Point Loma Nazarene University
EGR 122 INTRODUCTION TO ENGINEERING II (2 units)
Spring Semester 2019

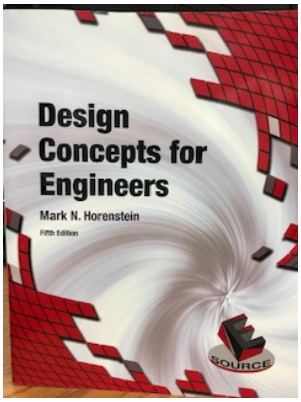
CREDIT AND CONTACT HOURS: 3 credit hours. Class meets 1 time per week for 2 hours and Lab meets for 2 hours one time per week.

Lecture Class:	Tuesday 2:30 – 4:25 pm	LA102
Lab Class:	Thursday 2:30 – 4:25 pm	LA102
Lab Assistants:	Alex Mathews and Joey Tuttobene	

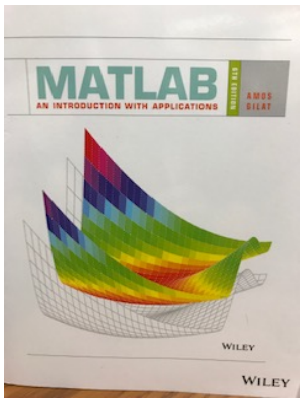
INSTRUCTOR: Professor Chris Gabler
CONTACT INFO: cgabler@pointloma.edu Cell phone: 858-354-8762
Office hours: By appointment –Trailer 2- RS282 (available February 4)

TEXTBOOKS:

1. Design Concepts for Engineers, 5th edition, Mark N. Horenstein, Pearson, 2015, ISBN 9780134001876. This text may be used in future engineering courses.



2. MATLAB: An Introduction with Applications, 6th edition, Amos Gilat, Wiley, 2017, ISBN 9781119256830



REFERENCES/SUPPLEMENTS:

1. Access to SolidWorks Inventor and MATLAB, either on a personal computer or in the labs.

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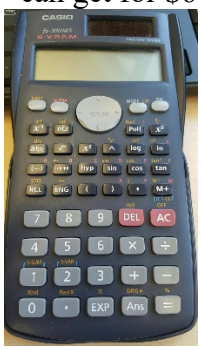
2. For an engineering class, you will need a "Scientific Calculator" that allows you to use powers of ten to represent numbers in scientific notation, (e.g. ***6.02 x 10^{23}***), with an "EXP" or "EE" function button. These calculators can be any brand, like Casio. Most of them you can get for $6 - $7 each.



CATALOG DATA:
EGR122 Introduction to Engineering II (2)
An introduction to the engineering design process building on the tools introduced in EGR 111. In addition to designing a prototype, students learn the engineering aspects of teamwork development, ethics, professionalism, and reporting.
Prerequisite(s): EGR111 and Co-requisite: EGR122L

EGR122 Introduction to Engineering I Lab (1)
Laboratory to compliment EGR122. Meets two hours per week.
Co-requisite: EGR122

CURRICULUM PLACEMENT: This is a required course for the Engineering, B.S.

NOTE FROM INSTRUCTOR:
A survey was given recently to top executives and managers of U.S technology/science and engineering companies, asking what were the top qualities needed in new employees. Their answers were given below:

Integrity
Critical thinking
Creativity
Cooperation (the Right Attitude)
Collaboration (Teamwork and Humility)
Communication skills

I am hoping that this course will help develop each of these essential traits in the students of this course.

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COURSE LEARNING OUTCOMES/EXPECTED PERFORMANCE CRITERIA:
Upon completion of this course, students will

1. Be able to explain and apply a general three-phase design process to open-ended design problems;
2. Be proficient in working with Excel to present data results graphically and professionally.
3. Be proficient in understanding data along with basic error analysis in experimental data and the importance of representing this analysis clearly.
4. Know how to work on interdisciplinary teams more effectively than before, including providing constructive peer feedback;
5. Be able to design, build, and test against requirements using the Mindstorm LEGO™ NXT robotics system;
6. Know how to identify and apply key concepts in MATLAB programming, including creation of basic programs;
7. Know how to identify and apply key concepts of Arduino microcontroller board configuration and programming.

