials, submit their coursework as instructed, and follow up on new announcements. This course requires at least 6 hours of extensive study outside of the classroom per week.

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Attendance Policy

Class Attendance Requirement (one lateness = 1/2 absence)

# of Absences	0 – 3	4	5	6	7	>7
Point Deduction	0	- 2	- 4	- 10	- 30	F

Lab Safety Training

Students registered for this course must complete the required Lab safety training prior to entering the Lab and undertaking any activities. There are no exceptions to this University policy. Failure to complete the required training will preclude participation in Lab activities and assessments.

Lab Report Formatting

Students are required to follow the Laboratory Report template provided on D2L. This template is in Microsoft Word format and must be submitted in Microsoft Word format to the associated lab dropbox on D2L. Other formats such as Google Docs or adobe PDF will not be accepted. Failure to follow the template will result in lower grading or potentially a grade of zero for the assignment.

Assignment Submissions

Homework assignments are to be submitted electronically to D2L drop boxes by the due date/time posted on D2L. Late submissions will not be accepted and will result in a grade of zero for the assignment. The student is highly encouraged to work on the problems from each chapter as we are working through the chapter in the lectures. This approach supports the best learning and retention of the materials presented in lecture.

GRADING

Final grades in this course will be based on the following scale:

A = 90%-100%
B = 80%-89%
C = 70%-79%
D = 60%-69%
F = 59% or Below

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Total points corresponding to the final letter grades

A = 90-100 Points

B = 80-89 Points

C = 70-79 Points

D = 60-69 Points

F = 59 & > Points

Weights of the assessments in the calculation of the final letter grade.

Assessment	Weight	Due time
Homework Assignments	20%	~Weeks 2, 3, 5, 6, 9, 10, 12 13
Quizzes	20%	~Weeks 4, 7, 11, and 14
Midterm Exam	20%	Week 8
Final Exam	20%	Week 16
Lab Work	20%	~Bi-Weekly

Relationship between Assessments and Course/Student Learning:

Learning Outcomes of Instruction	Assessment
1. Determine parameters such as node voltages, branch currents, and electric power in an electric circuit using Ohm's law, and Kirchhoff's current and voltage laws.	Quizzes, Exams
2. Analyze AC and DC circuits using mesh analysis, nodal analysis, superposition, Thevenin, Norton, and source transformation techniques.	Quizzes, Exams
3. Determine natural and step responses of RC, RL, and RLC circuits.	Lab Work
4. Identify the most appropriate circuit analysis techniques for analyzing DC/AC circuits.	Exams
5. Design and analyze op-amp circuits.	Lab Work
6. Analyze AC circuits using the frequency domain approach.	Quizzes, Exams, Lab Work
7. Calculate AC powers in ac circuits.	Lab Work
8. Use appropriate software tools PSpice/ Multisim for AC/DC Circuits analysis.	Lab Work

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9. Use Laboratory instruments such as multimeters, oscilloscopes, function generators, power supplies, etc.	Lab Work
10. Perform experiments to validate the fundamentals of electric circuit theory.	Lab Work

Quizzes and Exams

Unless otherwise noted by the instructor, quizzes and exams will be closed book and closed notes, except for one (1) standard 8.5/11 letter-sized "cheat sheet of your own making." Your cheat sheet should include relevant scientific formulas and problem examples you find to be most important in the homework and classwork.

Students will need to bring a scientific calculator with no wifi functionality for quizzes and exams. The use of personal phones or personal electronic equipment is strictly prohibited during quizzes and exams unless specifically pre-approved and allowed by the instructor. Makeup quizzes and exams may be offered but an official permit for an absence that fulfills University procedures must be made available to the instructor in a timely manner.

Assignments

Homework solutions should be submitted to the appropriate D2L drop box by the due date/time identified on D2L. Students will need to submit one solution report per homework assignment. Homework solutions of an assignment will be due one week from the day it is assigned or per the D2L schedule. Unless prior arrangements are made with the instructor, no late submission of assignment solutions will be permitted. Some homework assignments may require the submission of simulation files created in Multisim.

Lab Work

Students will perform experiments to verify practically the theories and fundamental concepts of DC and AC electric circuits. They will analyze various electric circuit networks to measure circuit parameters such as AC and DC voltages, currents, power, energy, etc. They will acquire practical skills in building electric circuits that contain discrete components such as resistors, capacitors, inductors, etc. This lab will also provide students with experience in using basic measurement devices and equipment available in the electric circuit laboratory and software simulation using Multisim and/or PSpice. There will be 6 Lab exercises distributed over the semester and Lab exams. Students will work in teams (2-3 students/team).

