Syllabus

PLNU Logo	**Physics & Engineering** **EGR 2024 & 2024L Electronics and Circuit Analysis 4 Units** **Lecture: Tu/Th 1:30-2:45 pm (RS365)** **Lab: Tu 10:00-11:45 am (RS 265)**
Fall 2020	

Instructor: Tom Carter, Ph.D.
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Office hours: - Tuesday: by appointment via Zoom - Thursday: 10 - 11am via Zoom - Thursday: 10 - noon, Group Session

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

This course provides an introduction to linear circuits, both DC and AC, including the math and algorithms necessary to analyze and understand them. The math required includes simultaneous equations, differential equations, complex numbers, and Laplace Transforms - much of which is important in many engineering and scientific fields.

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

1. Students will be able to explain and apply basic electrical principles to analyze linear DC and AC circuits, including KVL, KCL and various circuit topologies.
2. Students will be able to 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. Students will be able to describe basic waveforms, define, measure and calculate key parameters such as period, frequency, phase of periodic signals.
4. Students will be able to 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. Students will be able to analyze the sinusoidal steady-state response of linear AC circuits using phasors.
6. Students will be able to analyze the full response of linear AC circuits using Laplace Transforms and assess implications across the frequency domain.
7. Students will be able to understand, build and test linear circuits from discrete components and utilize basic electrical test equipment, signal generators and power supplies.

REQUIRED TEXTS AND RECOMMENDED STUDY RESOURCES

'***The Analysis and Design of Linear Circuits***', 8th Edition, by Roland Thomas, Albert Rosa, & Gregory Toussaint, 2016

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 (including lab) taught over 15 weeks. Specific details about how the class meets the credit hour requirement can be provided upon request. (Based on 37.5 hours of student engagement per credit hour.)

Distribution of Student Learning Hours

Category	Time Expectation in Hours
Synchronous Lectures	33
Lab	26
Homework Assignments	50
Reading, Review & Group Discussions	35
Exams	6
Total Hours	150

ASSESSMENT AND GRADING

Graded Components

- **Labs:** Labs will be conducted by assigned groups according to provided instructions. The lab reports are due at the scheduled dates and times (typically Tuesday at the end of lab period), and 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) if recorded via Zoom. A single grade will be given to assigned groups (for all who participate).
- **Homework**: Homework will be due at the scheduled dates and times (typically Thursday night at midnight the week after assigned) and 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). Homework feedback, if needed, will be posted in comments on Canvas upon completion of grading.
- **Collaborative Discussion Groups**: A general discussion question or set of related questions will be posted once a week (typically on Tuesday) which requires independent research and/or explanation. Each assigned group will address the question(s), including references used, and collaborate to get to their best answer(s) in a weekly Canvas Discussion. These discussions must be completed by the scheduled dates and times (typically Tuesday midnight, the week after assigned). Some of the topics will involve questions and problems with no single “right” answer. Those will be graded based on clarity, completeness of source references, collaboration and ability to independently research. In some cases, creativity may also be required and evaluated. Each group member should clearly specify what they did (with references) in investigating the question as part of their discussion. A grade will be given to each group and then adjusted up or down by up to 20% for each individual that participated based on an assessment of their contributed effort.
- **Examinations and the Final Examination**. Midterm examinations and the Final examination will include problems and questions covering material assigned in the text, as well as material presented in class. Personal notes, in your own handwriting of any length or format, may be used for the exams, along with a dedicated calculator (no cell phones or computers). 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.
- **Late work will not be accepted** without prior consent, except for homework assignments which may be submitted up to a day late - grades for the portion of the homework submitted in this time frame will be reduced by 10% . To provide grace in grading the lowest score during the semester for each of homework, labs and group discussions will be dropped from the calculations of the overall grade.
- The examination schedule is included in the semester schedule. Note that Midterm Exams will be given during scheduled lab periods in order to provide additional time.