PROGRAM OUTCOMES:
This course contributes to meeting program outcomes by developing student skills in the following areas.

1. Students will be able to apply knowledge of mathematics, science, and engineering.
2. Students will have an ability to design and conduct experiments.
3. Students will be able to analyze and interpret data from experiments.
4. Students will be able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
5. Students will have an ability to excel as engineers on multidisciplinary teams.
6. Students will be able an ability to identify, formulate, and solve engineering problems.
7. Students will gain an understanding of professional and ethical responsibility.
8. Students will gain an ability to communicate effectively and develop their ability to articulate science and engineering concepts.
9. Students will learn and develop the techniques, skills, and modern engineering tools necessary for engineering practice.

TOPICS: Open-Ended Problems

1. Design Projects
2. Making Assumptions
3. Background Research and/or Testing
4. Applying Appropriate Analyses
5. Leveraging Information for Design Project

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GRADING:

Class Activities/Assignments	10%	Quizzes	20%
Homework	25%	Final	20%
Labs	25%		

Final grades will be determined as follows:

100-93%	A
90-92.9%	A-
87-89.9%	B+
83-86.9%	B
80-82.9%	B-
77-79.9%	C+
73-76.9%	C
70-72.9%	C-
67-69.9%	D+
63-66.9%	D
60-62.9%	D-
0-59.9%	F

COURSE ORGANIZATION:

Lectures: PowerPoint and interactive discussion will cover the topics below. In class assignments on the topics will be performed within designated groups and handed in before the end of class. All members present for the assignment will receive the same grade on that assignment. Those not present will receive no credit for that assignment.

Homework: will be assigned weekly at the end of the lecture period (Tuesdays) and due before the start of the next lecture. Many of the homework assignments will have questions and problems with no single "right" answer. Those will be graded based on your originality, creativity and ability to independently research. Copied answers will be given zero credit.

Quizzes: Regular quizzes will be given during the class period to test your understanding and retention of the material covered since the last quiz. These tests may not be announced ahead of time and absence or late arrival to a class will not be accommodated except as discussed below. Your own personal handwritten notes may be used.

Labs: Hands-on lab assignments will be made weekly, culminating in an independent group project. Lab sessions are mandatory and will include weekly documentation. All hands-on work must be done in the lab room and during lab period or other times when the room is specifically made available. Unless otherwise stated the lab assignments are due no later than the beginning of the next lab session. If the lab requires a demonstration, you will be given one opportunity to do so. It will be signed off at this time and results marked. Labs will be graded primarily on creativity, teamwork and adherence to the engineering process/project goals and constraints, including schedules and requirements. Each lab group will receive the same base grade for each assignment but this base grade may be adjusted up or down based on an individual's observed level of contribution.

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No late assignments will be accepted but the lowest grade for each type of assignment (homework, in-class assignments and quizzes) will be dropped. Independent thinking and communication skills are a big part of the class objectives so **answers should be original and in your own words** and will be graded accordingly.

If you will miss a class, lab or exam for a school function, you must arrange to make it up **ahead of time**. This includes accommodations for missing real-time group assignments due to your requirement at a school function. These will be addressed on a case by case basis and depending on the assignment may require you to do it on your own ahead of time as feasible. It is your responsibility to let the professor know of such an absence enough ahead of time to accommodate. Absences due to unexpected emergencies will require documentation from a reliable and verifiable source of the time and reason for such absence.

UNIVERSITY MISSION:
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 becomes 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.

ATTENDANCE:
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 Attendance Policy in the in the Undergraduate Academic Catalog.

CLASS ENROLLMENT:
It is the student's responsibility to maintain his/her class schedule. Should the need arise to drop this course (personal emergencies, poor performance, etc.), the student has the responsibility to follow through (provided the drop date meets the stated calendar deadline established by the university), not the instructor. Simply ceasing to attend this course or failing to follow through to arrange for a change of registration (drop/add) may easily result in a grade of F on the official transcript.