Additional guidelines for Lab work:

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- Perform 6 extensive Lab experiments, each of which will require up to 2 weeks of work to be performed. Experiments are listed in the course outline below.
- The class will be divided into groups to do Lab work, with 2-3 students/group. .
- Students are required to perform extensive simulations for each Lab experiment. This is a compulsory requirement.
- Students must come to the Labs to perform hardware work.
- Each group of 2-3 students will need to submit a single, full report for each experiment, using the Lab report template provided on D2L.
- The course instructor will be present with students during the Lab times to explain the experiment, to follow up on students' progress, and to answer questions.
- Students must be present in the Lab to be involved with the class and the instructor.

Grading Policy for Lab Work:

Pre-Labs must be completed before coming to the Lab. Students will be turned away from the Lab if the Pre-Lab is not complete. Prelab consists of downloading and reading the lab requirements and performing pre-lab calculations and/or research before coming to the lab to perform the lab experiment.

Lab circuits must be built during Lab on an empty breadboard. They may not be built before the Lab period. Each student will be provided with a Breadboard and tools and will be responsible for maintaining and returning the supplies at the end of the course. At the end of each Lab, you will be asked to demonstrate your functioning circuit to the instructor.

Formal Lab reports should follow the same approach used in the Lab, which is a Hypothesis/Test sequence. In Pre-Lab, you will be asked to design a circuit to perform a specific function. During the Lab time, you will build the circuit and collect test data to show how the circuit performs.

Lab reports must strictly follow the template provided on D2L. This is a mandatory requirement.

A Formal Lab report should enable someone else to duplicate your work and obtain the same results without reference to any other documents. This does not mean that you should append data sheets to your report but that the schematics and parts layout should be clear and accurate.

Submit the files containing the circuit simulation, a schematic, and data which explain the Lab results you obtained to the Lab Report dropbox on D2L. Graphics must be created using a graphics program. Acceptable programs are Multisim, Visio, or similar graphics programs. Graphics in your Lab reports

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should not be hand-drawn.

Lab reports are due as softcopy on D2L before Lab time one week after the Lab was performed. Deductions of 10% per day will be deducted from the final Lab grade for each 24 hours or portion thereof that a Lab is late to submission on D2L.

TECHNOLOGY REQUIREMENTS

LMS

All course sections offered by Texas A&M University-Commerce have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are technical requirements

LMS Requirements:
https://community.brightspace.com/s/article/Brightspace-Platform-Requirements

LMS Browser Support:
https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm

Zoom Video Conferencing Tool
https://inside.tamuc.edu/campuslife/CampusServices/CITESupportCenter/Zoom_Account.aspx?source=universalmenu

ACCESS AND NAVIGATION

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or helpdesk@tamuc.edu.

Note: Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a TAMUC campus open computer lab, etc.

COMMUNICATION AND SUPPORT

If you have any questions or are having difficulties with the course material, please contact your Instructor.

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Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:

https://community.brightspace.com/support/s/contactsupport

Interaction with Instructor Statement

Preferred communication and response time to communication, as well as office hours, are identified in the paragraphs above in this syllabus. Feedback on assessments and students' progress will be discussed in a timely manner during class meetings.

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Course Specific Procedures/Policies

No food or drink allowed on the Lab work benches. This is for the safety of the student as well as the protection of the lab equipment.

Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress or weather induced class cancellations, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

University Specific Procedures

Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the Student Guidebook.
http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum:
https://www.britannica.com/topic/netiquette

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TAMUC Attendance

For more information about the attendance policy please visit the [Attendance](#) webpage and [Procedures 13.99.99.R0.01](#)
http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx

http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/academic/13.99.99.R0.01.pdf

Academic Integrity

Students at Texas A&M University-Commerce are expected to maintain high standards of integrity and honesty in all of their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

[Undergraduate Academic Dishonesty 13.99.99.R0.03](#)
[Undergraduate Student Academic Dishonesty Form](#)

http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/documents/13.99.99.R0.03UndergraduateStudentAcademicDishonestyForm.pdf

[Graduate Student Academic Dishonesty Form](#)

http://www.tamuc.edu/academics/graduateschool/faculty/GraduateStudentAcademicDishonestyFormold.pdf

http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf

Students with Disabilities-- ADA Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services
Texas A&M University-Commerce
Velma K. Waters Library Rm 162
Phone (903) 886-5150 or (903) 886-5835
Fax (903) 468-8148
Email: studentdisabilityservices@tamuc.edu

Website: [Office of Student Disability Resources and Services](#)

http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/

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text beyond individual words, as determined by the instructor of the course.

Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

Individual instructors may disallow entirely the use of such software for individual assignments or for the entire course. Students should be aware of such requirements and follow their instructors 'guidelines. If no instructions are provided the student should assume that the use of such software is disallowed.

