EMCH 315 Syllabus & Policies

Instructor

Dr. Lucas J. Passmore
Assistant Professor
Engineering Science & Mechanics
210 Earth & Engineering Sciences Bldg.
University Park, PA 16802
Email: ljp149@psu.edu
Phone: (814) 867-5409

Required Textbook

R.A. Queeny and A.E. Segall *Mechanical Response of Engineering Materials*, **2nd Edition**. ISBN 978146525190 (Note: ISBN 9780757584947 is a previous version with the same edition number that is also acceptable).

Supplemental Textbooks

R.C. Hibbeler. *Mechanics of Materials*, ANY edition. Pearson.

N.E. Dowling. *Mechanical Behavior of Materials*, ANY edition. Pearson.

Prerequisites & Expectations

The prerequisite for E MCH 315 is E MCH 213 (strength of materials) and by extension, EMCH 211 (statics) and MATH 141 (Calc II). If you have not had these prerequisite courses, please contact Prof. Passmore as soon as possible. In particular, each student is expected to have a working knowledge of the material covered in all prerequisite courses, which includes, but is not limited to:

- Geometry and trigonometry, including the laws of sines and cosines, direction cosines, and the like.
- Vector calculus. Vectors in 2- and 3-space, inner products, and vector products.
- Statics. How to draw correct free body diagrams, find force and moment equilibrium, write friction laws, and find support reactions. Equivalent force systems. Moments of inertia.
- Strength of Materials. How to calculate normal and shear stresses for a variety of loading configurations and the associated strains. Stress transformations including Mohr's Circle.
- Differential and integral calculus. How to differentiate and integrate most simple functions (e.g., polynomials, sine, cosine, exponentials, logarithms, and combinations of these functions); apply simple sequences and series; and apply the chain rule to both differentiate and integrate functions.

You are also expected to devote sufficient time to master the course material. It is unreasonable to expect that good performance can be achieved without study. Since I would expect students to spend about 6 hours per week on this course during a 15 week semester, you should expect to spend that much time during the six-week summer session.

I expect students to watch all the lecture videos, supplemental problem solutions, do all the assigned reading, and complete all assigned homework.

Description

The main goal of EMCH 315 is to present mathematical models to describe mechanical behavior of materials and develop skills relevant to understanding engineering design using realistic materials. The course introduces various material responses to external factors pertinent to engineering analysis including static loading, cyclic loading, and elevated temperatures. This broad base serves as a foundation for subsequent employment, as well as further advanced study, in systems design and testing, engineering analysis, mechanical design, materials engineering and/or materials selection. General topics include: elastic, viscoelastic, plastic, and creep deformation; temperature effects, stress-based failure criteria for ductile and brittle material behavior; creep rupture; fracture mechanics prediction of brittle failure; and failure by fatigue. This breadth of topics makes the course extremely useful and a versatile class that has many applications in all engineering disciplines.

Course Outcomes

EMCH 315 is intended to achieve the following educational outcomes:

- OUTCOME a:
  - Analyze stress and strain conditions found in various components and determine their principal values.
  - Analyze failures and make life cycle predictions.
  - Determine time-dependent (life) to be expected for success of a design.
  - Begin to be able to select appropriate materials for safe applications based on their properties and dominant engineering attributes.
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Course Topics

Over the course of the semester we will cover the topics outlined below:

- Introduction to the mechanical behavior of materials and tensile & compressive responses.

- Elastic behavior of materials
- Constrained thermal stress and strains
- Analysis of stress: transformations in a plane
- Analysis of stress: 3-D stress transforms
- Stress concentration
- Analysis of strain: transformations in a plane
- Analysis of strain: measurement & analysis
- Yielding for multi-axial stress states: Maximum Shear Stress Theory (MSST)
- Yielding for multi-axial stress states: Distortion Energy Theory (DET)
- Plastic deformation & ductile failure
- Fracture
- Fatigue failure
- Viscoelasticity
- Steady state creep
- Creep rupture

Academic Integrity

You are in training to become an engineer. The decisions that you will make in your professional careers have the potential to affect the lives of countless people. Part of your training will be in ethical behavior. I believe this process starts with academic integrity. I will make every effort to behave ethically and with integrity in my treatment of each of you, and the class as a whole. I will show you honesty, respect, and fairness. I will also behave responsibility in my treatment of each of you as individuals. I hope in doing so, that I can earn your trust. I expect each of you to maintain the same high standards.

The Department of Engineering Science and Mechanics at The Pennsylvania State University considers academic training to be apprenticeship for practice in the professions. Students are expected to demonstrate a code of moral integrity and ethical standards commensurate with the high expectations that society places upon professional practice. Accordingly, it is the policy of the department to maintain the highest standard of academic honesty and integrity.

