POINT 1902 LOMA
NAZARENE UNIVERSITY

Department of Physics and Engineering

EGR4103 Electrical Signals and Systems

3 Units

Fall 2026

MWF | 11:00 - 11:55 AM

Meeting location Rohr Science Hall (RS) 265

Final Exam: 12/18 10:30 AM - 1:00 PM

Instructor title and name:	Dr. José Manjarrés
Phone:	(619) 849-2451
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Office location and hours:	RS 276 | MWF 9:00 - 9:50 AM, 1:00 PM - 1:30 PM; T 10:30 - 11:30 AM Schedule office hours here

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

Advanced techniques for the analysis of analog electrical systems. Topics include: frequency domain analysis, Laplace transforms, Fourier series, Fourier transforms, and continuous versus discrete signal analysis. Frequency response is analyzed using transfer functions, Bode plots, and spectral plots. Digital Signal Processing (DSP) is introduced.
Prerequisite(s): EGR 2024 with a grade of C- or higher and MTH 3033 with a grade of C- or higher.

Program and Course Learning Outcomes

Student Outcomes:

- Understand and apply mathematical representations of signals and systems
- Analyze signals using basic spectral representations
- Utilize Fourier series to analyze and synthesize periodic and non-periodic signals
- Apply the sampling theorem in analog-to-digital conversion of signals
- Describe the effect of linear time-invariant systems using convolution
- Interpret frequency response graphs of linear time-invariant systems
- Design digital filters using specialized tools considering spectral characteristics and windowing effects
- Apply discrete Fourier transforms to obtain digital spectral representation of signals and systems
- Use signal processing algorithms and representations with proper understanding of the mathematical principles behind them
- Develop software tools to analyze, synthesize, and modify audio signals using the mathematical principles introduced in the course

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 acquire and apply new knowledge as needed, using appropriate learning strategies. (LO7)

Required Texts and Recommended Study Resources

- McClellan, J., Schafer, R., Yoder, M. DSP First, 2nd ed. Pearson. ISBN: 9780137848188.

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-unit class delivered over 14 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 112.5 total hours meeting the course learning outcomes.

Assessment and Grading

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

1. Reading Assignments: Pre-class reading assignments that prepare students for the class activities.
2. Practical Assignments: Design problems to apply theoretical concepts in real-world audio processing scenarios using software tools. Each assignment includes a technical note documenting the design process.
3. Tests: Evaluations of theoretical understanding.
4. Final Project: A comprehensive design problem encompassing topics from the beginning to the end of 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	Quantity	Total Points
Reading Assignments	10	28	280
Practical Assignments	100	4	400
Tests	100	5	500
Final Project	200	1	200
Total			1380

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 (final project) 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, if allowed, 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, by email or phone at 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 approved 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 approved accommodations in that particular course. Accommodations are not retroactive; as such, 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-related need should contact the EAC as early as possible (i.e., ideally before the beginning of the semester) to assure appropriate accommodations can be provided. In accordance with ADA, accommodations cannot constitute a fundamental alteration to

course outcomes; therefore, planning ahead is vital in establishing appropriate accommodations for equal access to this course. 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 eligibility 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 LomaBooks materials.

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/1SoL5YMfCv_5cobhBwrDjbcZJzNKKTCfM/edit?usp=sharing&ouid=104297418648613020764&rtpof=true&sd=true

Semester Schedule Outline

Date	Session #	Topic
31-Aug	**0**	Welcome
2-Sep	**1**	Python Overview
4-Sep	**2**	Introduction to Signals and Systems
7-Sep		Labor Day - No classes
9-Sep	**3**	Sinusoids
11-Sep	**4**	Phasors
14-Sep	**5**	Basics of Spectral Representation
16-Sep	**6**	Amplitude Modulation
18-Sep	**7**	Operations on the Spectrum

21-Sep	**8**	Review
23-Sep	**T1**	Test 1
25-Sep	**9**	Periodic Waveforms & Harmonics
28-Sep	**10**	Fourier Series
30-Sep	**11**	Basic Spectrograms
2-Oct	**12**	Sampling & Aliasing
5-Oct	**13**	Review
7-Oct	**T2**	Test 2
9-Oct	**14**	FIR Filters
12-Oct	**15**	Convolution
14-Oct	**16**	LTI Systems
16-Oct	**17**	Frequency Response of LTI Systems
19-Oct	**18**	Graphical Representation of the Frequency Response of LTI Systems
21-Oct	**19**	LTI Systems and Continuous-time Signals
23-Oct		Fall Break - No classes
26-Oct	**20**	Review
28-Oct	**T3**	Test 3
30-Oct	**21**	DTFT and Its Properties
2-Nov	**22**	Ideal and Practical Filters
4-Nov	**23**	Filter Design with PyFDA
6-Nov	**24**	DFT and Its Properties
9-Nov	**25**	Convolution with DFT
11-Nov	**26**	Spectrum Analysis of Discrete Periodic Signals
13-Nov	**27**	Windows
16-Nov	**28**	The Spectrogram
18-Nov	**29**	FFT
20-Nov	**30**	Review
23-Nov	**T4**	Test 4
25-Nov		Thanksgiving Break - No classes
27-Nov		Thanksgiving Break - No classes
30-Nov	**31**	z-Transform and Its Properties
2-Dec	**32**	Convolution and the z-Transform
4-Dec	**33**	Zeroes and Poles
7-Dec	**34**	Bandpass Filter Design
9-Dec	**35**	Review

11-Dec	**T5**	Test 5
18-Dec	**FP**	Final Projects Showcase