POINT 1902 LOMA
NAZARENE UNIVERSITY

Physics and Engineering
School of STEM

EGR 3034/3034L – Mechanics of Materials

Number of Units: 3+1

Fall 2024

Meeting days/times (MWF 8:30 am – 9:25 am)

Meeting location (Rohr Science (RS) 265)

Final Exam: (Fri, 12/20, 7:30 – 10:00 am)

INFORMATION	SPECIFICS FOR THE COURSE
Instructor title and name:	Dr. Anthony Cortez
Phone:	(619) 849-2439
Email:	AnthonyCortez@pointloma.edu
Office location and hours:	Office Hours: By Appointment Book a time here Location: Rohr Science 282

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.

Physics and Engineering 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

EGR 3034 – Mechanics of Materials (3)

Theory and analysis of forces, stress, and strain within engineering structural elements and members. Topics include the theory of stress and strain, elastic and plastic deformation, modes of structural failure, compression and tension, torsion, shear, shafts, beams, posts, transformations of stress and strain.

Prerequisite(s): EGR 2014 and PHY 2044 with a grade of C- or higher.
Corequisite(s): EGR 3034L

EGR 3034L – Mechanics of Materials Lab (1)

A lab course designed for a hands-on exploration of Mechanics of Materials. Meets three hours per week.

Prerequisite(s): EGR 2014 and PHY 2044 with a grade of C- or higher.
Corequisite(s): EGR 3034

Program and Course Learning Outcomes

1. Explain and apply engineering principles to analyze the mechanics of materials.
2. Appropriately identify and know the significant features in a stress-strain diagram for a given specimen.
3. Identify the key resultant forces of a member subjected to a given loading or shear.
4. Appropriately select materials for a particular engineering design with consideration of safety.
5. Effectively communicate reasoning behind an engineering design with a wide range of audiences (technical and non-technical).
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

STUDENT OUTCOMES ADDRESSED

- 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)

Required Texts and Recommended Study Resources

Mechanics of Materials by R. C. Hibbeler– 10th Edition

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

Grades will be based on the following:

- **Homework**: Homework will be assigned weekly and is due at the start of class the following week.
- **Labs**: Labs will provide hands on applications of techniques used for characterizing the mechanics of materials we are learning in lecture. You will be assigned a group to work with for the duration of the semester. Each lab you will complete a lab report that is due at the end of the scheduled lab time.
- **Problem Presentation:** Each homework assignment will contain a problem intended to be solved in front of the class the following week. This homework will be presented and solved in detail by a student. Assignment of questions to students will be randomized. It is required that the student presenting will meet with me during office hours prior the scheduled presentation date.
- **Examinations and the Final Examination**. Examinations and the Final Examination will include problems and questions over material assigned in the text, readings and handouts, as well as material presented in class. 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. Only your two highest exam scores (not including the final) will be included in the calculation of your grade. You must take all three exams in order to drop the lowest score, otherwise all three exams will be used in the calculation of your grade. 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.

Grading Distribution	Percent
Exams (Lowest Score Dropped)	30
Final Exam	30
Homework	15
Labs	20
Problem Presentation	5
Total	100

Sample Standard Grade Scale Based on Percentages

Standard Grade Scale Based on Percentages					
	A	B	C	D	F
+		87.5- 89.5	77.5-79.5	67.5-69.5	
	91 -100	81-87.5	71-77.5	61 -67.5	0-57
_	89.5-91	79.5-81	69.5-71	57-61	

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 by the due dates. Assignments will be considered late if posted after the due date and time using Pacific Standard Time. Late assignments will receive a grade of 0.

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 you have questions, a desire to meet with the chaplain or have prayer requests you can contact your professor or the Office of Spiritual Life and Formation.

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.

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 Recording Notification

In order to enhance the learning experience, please be advised that this course may be recorded by the professor for educational purposes, and access to these recordings will be limited to enrolled students and authorized personnel.

Note that all recordings are subject to copyright protection. Any unauthorized distribution or publication of these recordings without written approval from the University (refer to the Dean) is strictly prohibited.

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. For all student appeals, faculty and students should follow the procedures outlined in the University Catalog. See Academic Policies for definitions of kinds of academic dishonesty and for further policy information.

