Point Loma Nazarene University
EGR 2024 Electric Circuits Analysis (3 units)
EGR 2024L Electric Circuits Lab
FALL 2019

CREDIT AND CONTACT HOURS: 3 credit hours.

Lecture	Tue/Thurs 11:00am-12:15 pm	RS 365
Lab	Thurs 12:30pm-2:15pm	RS 295

INSTRUCTOR: Dr. Tom Carter

OFFICE HOURS: Tue: morning by appointment, 1:00-2:00 pm; Thurs: 9-10:30am RS 282

TEXTBOOK: *Analysis & Design of Linear Circuits*, Thomas, Rosa & Toussaint, 8th edition

REFERENCES/SUPPLEMENTS: *Calculator, Matlab or equivalent*

CATALOG:

EGR2024 Electric Circuits Analysis (3)

Theory and analysis of electrical and electronics circuits. Topics include basic circuit elements, laws of circuit analysis, Kirchoff's laws, loop and nodal analysis, differential equations for modeling electronic circuits, AC and DC analysis, transient analysis, complex impedance and steady state analysis, Laplace Transforms, and frequency domain analysis.

EGR2024L Electric Circuits Analysis Lab (1)

A lab course designed for a hands-on exploration of Electronics Circuits Analysis.

COURSE LEARNING OUTCOMES/EXPECTED PERFORMANCE CRITERIA:

PROGRAM OUTCOMES: This course contributes to meeting the program outcomes by developing student skills in the following areas. Upon completion, students be able to:

1. Explain and apply basic electrical principles to analyze linear DC and AC circuits.
   - explain & apply the voltage-current relationships for resistors, capacitors, & inductors
   - explain and apply Kirchhoff's Voltage Law
   - explain and apply Kirchhoff's Current Law
   - explain and apply circuit equivalency (series, parallel) & source transformations

2. Apply circuit theorems to find voltage, current, and power in linear DC & AC circuits.
   - use voltage division and current division
   - use mesh analysis
   - use nodal analysis
   - use superposition
   - use Thevenin and Norton equivalent circuits

3. Describe basic waveforms.
   - identify and manipulate step, ramp, exponential, and sinusoidal waveforms
   - identify and manipulate composite waveforms
   - define and calculate the frequency, period, and phase of periodic waveforms
   - explain and calculate the average and effective (rms) values of periodic waveforms

4. Calculate the transient response of linear DC RC, RL & RLC circuits.
   - explain and calculate the time constant of RC, RL and RLC circuits
   - calculate the initial and final conditions of RC, RL and RLC circuits
   - formulate and graph the transient response of RC, RL and RLC circuits
   - model switches in circuits using step functions

5. Analyze the sinusoidal steady-state response of linear AC circuits.
   - express sinusoidal waveforms as phasors
   - describe the voltage-current relationships of passive elements by their impedances
   - calculate voltage phasors and current phasors in circuits containing complex impedances
   - express phasors as sinusoidal waveforms

6. Analyze full response (transient plus steady-state) of linear AC circuits
   - describe and evaluate circuits using Laplace transforms
   - evaluate circuit response at different frequencies using frequency domain analysis

7. Understand how to build and test linear circuits from discrete components
   - be proficient with electrical test equipment, power supplies and signal generators
   - apply theoretical techniques to design and evaluate real circuits
   - clearly communicate lab results and support team activities

GRADING

Homework	25%	(lowest score for the semester will be dropped)
Lab	20%	(lowest score for the semester will be dropped)
Midterm #1	15%	
Midterm #2	15%	
Final	25%	

Final grades will be determined as follows:

100-93%	A
90-92.9%	A-
87-89.9%	B+
83-86.9%	B
80-82.9%	B-
77-79.9%	C+
73-76.9%	C
70-72.9%	C-
67-69.9%	D+
63-66.9%	D
60-62.9%	D-
0-59.9%	F

COURSE ORGANIZATION

Lectures: PowerPoint and interactive discussion will cover the topics below. In class participation may result in extra credit points that will be applied to the next exam. Lectures will be posted on Canvas after the class.

Homework: will be assigned weekly at the end of the lecture period (Thursdays) and due before the end of the day the following Thursday. Homework should be submitted on Canvas as either text or attached file (which can include pictures of handwritten work, if clearly legible). If delivered late, but by the end of the next day (Friday), the grade will be reduced to a max of 20% of original points. No late homework will be accepted after that. The lowest grade for a homework assignment for the semester will be dropped. Some of the homework assignments will involve independent research and have questions and problems with no single "right" answer. Those will be graded based on your clarity, completeness of source references, and ability to independently research. In some cases, creativity may also be required and evaluated. Copied answers will be given zero credit. Homework feedback will be posted on Canvas once grading is completed.

Lab: will be conducted on Thursdays and will provide hands-on experience with discrete component circuits on subjects related to the material being covered at that time. Some of the lab time may also be used for interactive problem sessions, if needed. Occasionally, lab time may also include Matlab (or equivalent) programming for topics being studied. Lab results will be documented in a lab notebook and turned in at the end of the lab session unless otherwise stated. Graded labs will be returned at the beginning of the next lab. The lowest grade for a lab in the semester will be dropped. Much of the lab work will be done with a lab partner(s) and lab submittal will be joint, so communication and teamwork will factor into the grade. A final lab project, which will allow some design creativity, is planned for the end of the semester and may be spread over multiple lab sessions.

Midterms: Two midterms will be given, based on the material covered during that period of the class. Your own personal handwritten notes may be used on these exams, along with a dedicated calculator. Phones and computers will not be allowed.

Final: The Final will be comprehensive, covering the material of the entire semester. Your own personal handwritten notes may be used on the Final.