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ACADEMIC ACCOMMODATIONS:
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.

ACADEMIC HONESTY:
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 the catalog for definitions of kinds of academic dishonesty and for further policy information.

FINAL EXAM:
The final exam will be comprehensive over all the material covered in the class. 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. The **Final** is listed to be **May 2, 2019, Thursday, at 4:30 – 7:00 pm**.

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COPYRIGHT PROTECTED MATERIALS:
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.

CREDIT HOURS:
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 15 weeks. Specific details about how the class meets the credit hour requirements can be provided upon request.

COURSE TOPICS OUTLINE (EXPECTED SCHEDULE BY WEEK)

Week#	**Date**	**Lecture/Lab Topics**	**Assigned reading**
Week	01/08	**Tuesday has Monday schedule**	**No lecture class**
1	01/10	EGR 122 Lab – Class Intro.	Graphing in Excel (handouts)
Week	01/15	Intro to Engineering II Ch 1: What is Engineering?	Horenstein: Ch 1 – pps. 1-12
2	01/17	Lab – Graphing II	Linear Regression
Week	**01/21**	**MLK Holiday: No Monday class**	
3	01/22	Ch 1: What is Engineering?	Ch 1: pps. 12-24
	01/24	Lab – Errors in Data Significant digits (figures) Median, standard deviation	Precision versus accuracy mean/average
Week	01/29	Ch 2: What is Design? The design cycle (phases of design)	Ch 2: pps. 25-47
4	01/31	Introduction to MATLAB Scalar variables, command window	Gilat: Ch 1 Starting with MATLAB Ch 1: pps. 1-34
Week	02/05	Horenstein**:** Ch 2 Generating ideas, design examples	pps. 47-87
5	02/07	MATLAB: Scripts in MATLAB	Gilat: Ch 2: pps. 35-62 Creating arrays, vectors

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Week	02/12	Horenstein**:** Ch 3 Project management/teamwork	Ch 3: pps. 97-116 collaboration
6	02/14	Lab: MATLAB Array math operations	Gilat: Ch 3: pps. 63-78
Week	02/19	Horenstein**:** Ch 3 Managing tasks	Ch 3: pps. 116-130 Documentation
7	02/21	Lab: MATLAB Script files, managing data	Gilat: Ch 4: pps. 95-120
Week	02/26	Horenstein**:** Ch 4 Engineering tools	Ch 4: pps. 131-152
8	02/28	Lab: SolidWorks Inventor Intro and examples	-
Week	03/05	**Spring Break: no classes**	 **03/04 – 03/08**
9	03/07	**Spring Break: no classes**	
Week	03/12	Horenstein**:** Ch 4 Prototyping, MATLAB	Ch 4: pps. 153-185 spreadsheets applications
10	03/14	Lab: SolidWorks Inventor Part II: Design and create	-
Week	03/19	Horenstein**:** Ch 4 Solid Modeling and CAD	Ch 4: pps. 185-192 192-201 system simul.
11	03/21	Lab: SolidWorks Inventor Part III: Design and create	-
Week	03/26	Horenstein**:** Ch 5-6 The Human-Machine Interface Engineers in the real world	Ch 5: pps. 211-229 Ch 6: pps. 233-245
12	03/28	Lab: Mindstorm LEGO Project 1 with robotics	

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Week	04/02	Preparing for failure Case studies	Ch 6: 245-255
13	04/04	Lab: Mindstorm LEGO Project 2 with robotics	
Week	04/09	Horenstein: Ch 7 Communication skills	Ch 7: 258-275
14	04/11	Lab: Mindstorm LEGO Project 3 with robotics	
Week	04/16	Horenstein: Ch 7 Instruction manuals, documentation	Ch 7: 275-285
15		Technical writing	
	04/18	**No Class: Easter Holiday - 04/18-04/22**	
Week	04/23	MATLAB – 2D Plots	Gilat: Ch 5 Pps. 133-154
16	04/25	LAB – MATLAB 2D Plots	
Week			
17	05/02	**Thursday - FINAL EXAM Cumulative Test (Mandatory)** **FINAL EXAM** 4:30 – 7:00 p.m.	

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