Artificial Intelligence (AI) Policy

You are allowed to use Artificial Intelligence (AI) tools (e.g., ChatGPT, Gemini Pro 1.5, etc) to generate ideas, but you are not allowed to use AI tools to generate content (text, video, audio, images) that will end up in any work submitted to be graded for this course. If you have any doubts about using AI, please gain permission from the instructor.

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 619-849-2486). 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. The EAC makes accommodations available to professors at the student's request.

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 special accommodations.

Sexual Misconduct and Discrimination

In support of a safe learning environment, if you (or someone you know) have experienced any form of sexual discrimination or misconduct, including sexual assault, dating or domestic violence, or stalking, know that accommodations and resources are available through the Title IX Office at pointloma.edu/Title-IX. Please be aware that under Title IX of the Education Amendments of 1972, faculty and staff are required to disclose information about such misconduct to the Title IX Office.

If you wish to speak to a confidential employee who does not have this reporting responsibility, you can contact Counseling Services at counselingservices@pointloma.edu or find a list of campus pastors at pointloma.edu/title-ix.

If you (or someone you know) have experienced other forms of discrimination or bias, you can find more information on reporting and resources at www.pointloma.edu/bias

PLNU Attendance and Participation Policy

Regular and punctual attendance at all class sessions is considered essential to optimum academic achievement. If the student is absent for more than 10 percent of class sessions, the faculty member will issue a written warning of de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university withdrawal date or, after that date, receive an "F" grade.

Tentative Schedule (Subject to Updates)

Date	Topic	Reading
(WEEK 1) 2-Sep	No Class	
4-Sep	Intro and Equilibrium Review	1.2
6-Sep	Normal Stress	1.3-1.4
(WEEK 2) 9-Sep	Average Shear Stress and Design	1.5-1.6
11-Sep	Normal Strain	2.1-2.2
13-Sep	Shear Strain	2.2
(WEEK 3) 16-Sep	Stress-Strain Diagram	3.1-3.2
18-Sep	Ductile and Brittle Materials	3.3
20-Sep	Strain Energy and Poisson's Ratio	3.4-3.5
(WEEK 4) 23-Sep	Shear Stress-Strain Diagram	3.6
25-Sep	Creep and Fatigue *	3.7
27-Sep	Catch up/Review	
(WEEK 5) 30-Sep	Exam 1	
2-Oct	Axial Load	4.1-4.2
4-Oct	Statically Indeterminate Axial	4.3-4.4
(WEEK 6) 7-Oct	Force Method of Analysis	4.5

9-Oct	Thermal Stress and Stress Concentrations	4.6-4.7
11-Oct	Torsion	5.1-5.2
(WEEK 7) 14-Oct	Power Transmission and Angle of Twist	5.3-5.4
16-Oct	Statically Indeterminate Torsion	5.5
18-Oct	Torsional Stress Concentration	5.8
(WEEK 8) 21-Oct	Catchup/Review	
23-Oct	Exam 2	
25-Oct	Fall Break – No Class	
(WEEK 9) 28-Oct	Shear and Moment Diagrams and Graphical Method	6.1-6.2
30-Oct	Bending Deformation and Flexure	6.3-6.4
1-Nov	Unsymmetric Bending	6.5
(WEEK 10) 4-Nov	Transverse Shear	7.1-7.2
6-Nov	Shear Flow in Built-Up Members	7.3
8-Nov	Thin Walled Pressure Vessels	8.1
(WEEK 11) 11-Nov	State of Stress Caused by Combined Loadings	8.2
13-Nov	Plane-Stress Transformation	9.1-9.2
15-Nov	Principal Stresses and Mohr's Circle	9.3-9.5
(WEEK 12) 18-Nov	Beam Design	11.1-11.2
20-Nov	Deflection of Beams	12.1
22-Nov	Catch up/Review	
(Week 13) 25-Nov	Exam 3	
(WEEK 14) 2-Dec	Deflection of Beams	12.2

4-Dec	Method of Superposition Deflection and Statically Indeterminate Beams	12.5-12.6
6-Dec	Column Buckling	13.1
(WEEK 15) 9-Dec	Column Buckling Cont.	13.2
11-Dec	Flex Day	
13-Dec	Review	
20-Dec	Final Exam	