The University defines academic integrity as the pursuit of scholarly activity in an open, honest and responsible manner. All students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an

environment in which all can succeed through the fruits of their efforts (refer to Senate Policy 49-20 (Links to an external site.)Links to an external site.). Dishonesty of any kind will not be tolerated in this course. Dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor (this includes, for example, copying solutions from the solution manual or Chegg), or tampering with the academic work of other students. Students who are found to be dishonest will receive academic sanctions and will be reported to the University's Office of Student Conduct for possible further disciplinary sanctions (refer to Senate Policy G-9 (Links to an external site.)Links to an external site.).
A student charged with academic dishonesty will be given oral or written notice of the charge by the instructor. A student contesting such a charge may seek redress through informal discussions with the instructor(s), department head or college dean. If the instructor believes that the infraction is sufficiently serious to warrant referral to the Office of Conduct Standards (Links to an external site.)Links to an external site., or if the instructor awards a final grade of F in the course because of the infraction, the student and instructor will be afforded formal due process procedures governed by Penn State Senate Policy 49-20 (Links to an external site.)Links to an external site.. Policy 49-20 and procedures can be found in the document "Policies and Rules for Undergraduate Students (Links to an external site.)Links to an external site." issued annually by the Senate Office and available through each student's home department or college dean's office. See more Academic Integrity policy information from the College of Engineering at http://www.engr.psu.edu/AcademicIntegrity (Links to an external site.)Links to an external site..

Grading

All grades are determined by performance, which is evaluated using objective standards rather than standards based on a notion of average class performance (i.e., I do not grade on a curve). Each grade will be based on a scale of 100 percent. Letter grades will be determined according to the following table.

F	D	C's	B's	A's
0–59	60–69	70–79	80–89	90–100

****You must also score an average of 70% on the 2 course exams**

to pass this course with a grade of C or better.**

Grade Determination

The final overall percentage used to determine your grade will be determined according to the weightings in the following table.

Category	Percent of Grade
Midterm Exam	35%
Homework/Quizzes	25%

Final Exam	40%

Canvas (Penn State's Course Management System)

Canvas is Penn State's online course management system. It will contain, in part:

- all the lecture videos and slides
- all the supplemental example problems
- old exams to help you study
- and more

Since all announcements sent to the class will be sent from Canvas, it is important that you properly configure Notification Preferences in Canvas to alert you (options include email, text message, push notification, and more) to all announcements.

Exams

There will be one exam during the semester and a final exam. The dates of the exams can be found in your Calendar and in Assignments. ***All exams will closed book and closed notes. If you do not take the exam on the University Park campus, you will be required to take the exam using the online proctoring service, "Examity".*** If you do take the exam on campus, we will arrange a time and place for you to take the exam on campus for each exam.

Since some of you will be using Examity, I have been instructed that the following statement must be included in this course syllabus:

"This course may require you to take exams using certain proctoring software that uses your computer's webcam or other technology to monitor and/or record your activity during exams. The proctoring software may be listening to you, monitoring your computer screen, viewing you and your surroundings, recording and storing any and all activity (including visual and audio recordings) during the proctoring process. By enrolling in this course, you consent to the use of the proctoring software selected by your instructor, including but not limited to any audio and/or visual monitoring which may be recorded. Please contact your instructor with any questions."

In the event you are unable to take one of the scheduled exams, ***no makeup exam will be administered unless all of the following conditions are met***:

1. **Legitimate Reason**
   The missed exam is due to circumstances beyond your control (e.g., illness, family emergency, or a university-sponsored activity).
2. **Prior Notification**
   It is your responsibility to notify Prof. Passmore prior to the time at which you are scheduled to start the exam if you are unable to take the exam (this may be done by phone or by email). If circumstances prevent you from contacting Prof. Passmore directly, then you must notify the ESM Office at (814) 865-4523.

3. **Verification**
   Sufficient information must be provided so that your claim can be verified.

If you miss an exam and are unable to satisfactorily fulfill each of the above three conditions, then you will receive a zero for that exam.

Homework

Each problem on each homework assignment will be worth 5 points and will be graded according to the following rubric.

- **0 pts**: Essentially nothing is there. Maybe just a couple of equations and a picture of a giraffe.
- **1 pt**: The problem has been restated accurately and completely, including knowns and unknowns.
- **2 pts**: Appropriate sketches have been drawn.

- **3 pts**: The governing equations have been stated.
- **4 pts**: The problem has been solved incompletely or completely and is not correct.
- **5 pts**: The problem has been solved completely and is substantially correct.

All homework assignments are weighted equally. That is, a 15 point assignment counts just as much as a 35 point assignment in your overall grade. When computing your final, overall homework grade, ***the lowest two homework scores will be dropped***.

There will be approximately two homework assignments per week that are due on the day and time indicated for each assignment. **Late homework will not be accepted** - with only 6 weeks to complete a 15-week class, we need to keep moving.

Quizzes

All quizzes will be announced in advance and will carry equal weight to a single homework assignment. They may be submitted electronically like homework, or be integrated into the Canvas website.

Announcements

All information I send to the class will be sent through Canvas.

If you have an administrative question, first read this Syllabus and the Announcements on Canvas. If the information you need is ***not*** contained in any of those sources, then you may contact Prof. Passmore or one of the TAs with your inquiry.

Since homework in this course is equation and diagram intensive, if you email us with a question, please include a legible scan of your attempt at the problem in question.

Students with Disabilities

Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in

this course, contact Student Disability Resources, SDR located in room 116 Boucke Building at 814-863-1807(V/TTY). For further information regarding SDR, please visit their website http://equity.psu.edu/student-disability-resources/. (Links to an external site.)Links to an external site.Instructors should be notified as early in the semester as possible regarding the need for reasonable academic adjustments.