Department of Physics and Engineering
EGR4042/L - Embedded Systems and Robotics
1+1 units

Fall 2020 | August 17-December 4

Instructor: Dr. Paul D. Schmelzenbach

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Office hours: By appointment as needed.

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

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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

Embedded systems are everywhere. They are in your watch, your phone, and your TV. Embedded systems are also found in cars, airplanes, and robots. They are a fundamental part of the "internet of things." In this hands-on course you will learn the basics of designing, interfacing, configuring, and programming embedded systems by working with robots.

COURSE LEARNING OUTCOMES

1. acquire and apply new knowledge as needed, using appropriate learning strategies.
2. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
3. communicate effectively with a range of audiences
4. interface a microcontroller to a variety of digital and analog input and output devices
5. Program a microcontroller to implement a closed-loop automatic control
6. Analyze a problem to determine appropriate microcontroller use
7. Understand features of algorithms such as obstacle avoidance

REQUIRED RESOURCES

1. Through the course you will be using: FreeNOVE Arduino kit and power recommended batteries

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 2 unit class delivered over sixteen 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.)

Category	Time Expectation in Hours
Online prep	13
Hands on Building	40
Written Assignments	8
Other Assignments & Learning Activities	10
Quizzes, Surveys	3
Total Hours	76

ASSESSMENT AND GRADING

Graded Components

- **Projects** are a major component of this class. I encourage collaboration between you and your peers while working on tasks and projects, but your work you say is your own must be your own. The guideline is: you should never have any trouble explaining your work. Some projects will have some specific teamwork components and it is important to identify what components are team efforts. A final project will provide some constraints and parameters but will allow you considerable more freedom to demonstrate the skills you have developed through the semester.

- **Exams**: Through the semester there will be 3 exams (including one during the final exam week) will include problems and questions over material explored through the class. A score of zero will be assigned for an examination that is missed without prior consent or a well-documented emergency beyond your control.
- **Homework:** Each week there will be homework that will tend to support the ideas of the project generally or sometimes specifically. The lowest homework score will be dropped from the overall grade calculation.
- **Video Questions**: Most weeks there will be a few short questions that will help prepare you optimizing your time in meetings and lab.
- **Late work will not be accepted** without prior consent or a well-documented emergency. Up to a maximum of two homework or project assignment will be accepted up to 3 days late provided that consent is received from the professor *before* it is due. A project or homework that is submitted late without prior consent will be recorded with a score of zero. The lowest homework score will be dropped from the homework component of the grade

Grading Distribution	Percent
Projects	40
Exams	20
Homework	20
Video Questions	5
Final Project	15

Grading Scale

Approximate minimal percentages required to obtain a given grade are:

Standard Grade Scale Based on Percentages

	A	B	C	D	F
+		87.5- 90	77.5-80	67.5-70	
	92.5 -100	82.5-87.5	72.5-77.5	62.5 -67.5	0-60
_	90-92.5	80-82.5	70-72.5	60-62.5	

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.

INCOMPLETES AND LATE ASSIGNMENTS

All assignments are to be submitted/turned in by the beginning of the class session when they are 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 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 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 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 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

Course Summary:

Date	Details	
Mon Aug 17, 2020	Page Week 1: Welcome to EGR4042!	to do: 11:59am
Page Week 1: Overview	to do: 12:30pm	
Page Home Page	Quick Links to Resources	to do: 11:59pm	
Page Meet Your Instructor	to do: 11:59pm	
Page Syllabus	to do: 11:59pm	
Tue Aug 18, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Wed Aug 19, 2020	Assignment VQ 1	due by 11:59pm
Thu Aug 20, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Fri Aug 21, 2020	Assignment Week 1 Hmk	due by 11:59pm
Mon Aug 24, 2020	Page Week 2: Overview	to do: 11:59pm
Assignment VQ2	due by 11:59pm	

