Department of Physics and Engineering

EGR2024/L Electrical Circuit Analysis and Lab

4 Units

Fall 2025

MWF | 11:00 - 11:55 AM
T | 10:30 AM - 1:20 PM (Labs)

Meeting location Rohr Science Hall (RS) 265, 295 (Labs)

Final Exam: 12/17 10:30 AM - 1:00 PM

Instructor Title and Name: Dr. José Manjarrés
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Office Location and Office Hours: RS 276 | MW 8:30 - 9: 30 AM, 1:00 PM - 3:00 PM; T 8:30 - 9: 30 AM; R 1:00 PM - 1:30 PM; F 8:30 - 9: 30 AM, 1:00 PM - 1:30 PM

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 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.

Course Description

Theory and analysis of electrical 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.

Prerequisite(s): PHY 2054
Corequisite(s): EGR2024L

Program and Course Learning Outcomes

Student Outcomes:

- Master the fundamental principles of electrical circuits.
- Interpret basic circuit schematics that translate into simulated and mounted circuits on a breadboard.
- Analyze DC and AC circuits using appropriate mathematical tools.
- Utilize computational tools to solve equation systems that describe DC or AC circuits.
- Understand the significance of every component in complex power.
- Design and implement a model of a microgrid with distributed generation.

Program Outcomes:

- 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)
- 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 (LO4)
- 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. (LO5)

Required Texts and Recommended Study Resources

Students are responsible for having the required course textbooks prior to the first day of class.

All supplemental materials posted on this course site (including articles, book excerpts, or other documents) are provided for your personal academic use. These materials may be protected by copyright law and should not be duplicated or distributed without permission of the copyright owner.

Required Texts:

- Alexander, C., Sadiku, M. Fundamentals of Electric Circuits, 7th ed. McGraw-Hill. ISBN: 9781264144037.

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 4-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

This course will have four ways to assess knowledge and learning, described as follows.

1. Pre-class readings: Short quiz related to a pre-session reading to be completed before the class session.
2. Lab reports: Technical document summarizing an experiment set and a brief result analysis.
3. Tests: 50-minute evaluations on a group of related topics.
4. Final Project: A comprehensive design problem encompassing several topics from the course. It includes a report and a presentation to the general public during the time designated for the final exam.

The table below outlines the assessment criteria for this course.

Activity	Points Per Activity	Qty.	Total
Pre-class Readings	10	32	320
Lab Reports	50	5	250
Tests	100	6	600
Final Project Proposal	50	1	50
Final Project Progress Presentation	50	1	50
Final Project	200	1	200
Total			**1470**

Grades will be based on the following:

Sample Standard Grade Scale Based on Percentages

A	B	C	D	F
A 93-100	B+ 87-89	C+ 77-79	D+ 67-69	F Less than 59
A- 90-92	B 83-86	C 73-76	D 63-66	
	B- 80-82	C- 70-72	D- 60-62	

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 Traditional Undergraduate Records: Final Exam 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/turned in by when they are due—including assignments posted in Canvas. Late assignments are deducted 20% of its grade. Incompletes will only be assigned in extremely unusual circumstances.

Artificial Intelligence (AI) Policy

You are allowed to use Generative Artificial Intelligence (GAI) tools (e.g., ChatGPT, Claude, Gemini, etc.) in this course as a study support tool. You may not use GAI to write content for any kind of evaluation; if you do so, it'll be considered a case of academic dishonesty and prompt disciplinary action.

PLNU Academic Accommodations Policy

PLNU is committed to providing equal opportunity for participation in all its programs, services, and activities in accordance with the Americans with Disabilities Act (ADA). 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 619-849-2533). Once a student's eligibility for an accommodation has been determined, the EAC will work with the student to create an Accommodation Plan (AP) that outlines allowed accommodations. Professors are able to view a student's approved accommodations through Accommodate.

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. Accommodations are

not retroactive so clarifying with the professor at the outset is one of the best ways to promote positive academic outcomes.

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. Students cannot assume that because they had accommodations in the past, their eligibility at PLNU is automatic. All determinations at PLNU must go through the EAC process. This is to protect the privacy of students with disabilities who may not want to disclose this information and are not asking for any accommodations.

LomaBooks Instructions for Students

This course is part of our course material delivery program, LomaBooks. The bookstore will provide each student with a convenient package containing all required physical materials; all digitally delivered materials will be integrated into Canvas.

You should have received an email from the bookstore confirming the list of materials that will be provided for each of your courses and asking you to select how you would like to receive any printed components (in-store pick up or home delivery). If you have not done so already, please confirm your fulfillment preference so the bookstore can prepare your materials.

For more information about LomaBooks, please go: HERE

Additional Course Information

Additional PLNU policies and practices that apply to this course can be found at the following link: https://docs.google.com/document/d/11BgAANLOJ9tjt837d24EZ181ukM2qzHF/edit

Semester Schedule Outline

Date	Topic
2-Sep	Welcome
3-Sep	Prefixes, Voltage, and Current
5-Sep	Power, Energy, and Electricity Bills
8-Sep	Power Conservation
9-Sep	First DC Circuit Lab (Multimeter, Breadboard, DC Power Supply)
10-Sep	Ohm's Law
12-Sep	Resistor Color Code Competition
15-Sep	Kirchhoff's Laws
16-Sep	Intro to Final Project and Solar Panels Lab

17-Sep	Voltage Division
19-Sep	Current Division
22-Sep	Practice: Reduction in Resistive Circuits
23-Sep	Resistive Circuits Lab
24-Sep	Test 1
26-Sep	Capacitors and Inductors
29-Sep	Intro to Complex Numbers
30-Sep	Intro to Oscillscopes and Waveform Generators
1-Oct	Complex Number Operations
3-Oct	Introduction to Phasors
6-Oct	Phasors Practice
7-Oct	Final Project Proposal Presentations
8-Oct	Impedance and Admittance
10-Oct	Impedance Combinations
13-Oct	Practice: Converting to phasor domain
14-Oct	Intro to AC Circuit Simulation and Implementation
15-Oct	Practice: Reduction in AC Circuits
17-Oct	Test 2
20-Oct	Nodal Analysis
21-Oct	Intro to Linear Equations & MATLAB Tutorial to Solve Equation Systems
22-Oct	Nodal Analysis with Voltage Sources
24-Oct	No class – Fall Break
27-Oct	Nodal Analysis in AC
28-Oct	Practice: Nodal Analysis
29-Oct	Practice: Nodal Analysis
31-Oct	Test 3
3-Nov	Mesh Analysis
4-Nov	Final Project Progress Presentations
5-Nov	Mesh Analysis with Current Sources
7-Nov	Mesh Analysis in AC
10-Nov	Practice: Mesh Analysis
11-Nov	Practice: Mesh Analysis

12-Nov	Test 4
14-Nov	Thévenin's Theorem
17-Nov	Practice: Thévenin Theorem
18-Nov	Thévenin Theorem Lab
19-Nov	Maximum Power Transfer
21-Nov	Thévenin's Theorem in AC
24-Nov	Practice: Thévenin Theorem in AC
25-Nov	Test 5
26-Nov	No class - Thanksgiving
28-Nov	No class - Thanksgiving
1-Dec	Instantaneous and Average Power
2-Dec	Final Project Time
3-Dec	Maximum Power Transfer in AC
5-Dec	Apparent Power and Power Factor
8-Dec	Complex Power and Power Factor Correction
9-Dec	Practice: Complex Power and Power Factor Correction
10-Dec	Practice: Complex Power
12-Dec	Test 6
15-Dec	Final Project Presentations