In any case, students are fully responsible for the content of any assignment they submit, regardless of whether they used an AI, in any way. This specifically includes cases in which the AI plagiarized another text or misrepresented sources.

13.99.99.R0.03 Undergraduate Academic Dishonesty

13.99.99.R0.10 Graduate Student Academic Dishonesty

COURSE OUTLINE / CALENDAR

The instructor reserves the right to adjust the schedule to serve the needs of the class and any changes will be communicated in a timely manner.

Course Schedule: The sequence of chapters follows the textbook.

Week	Topic	HW/Quiz/Exam	Chapter
1	Ch 1 – Circuit Terminology		1
2	Ch 2 – Resistive Circuits	HW 1 (Ch 1 Due)	2
3	Ch 3 – Analysis Techniques	HW2 (Ch 2) Due	3
4	Ch 3 – Analysis Techniques	Quiz 1 (Ch 1-2)	3
5	Ch 5 – RC and RL First-Order Circuits	HW3 (Ch 3) Due	5
6	Ch 5 – RC and RL First-Order Circuits	HW4 (Ch 5) Due	5
7	Ch 6 – RLC Circuits	Quiz 2 (Ch 3 & 5)	6
8	Midterm Exam (Ch 1-3, 5)		
	Spring Break		
9	Ch 6 – RLC Circuits	HW5 (Ch 6) Due	6
10	Ch 7 – AC Analysis	HW 6 (Ch 7) Due	7
11	Ch 8 – AC Power	Quiz 3 (Ch 6-7)	8
12	Ch 8 – AC Power	HW 7 (Ch 8) Due	8
13	Ch 11 – Magnetically Coupled Circuits		11
14	Ch 11 – Magnetically Coupled Circuits	HW8 (Ch11) Due	11
15	Review, Quiz, Dead Days (May 1-3)	Quiz 4 (Ch 8 & 11)	
16	Final Exam – Tuesday 5/7/24, 1:15-3:15 PM	Comprehensive Exam	Ch 1-3, 5-8, 11

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Lab Schedule: The sequence of experiments follows the Lab manual.

Lab Exercises (3 Points per Lab Report)	Week
Series-Parallel DC Circuits	3-4
Superposition Theorem (DC)	5-6
Thevenin's Theorem and Maximum Power Transfer	7-8
R-C, *R-L* and *R-L-C* Circuits with a DC Source Voltage	9-10
Sinusoidal Circuits	11-12
Parallel Resonant Circuits	13-14
Lab Exam (2% of final Grade)	15-16

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Homework Assignments

Homework assignments are defined on Day 1 of the class. Failure to turn in homework will result in zero credit for the assignment. Late submission of homework will not be accepted.

It is the student's responsibility to work homework AS we are working through the chapters in lecture, rather than waiting until the end to perform the homework. Failure in keeping up with the homework assignments the leading reason for poor or failing performance in this class. It is HIGHLY recommended that the students keep up with their assignments to allow questions to be asked during lecture concerning the current homework assignment.

NOTE: The assignments listed below are subject to change. The homework assignments identified in D2L are to be followed as the requirement for the assignment.

NOTE ALSO: Instead of stating problem numbers by Chapter.Problem format, the chapter number will be identified, followed by the problem numbers from that chapter. For example, "Problems 1.2, 1.23" will be identified as "Chapter 1 Problems 1, 23"

Homework Assignment 1:
Chapter 1 Problems 1, 3, 5, 7, 9, 15, 19, 23, 25, 27, 37, 41

Homework Assignment 2:
Chapter 2 Problems 5, 9, 13, 15, 17, 19, 27, 29, 31, 33, 43, 53, 61, 73 (multisim)

Homework Assignment 3:
Chapter 3 Problems 1, 3, 9, 15, 23, 27, 29, 37, 49, 61, 65, 73, 81

Homework Assignment 4:
Chapter 5 Problems 8, 9, 15, 17, 19, 23, 27, 29, 31, 33, 41, 45, 47, 75 (multisim)

Homework Assignment 5:
Chapter 6 Problems 1, 3, 7, 13, 15, 19, 25, 31, 37, 45, 47, 60(multisim),

Homework Assignment 6:
Chapter 7 Problems 1, 3, 5, 10, 11, 15, 17, 19, 21, 23, 25, 27, 33, 35, 41, 47, 53, 57, 65, 75, 87(multisim)

Homework Assignment 7:
Chapter 8 Problems 1, 5, 15, 17, 19, 21, 23, 25, 31, 35, 45, 51, 57, 61(multisim)

Homework Assignment 8:
Chapter 11 Problems 1, 3, 5, 11, 13, 23, 25`

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