EE 220.001 CIRCUIT THEORY

3 (2:30, 2:30) [Credit Hours (Lecture, Lab)]

COURSE SYLLABUS: SPRING 2020

INSTRUCTOR INFORMATION

Instructor: Redha M. Radaydeh, PhD
Electrical Engineering Program
Department of Engineering and Technology
Office Location: AGIT 204
Office Hours: Tuesday 11:30 am - 2:00 pm, Wednesday 12:00 pm – 1:00 pm, Thursday 11:30 am – 2:00 pm, or by appointment.
Office Phone: 903-886-5471
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University Email Address: Redha.Radaydeh@tamuc.edu
Preferred Form of Communication: email.
Communication Response Time: within 48 hours (weekdays) to email.

COURSE INFORMATION

Class Meeting Schedule: Meets 1/13/2020 through 5/8/2020.
Class Meeting Dates: Weekly meetings; Tuesday and Thursday 2:00 pm - 4:30 pm.
Classroom: AGIT 214.
Course Format: This course contains lectures and Lab sessions. The Lectures will be conducted on Tuesdays and Lab sessions will be on Thursdays.

Materials – Textbooks, Readings, Supplementary Readings

Textbook Required:

- J. W. Nilsson and S. Riedel, *Electric Circuits*, 11th Edition, 2018, Pearson, ISBN-13: 978-0134746968.

Laboratory Manual:

- R. L. Boylestad and G. Kousourou, *Laboratory Manual for Introductory Circuit Analysis*, 13th Edition, 2016, Pearson, ISBN-13: 978-0133923780.

Optional References:

- 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 for DC and AC circuit analyses. Topics include electric circuit laws, network theorems, operational amplifiers, RL, RC, and RLC networks, topology of electrical networks, and sinusoidal steady-state 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 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 circuit using mesh analysis, nodal analysis, superposition, Thevenin, Norton, and source transformation techniques.
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, oscilloscope, 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, class discussion, course project, problem solving, Lab reports and exercises, and simulations using software. Instructions will be based on the course textbook and on 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

Student must attend classes, participate in class work and discussions, perform required course assessments supporting the anticipated learning objectives, such as Lab experimentations and design project. Students are expected to regularly log into the course website to downloads course material, submit their course works as instructed, and follow up on new announcements. This course covers an advanced content that requires at least 6 hours of extensive study per week.

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 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.

GRADING

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

A = 90%-100%
B = 80%-89%
C = 70%-79%

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D = 60%-69%

F = 59% or Below

Assessments

The following assessments will be performed during this course to assess individual progress towards learning outcomes:

Assessment	Weight	Due time
Exam I	15 %	Week 5
Exam II	20 %	Week 10
Exam III	20 %	Week 15
Lab Work	30 %	Weekly
Project	15 %	Week 16

Relationship between Assessments and Course/Student Learning Outcomes

Learning Outcomes of Instruction	Assessment
1. Determine parameters such as node voltages, branch currents, and electric power in electric circuit using Ohm's law, Kirchhoff's current and voltage laws.	Exams
2. Analyze AC and DC circuit using mesh analysis, nodal analysis, superposition, Thevenin, Norton, and source transformation techniques.	Exams
3. Determine natural and step responses of RC, RL, and RLC circuits.	Project, 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 frequency domain approach.	Exams, Lab Work
7. Calculate AC powers in ac circuits.	Project, Lab Work
8. Use appropriate software tools PSpice/ Multisim for AC/DC Circuits analysis.	Project, Lab Work
9. Use Laboratory instruments such as multimeters, oscilloscope,	Lab Work

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function generators, power supplies, etc.	
10. Perform experiments to validate the fundamentals of electric circuit theory.	Lab Work

Exams

The exams will be closed book & closed notes. Relevant scientific formulas will be provided in supplementary sheet. The use of personal phone is strictly prohibited during exams. Student will need to bring a scientific calculator for exam. Makeup exam may be offered but an official permit for absence that fulfills University procedures should be available in a timely manner.

Project

Students will work in teams (if possible, 2-4 students/team). Each team will identify practical electronic engineering project (e.g., research, prototype, product or design), and submit their project proposal at week 10 to instructor for approval. Each team will have to submit a report that describes and analyzes the main findings and present the work in class (during week 16). The report should not exceed 10 pages double-space 12 font-size with 1-inch margins, and the presentation should not exceed 25 slides. The project should demonstrate the student's ability to transfer the knowledge and skills acquired in the course for real-world applications.

