POINT 1902 LOMA
NAZARENE UNIVERSITY

Department/School Name:
Physics and Engineering

Course Number and Name:
EGR 2024/2024L – Circuit Analysis

Number of Units: 3+1

Fall 2023

Meeting days/times

Lecture: (MWF 11:00 am – 11:55 am)
Lab: (R 10:30am – 1:20pm)

Meeting location (Rohr Science Hall 295 (RS 295))

Final Exam: (Friday, 12/15, 10:30 – 1:00 pm)

Instructor title and name:	Dr. Anthony Cortez
Phone:	(619) 849-2439
Email:	AnthonyCortez@pointloma.edu
Office location and hours:	Office Hours: By Appointment Location: Rohr Science 282

PLNU Mission

To Teach ~ To Shape ~ To Send

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 is 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 Mathematical, Information, and Computer Sciences department at Point Loma Nazarene University is committed to maintaining a curriculum that provides its students with the tools to be productive, the passion to continue learning, and Christian perspectives to provide a basis for making sound value judgments.

Course Description

EGR 2024 – Circuit Analysis (3)

Theory and analysis of electrical circuits. Topics include basic circuit elements, laws of circuit analysis, Kirchhoff'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.

Prerequisite(s): PHY 2054 with a grade of C- or higher.
Corequisite(s): EGR 2024L

EGR 2024L – Circuit Analysis Lab (1)
A lab course designed for a hands-on exploration of Circuit Analysis.
Meets three hours per week.

Prerequisite(s): PHY 2054 with a grade of C- or higher.
Corequisite(s): EGR 2024

Program and Course Learning Outcomes

Course Learning Outcomes:

1. Explain and apply basic electrical principles to analyze linear DC and AC circuits, including KVL, KCL and various circuit topologies.
2. Apply circuit theorems to find voltage, current, and power in linear DC & AC circuits, including voltage and current division, mesh and node analysis, superposition, and Thevenin and Norton equivalencies.
3. Describe basic waveforms, define, measure and calculate key parameters such as period, frequency, phase of periodic signals.
4. Calculate the transient response of linear DC RC, RL & RLC circuits, including time constants, initial and final conditions, and response in switched DC circuits.
5. Analyze the sinusoidal steady-state response of linear AC circuits using phasors.
6. Analyze the full response of linear AC circuits using Laplace Transforms and assess implications across the frequency domain.
7. Understand, build and test linear circuits from discrete components and utilize basic electrical test equipment, signal generators and power supplies.
8. Learn fundamental skills for group collaboration, as well as lab and project execution/documentation/demonstrations.

Student Outcomes Addressed:

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (LO1)
- 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. (LO2)
- An ability to communicate effectively with a range of audiences. (LO3)

Required Texts and Recommended Study Resources

Analysis and Design of Linear Circuits by Roland E. Thomas, Albert J. Rosa, and Gregory J. Toussaint– 8th Edition

Course Credit Hour Information

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+1 unit class delivered over 15 weeks. It is anticipated that students will spend a minimum of 37.5 participation hours per credit hour on their coursework. For this course, students will spend an estimated 150 total hours meeting the course learning outcomes. The time estimations are provided in the Canvas modules.

Assessment and Grading

Grades will be based on the following:

- **Homework**: Homework will be assigned weekly and a hard copy is due at the start of class the following week.
- **Labs**: Labs will provide hands on applications of circuit analysis techniques we are learning in lecture. You will be assigned a group to work with for the duration of the semester. Each lab you will complete a lab report that is due at the end of the scheduled lab time. Lab reports will be submitted ONLY in Word, Excel, or .pdf format in Canvas (pictures of equations, circuit diagrams, set up, measurements, graphs, etc. may be embedded as long as legible). Up to 10% extra credit will be awarded for work done on the "If you have time" problems at the end of the lab, which may be turned in later (but before the next lab). A single grade will be given to each assigned group (for all who participate). In addition, there will be a lab final demonstrating an application of a reasonable technical implementation learned in the semester for each individual which will count as 30% towards the individual's lab grade. The labs are designed to enhance your understanding of the course material with hands on equipment, communicate your understanding in writing, and efficiently work in small teams.
- **Pre-Class Reading Questions**: There will be assigned reading prior to the start of select lectures. It is expected that you read the assigned section prior to the start of class. One quiz will be given each week at the start of a selected day.
- **Examinations and the Final Examination**. Examinations and the Final Examination will include problems and questions over material assigned in the text, readings and handouts, as well as material presented in class. No examination shall be missed without prior consent or a well-documented emergency beyond your control. A score of zero will be assigned for an examination that is missed without prior consent or a well-documented emergency beyond your control. Only your two highest exam scores (not including the final) will be included in the calculation of your grade. You must take all three exams in order to drop the lowest score, otherwise all three exams will be used in the calculation of your grade. 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.

Grading Distribution	**Percent**
Exams (Lowest Score Dropped)	30
Final Exam	25
Homework	20

Labs	20
Pre-Class Reading Questions	5
Total	100

Standard Grade Scale Based on Percentages					
	A	**B**	**C**	**D**	**F**
+		87.5- 89.5	77.5-79.5	67.5-69.5	
	91 -100	81-87.5	71-77.5	61 -67.5	0-57
_	89.5-91	79.5-81	69.5-71	57-61	

Final Examination Policy

Successful completion of this class requires taking the final examination on its scheduled day. The final examination schedule is posted on the Class Schedules site. If you find yourself scheduled for three (3) or more final examinations on the same day, you are authorized to contact each professor to arrange a different time for one of those exams. However, unless you have three (3) or more exams on the same day, no requests for alternative final examinations will be granted.

Incompletes and Late Assignments

All assignments are to be submitted by the due dates. Assignments will be considered late if posted after the due date and time using Pacific Standard Time. Late assignments will receive a grade of 0.

Spiritual Care

Please be aware PLNU strives to be a place where you grow as whole persons. To this end, we provide resources for our students to encounter God and grow in their Christian faith.

If students have questions, a desire to meet with the chaplain or have prayer requests you can contact your professor or the Office of Spiritual Life and Formation.

Rev 06.16.23

State Authorization

State authorization is a formal determination by a state that Point Loma Nazarene University is approved to conduct activities regulated by that state. In certain states outside California, Point Loma Nazarene University is not authorized to enroll online (distance education) students. If a student moves to another state after admission to the program and/or enrollment in an online course, continuation within the program and/or course will depend on whether Point Loma Nazarene University is authorized to offer distance education courses in that state. It is the student's responsibility to notify the institution of any change in his or her physical location. Refer to the map on State Authorization to view which states allow online (distance education) outside of California.

PLNU Copyright Policy

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.

PLNU Academic Honesty Policy

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 Academic Policies for definitions of kinds of academic dishonesty and for further policy information.

PLNU Academic Accommodations Policy

PLNU is committed to providing equal opportunity for participation in all its programs, services, and activities. Students with disabilities may request course-related accommodations by contacting the Educational Access Center (EAC), located in the Bond Academic Center (EAC@pointloma.edu or 619-849-2486). Once a student's eligibility for an accommodation has been determined, the EAC will issue an academic accommodation plan ("AP") to all faculty who teach courses in which the student is enrolled each semester.

PLNU highly recommends that students speak with their professors during the first two weeks of each semester/term about the implementation of their AP in that particular course and/or if they do not wish to utilize some or all of the elements of their AP in that course.

Rev 06.16.23

Students who need accommodations for a disability should contact the EAC as early as possible (i.e., ideally before the beginning of the semester) to assure appropriate accommodations can be provided. It is the student's responsibility to make the first contact with the EAC.

Sexual Misconduct and Discrimination

In support of a safe learning environment, if you (or someone you know) have experienced any form of sexual discrimination or misconduct, including sexual assault, dating or domestic violence, or stalking, know that accommodations and resources are available through the Title IX Office at pointloma.edu/Title-IX. Please be aware that under Title IX of the Education Amendments of 1972, faculty and staff are required to disclose information about such misconduct to the Title IX Office.