Tue Aug 25, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Thu Aug 27, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Fri Aug 28, 2020	Assignment Project Weeks 1-2	due by 11:59pm
Assignment Week 2: Hmk	due by 11:59pm	
Mon Aug 31, 2020	Page Week 3: Overview	to do: 11:59pm
Assignment VQ3	due by 11:59pm	
Tue Sep 1, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Thu Sep 3, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Fri Sep 4, 2020	Assignment Project 3	due by 11:59pm
Assignment Week 3: Hmk	due by 11:59pm	
Mon Sep 7, 2020	Page Week 4: Overview	to do: 11:59pm
Assignment VQ4	due by 11:59pm	
Tue Sep 8, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Thu Sep 10, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Fri Sep 11, 2020	Assignment Project 4	due by 11:59pm
Assignment Week 4: Hmk	due by 11:59pm	
Mon Sep 14, 2020	Page Week 5: Overview	to do: 11:59pm
Assignment VQ5	due by 11:59pm	
Tue Sep 15, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am

Thu Sep 17, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Fri Sep 18, 2020	Assignment Project 5	due by 11:59pm
Assignment Week 5: Hmk	due by 11:59pm	
Mon Sep 21, 2020	Page Week 6: Overview	to do: 11:59pm
Assignment VQ6	due by 11:59pm	
Tue Sep 22, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Assignment Exam 1	due by 11:59pm	
Thu Sep 24, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Fri Sep 25, 2020	Assignment Project 6	due by 11:59pm
Assignment Week 6: Hmk	due by 11:59pm	
Mon Sep 28, 2020	Page Week 7: Overview	to do: 11:59pm
Assignment VQ7	due by 11:59pm	
Tue Sep 29, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Thu Oct 1, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Fri Oct 2, 2020	Assignment Project 7	due by 11:59pm
Assignment Week 7: Hmk	due by 11:59pm	
Mon Oct 5, 2020	Page Week 8: Overview	to do: 11:59pm
Assignment VQ8	due by 11:59pm	
Tue Oct 6, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Thu Oct 8, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems	10am to

	And Robotics	11am
Fri Oct 9, 2020	Assignment Project 8	due by 11:59pm
Assignment Week 8: Hmk	due by 11:59pm	
Mon Oct 12, 2020	Page Week 9: Overview	to do: 11:59pm
Assignment VQ9	due by 11:59pm	
Tue Oct 13, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Thu Oct 15, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Fri Oct 16, 2020	Assignment Project 9	due by 11:59pm
Assignment Week9: Hmk	due by 11:59pm	
Mon Oct 19, 2020	Page Week 10: Overview	to do: 11:59pm
Assignment VQ10	due by 11:59pm	
Tue Oct 20, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Thu Oct 22, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Fri Oct 23, 2020	Assignment Project 10	due by 11:59pm
Assignment Week 10: Hmk	due by 11:59pm	
Mon Oct 26, 2020	Page Week 11: Overview	to do: 11:59pm
Assignment VQ11	due by 11:59pm	
Tue Oct 27, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Assignment Exam 2	due by 11:59pm	
Thu Oct 29, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am

Fri Oct 30, 2020	Assignment Project 11	due by 11:59pm
Assignment Week 11: Hmk	due by 11:59pm	
Mon Nov 2, 2020	Page Week 12: Overview	to do: 11:59pm
Assignment VQ12	due by 11:59pm	
Tue Nov 3, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Thu Nov 5, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Fri Nov 6, 2020	Assignment Project 12	due by 11:59pm
Assignment Week 12: Hmk	due by 11:59pm	
Mon Nov 9, 2020	Page Week 13: Overview	to do: 11:59pm
Assignment VQ13	due by 11:59pm	
Tue Nov 10, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Thu Nov 12, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Fri Nov 13, 2020	Assignment Project 13	due by 11:59pm
Assignment Week 13: Hmk	due by 11:59pm	
Mon Nov 16, 2020	Page Week 14: Overview	to do: 11:59pm
Assignment VQ14	due by 11:59pm	
Tue Nov 17, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Thu Nov 19, 2020	Calendar Event EGR4042-1 FA20 - Embedded Systems And Robotics	10am to 11am
Fri Nov 20, 2020	Assignment Week 14: Hmk	due by 11:59pm

Mon Nov 23, 2020	Page Week 15: Overview - Finals and Thanksgiving	to do: 11:59pm
Mon Nov 30, 2020	Page Week 16: Overview - Wrap Up Week	to do: 11:59pm
Thu Dec 3, 2020	Assignment Exam 3	due by 10:30am

Assignment Final Project   due by 11:59pm