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 the practical skills in building electric circuits that contain discrete components such as resistors, capacitors, inductors, etc. This lab will also provide students with hands on experience in using basic measurement devices and equipment available in the electric circuit laboratory. The hardware work will be supported by software simulation using Multisim and/or PSpice.

There will be seven Lab exercises distributed over the semester, a midterm and final Lab exams. Students will work in teams (2-4 students/team).

Grading Policy for Lab Work:

Assessment	Weight	Due time
Attendance	5 %	Weekly
Lab Work & Reports	15 %	Weekly
Lab Exam	10 %	Week 15

Pre-Labs must be completed prior to coming to Lab. Students will be turned away

from the Lab if the Pre-Lab is not complete.

Lab circuits must be built during Lab on an empty breadboard. They may not be built prior to the Lab period. Each student will be provided with 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 performance. The report, then, should be constructed as follows:

1. **Cover page**: Your Lab report cover page should include the following information:
    - Course name and title
    - Experiment number and title
    - Names of team members and their IDs
    - Instructor's name.
    - Date
2. **Objectives**: State clearly the objectives of the experiment.
3. **Equipment required**: List all the equipment and components used in the experiments.
4. **Introduction:** Provide the necessary background to the problem that you are trying to solve in the Lab and the approach to solve it.
5. **Procedure:** Each part of the Lab experiment should explain the following**:**
    - Basic measurements and calculation
    - Explanation of the derived solution
    - Schematics developed that demonstrate the solution
6. **Results and Analysis**: Each part of Lab experiment should have the following:
    - Include tests used to prove the solution worked. One of the tests should be a Multisim simulation of your work. Include in your report a copy of the Multisim schematic.
    - Include drawing of the solution you built in Lab.
    - Analyze the measured data and produce necessary plots by using graphing program such as Excel and MATLAB.
    - State the observations made while performing the Lab and an explanation of your results.
7. **Conclusions:**
    - Describe what you did and learned from the Lab.
    - Explain at what degree the objectives of the Lab were achieved.
    - Describe possible real time applications from the work done in the Lab.

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. Graphics must be created using a graphics program. Acceptable programs are Multisim, Visio, or similar graphics programs. Graphics in your Lab reports may not be hand-drawn.

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

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

YouSeeU Virtual Classroom Requirements:
https://support.youseeu.com/hc/en-us/articles/115007031107-Basic-System-Requirements

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.

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 timely manner during class meetings.

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Course Specific Procedures/Policies

Attendance/Lateness, Late Work, Missed Exams are identified in the paragraphs above in this syllabus.

Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress, 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

TAMUC Attendance

For more information about the attendance policy please visit the Attendance webpage and Procedure 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

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

Graduate Student Academic Dishonesty 13.99.99.R0.10

http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/graduate/13.99.99.R0.10GraduateStudentAcademicDishonesty.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
Gee Library- Room 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/

Nondiscrimination Notice

Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the

basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

Campus Concealed Carry Statement

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in Texas A&M University-Commerce buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and A&M-Commerce Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the Carrying Concealed Handguns On Campus document and/or consult your event organizer.

Web url:
http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all A&M-Commerce campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

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	Chapter
1	Circuit Variables	1
2	Circuit Elements	2
3	Simple Resistive Circuits	3
4-6	Techniques of Circuit Analysis	4
5	Exam I	-
7	The Operational Amplifier	5

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8-9	Inductance, Capacitance, and Mutual Inductance	6
10-11	Response of First-Order RL and RC Circuits	7
10	Exam II	-
12-13	Natural and Step Responses of RLC Circuits	8
14-15	AC Sinusoidal Steady-State Analysis	9
15	Exam III	-
16	Course Project Report and Presentation	-

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

Lab Exercices	Week	Lab Hours
Experiment Ohm's Law (Hardware and Simulation)	3	2
Experiment Series-Parallel DC Circuits (Hardware and Simulation)	4-5	4
Experiment Superposition Theorem (DC)	6-7	4
Experiment Thevenin's Theorem and Maximum Power Transfer (Hardware and Simulation)	8-9	4
Experiment *R-C*, *R-L* and *R-L-C* Circuits with a DC Source Voltage (Hardware and Simulation)	10-11	4
Experiment Sinusoidal Circuits (Hardware and Simulation)	12-13	4
Experiment Parallel Resonant Circuits (Hardware and Simulation)	14	2
Lab Exam	15	2

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