If you wish to speak to a confidential employee who does not have this reporting responsibility, you can contact Counseling Services at counselingservices@pointloma.edu or find a list of campus pastors at pointloma.edu/title-ix.

PLNU Attendance and Participation Policy

Regular and punctual attendance at all class sessions is considered essential to optimum academic achievement. If the student is absent for more than 10 percent of class sessions, the faculty member will issue a written warning of 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 an "F" grade.

Tentative Schedule (Subject to Updates)

Date	Topic	Reading	HW Due
28-Aug (WEEK 1)	Intro	1-1 to 1-4	
30-Aug	Intro to Devices (Element Constraints)	1-3	
1-Sep	Kirchhoff's Laws	2-2, 2-3	
4-Sep (WEEK 2)	Labor Day – No Class		
6-Sep	Equivalent Circuits	2-4	
8-Sep	Voltage and Current Dividers	2-5	HW 1
11-Sep (WEEK 3)	Circuit Reduction	2-6	

13-Sep	Computer-Aided Analysis	2-7	
15-Sep	Node Voltage Analysis	3-1, 3-2	HW 2
18-Sep (WEEK 4)	Mesh Current Analysis	3-1, 3-2	
20-Sep	Linearity (Proportionality and Superposition)	3-3	
22-Sep	Catch up/Review		HW 3
25-Sep (WEEK 5)	Exam 1		
27-Sep	Thévenin/Norton Theorems	3-4	
29-Sep	Signal Transfer and Interface Design	3-5, 3-6	HW 4
2-Oct (WEEK 6)	Comparison of Analysis Techniques	3-1 thru 3-6	
4-Oct	Dependent Sources I (Intro)	4-1, 4-2	
6-Oct	Dependent Sources II (Feedback)	4-2	HW 5
9-Oct (WEEK 7)	Op-Amps (Intro)	4-3	
11-Oct	Signals I (Singularity and Exponential Functions)	5-1 thru 5-3	
13-Oct	Signals II (Sinusoids and Partial Descriptors)	5-4 and 5-6	HW 6
16-Oct (WEEK 8)	Catchup/Review		
18-Oct	Exam 2		
20-Oct	Fall Break Day – No Class		
23-Oct (WEEK 9)	Capacitors and Inductors I (Fundamentals)	6-1 and 6-2	HW 7
25-Oct	Capacitors and Inductors II (Combining, Integrators, Differentiators)	6-3 and 6-4	
27-Oct	RL and RC Circuits (Natural Response)	7-1	
30-Oct (WEEK 10)	RL and RC Circuits (Step Response	7-2 and 7-3	

1-Nov	RL and RC Circuits (Exponential and Sinusoidal Transient Responses)	7-4	
3-Nov	RLC Series and Parallel Circuits (Natural Response)	7-5, 7-6	HW 8
6-Nov (WEEK 11)	RLC Step Response	7-7	
8-Nov	AC Circuit Analysis I (Basics)	8-1, 8-2	
10-Nov	AC Circuit Analysis II (Theorems)	8-2, 8-3	HW 9
13-Nov (WEEK 12)	AC Circuit Analysis and Design III	8-3, 8-4	
15-Nov	AC Circuit Analysis IV (Node Voltage/Mesh Current, Power)	8-5, 8-6	
17-Nov	Catch up/Review		HW 10
20-Nov (WEEK 13)	Exam 3		
22-24-Nov	Thanksgiving Break – No Class		
27-Nov (WEEK 14)	Intro to Laplace Transforms and the Complex Frequency Domain	9-1, 9-2	
29-Nov	Laplace II: Pole-Zero Diagrams and the Inverse Laplace	9-3, 9-4	
1-Dec	Laplace III: Circuit Response and Initial and Final Value Theorems	9-5, 9-6	HW 11
4-Dec (WEEK 15)	Laplace IV: Transformed Circuits	10-1, 10-2	
6-Dec	Flex Day		
8-Dec	Review		HW 12
15-Dec	Final Exam		