Grading Distribution	**Percent**

Two Midterms at 15% each	30
Final Exam	25
Labs	20
Homework	20
Collaborative Group Discussions	5
Total	100

Grading Scale

Approximate minimal percentages required to obtain a given grade are:

Standard Grade Scale Based on Percentages					
	A	**B**	**C**	**D**	**F**
+		87-90	77-80	67-70	
	93 -100	83-86.9	73-76.9	63 -66.9	0-59.9
–	90-92.9	80-82.9	70-72.9	60-62.9	

STATE AUTHORIZATION FOR ONLINE CLASSES

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 (https://www.pointloma.edu/offices/office-institutional-effectiveness-research/disclosures)** to view which states allow online (distance education) outside of California.

INCOMPLETES AND LATE ASSIGNMENTS

All assignments are to be submitted/turned in by the time due —including assignments posted in Canvas. Incompletes will only be assigned in extremely unusual circumstances.

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 (http://catalog.pointloma.edu/content.php?catoid=18&navoid=1278)** for definitions of kinds of academic dishonesty and for further policy information.

PLNU ACADEMIC ACCOMMODATIONS POLICY

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 (mailto: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.

PLNU ATTENDANCE AND PARTICIPATION POLICY

Attendance (in class or online) 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 **Academic Policies** **(http://catalog.pointloma.edu/content.php?catoid=18&navoid=1278)** for further information about class attendance.

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 the **Office of Spiritual Development** **(https://www.pointloma.edu/offices/spiritual-development)**

EGR2024 PLANNED CLASS SCHEDULE

LECTURE	TENTATIVE TOPICS *(subject to change)*	TEXT SECTIONS	LAB	Probable Date
1	Introduction; Key Terms	1-1 to 1-3	Orientation & demo	8/18
2	Circuit Elements; Analysis using KCL & KVL	2-1, 2-2, 2-3		8/20
3	Equivalent Circuits, Voltage/Current Division	2-4, 2-5	Basic Circuits	8/25
4	Circuit Reduction	2-6		8/27
5	Nodal Analysis, Mesh Analysis	3-1, 3-2, 3-3	Resistor Fun	9/1
6	Nodal Analysis, Mesh Analysis (cont.)			9/3
7	Thevenin & Norton Equivalent, Interface Design	3-4, 3-5, 3-6	Circuit Analysis	9/8
8	Thevenin & Norton Equivalent, (cont.)			9/10
9	Signal Waveforms & Descriptors	5-1 to 5-6	I/F Analysis	9/15
	Review/ Catch up			9/17
	FIRST MIDTERM EXAM (***Lecture Session:*** Signal Waveform lab)	4-1 to 4-4	EXAM	9/22
10	Capacitors, Inductors; Equivalent C and L	6-1, 6-2, 6-4		9/24
11	RC and RL Circuits, First-Order Step Response	7-1, 7-2	Intro to Inductors & Capacitors	9/29
12	Dynamic Sources for RL & RC Circuits	7-3, 7-4		10/1
13	RLC Circuits	7-5, 7-6	RL & RC Circuits	10/6
14	Phasors for AC Analysis	8-1		10/8
15	Steady State AC Analysis with Phasors	8-2, 8-3	RLC Circuits	10/13
16	Steady State AC Circuit Techniques	8-4 to 8-6		10/15

17	Steady State AC Power & Analysis Examples		RL/RC Steady State AC Circuits	10/20
	Review/Catch up			10/22
	SECOND MIDTERM EXAM (Lecture: Final Project Requirements/Ideas)			10/27
18	Laplace Transforms, Pole-Zero diagrams	9-1 to 9-3		10/29
19	Inverse Laplace Transforms	9-4	RLC Steady State AC	11/3
20	Laplace Transform Circuit Analysis	10		11/5
21	Circuit Frequency Response	12-1 to 12-2	Final Project Plans	11/10
22	Filtering Circuits	12-3 to 12-4		11/12
23	Catch up/Problem Session/Q&A		RF Radio/Filtering	11/17
	Review			11/19
	Final during Lab Time (Lecture period available for Final Project questions/help)			11/24
	Thanksgiving Break			11/19
	Final Project Demos Due (online)			Week of 11/30