If you will miss a class or exam for a school function, you must arrange to make it up **ahead of time**. It is your responsibility to let the professor know of such an absence enough ahead of time to accommodate. Absences due to unexpected emergencies will require documentation from a reliable and verifiable source of the time and reason for such absence.

UNIVERSITY MISSION:
Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service becomes an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

DEPARTMENT MISSION:
The Physics and Engineering Department at PLNU provides strong programs of study in the fields of Physics and Engineering. Our students are well prepared for graduate studies and careers in scientific and engineering fields. We emphasize a collaborative learning environment which allows students to thrive academically, build personal confidence, and develop interpersonal skills. We provide a Christian environment for students to learn values and judgment, and pursue integration of modern scientific knowledge and Christian faith.

ATTENDANCE:
Attendance is expected at each class session. In the event of an absence you are responsible for the material covered in class and the assignments given that day.

Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See Attendance Policy in the in the Undergraduate Academic Catalog.

CLASS ENROLLMENT:
It is the student's responsibility to maintain his/her class schedule. Should the need arise to drop this course (personal emergencies, poor performance, etc.), the student, not the instructor, has the responsibility to follow through (provided the drop date meets the stated calendar deadline established by the university). Simply ceasing to attend this course or failing to follow through to arrange for a change of registration (drop/add) may easily result in a grade of F on the official transcript.

ACADEMIC ACCOMMODATIONS:
While all students are expected to meet the minimum standards for completion of this course as established by the instructor, students with disabilities may require academic adjustments, modifications or auxiliary aids/services. At Point Loma Nazarene University (PLNU), these students are requested to register with the Disability Resource Center (DRC), located in the Bond Academic Center. (DRC@pointloma.edu or 619-849-2486). The DRC's policies and procedures for assisting such students in the development of an appropriate academic adjustment plan (AP) allows PLNU to comply with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act. Section 504 (a) prohibits discrimination against students with special needs and guarantees all qualified students equal access to and benefits of PLNU programs and activities. After the student files the required documentation, the DRC, in conjunction with the student, will develop an AP to meet that student's specific learning needs. The DRC will thereafter email the student's AP to all faculty who teach courses in which the student is enrolled each semester. The AP must be implemented in all such courses.

If students do not wish to avail themselves of some or all of the elements of their AP in a particular course, it is the responsibility of those students to notify their professor in that course. PLNU highly recommends that DRC students speak with their professors during the first two weeks of each semester about the applicability of their AP in that particular course and/or if they do not desire to take advantage of some or all of the elements of their AP in that course.

ACADEMIC HONESTY
Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See the catalog for definitions of kinds of academic dishonesty and for further policy information.

FINAL EXAM:
The final exam will be comprehensive over all the material covered in the class. The Final Exam date and time is set by the university at the beginning of the semester and may not be changed by the instructor. This schedule can be found on the university website and in the course calendar. No requests for early examinations will be approved. Only in the case that a student is required to take three exams during the same day of finals week, is an instructor authorized to consider changing the exam date and time for that particular student.

COPYRIGHT PROTECTED MATERIALS:
Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

CREDIT HOURS:
In the interest of providing sufficient time to accomplish the stated course learning outcomes, this class meets the PLNU credit hour policy for a 3 unit class and 1 unit lab delivered over 15 weeks. Details about how the class meets the credit hour requirements can be provided upon request.

EXPECTED COURSE SCHEDULE BY Date:

LECTURE	TENTATIVE TOPICS *(subject to change)*	TEXT SECTIONS	LAB	Probable Date
1	Introduction; Key Terms	1-1 to 1-3	Basic Circuits	9/5
2	Circuit Elements; Analysis using KCL & KVL	2-1, 2-2, 2-3		9/10
3	Equivalent Circuits, Voltage/Current Division	2-4, 2-5	Resistor Fun	9/12
4	Circuit Reduction	2-6		9/17
5	Nodal Analysis, Mesh Analysis	3-1, 3-2, 3-3	Circuit Analysis	9/19
6	Thevenin & Norton Equivalent, Interface Design	3-4, 3-5, 3-6		9/24
7	Overflow/ Problem Session		I/F Analysis	9/26

8	Signal Waveforms & Descriptors	5-1 to 5-6		10/1
9	Dependent Sources & Op Amp Intro	4-1 to 4-4	Signal Waveforms	10/3
10	Review/ Catch up			10/8
	FIRST MIDTERM EXAM			10/10
10	Capacitors, Inductors; Equivalent C and L	6-1, 6-2, 6-4		10/15
11	RC and RL Circuits, First-Order Step Response	7-1, 7-2	RL & RC Circuits	10/17
12	Dynamic Sources for RL & RC Circuits	7-3, 7-4		10/22
13	RLC Circuits	7-5, 7-6	RLC Circuits	10/24
14	Phasors for AC Analysis	8-1		10/29
15	Steady State AC Analysis with Phasors	8-2, 8-3	Steady State AC	10/31
16	Steady State AC Circuit Techniques	8-4 to 8-6		11/5
17	Steady State AC Power & Analysis Examples		Steady State AC	11/7
18	Review/Catch up			11/12
	SECOND MIDTERM EXAM			11/14
19	Laplace Transforms, Pole-Zero diagrams	9-1 to 9-3		11/19
20	Inverse Laplace Transforms	9-4	Laplace/filters	11/21
21	Laplace Transform Circuit Analysis	10		11/26
	Thanksgiving Recess			
22	Circuit Frequency Response	9-5, 12		12/3
	Open		Final Project	
23	Convolution & Circuit Frequency Response	11-6		12/10
24	Review		AM Radio Tuner	12/12
	FINAL	10:30 - 1pm		12/19