

Syllabus for

MECH 2322 - Mechanics of Materials

Spring 2022

1.0 Overview

This 3-credit hour sophomore-level class is the second course in the mechanical design sequence consisting of Statics, Mechanics of Materials (this course), Mechanical Design, Principles of Mechanical Engineering Design and finally Senior Project. In this class, you will begin to learn how to calculate stresses, strains and deformations of continuous bodies. In particular, we will discuss axial, shear, torsion, bending deformations and how to calculate the associated stresses. From this point, we will then consider components that are loaded by a combination of the deformation modes. In addition, we will discuss beam deflection and column buckling. We will also, use finite element programs to give an alternate perspective on these stress analyses. The material covered in this course is some of the most fundamental and essential for designing mechanical components and mechanical systems.

2.0 Course Information

Instructor: Dr. Jack Chessa

Email: jfchessa@utep.edu

Office Hours: TBD

Office: A-124 or via MS Teams (jfchessa@utep.edu)

Textbook(s): "Mechanics of Materials", 10th edition, Russell Hibbeler, Pearson with Mastering Engineering (both are required)

Prerequisites: MECH 1321 - Mechanics I: Statics

Meeting Times: COBA 332 - TTH 3:00-4:20

2.1 Course Delivery

This course we will be delivered fully face-to-face. Class will be held at the assigned meeting times and attendance is required. The course material will be mostly on the course Blackboard shell, in the textbook as well as in Pearson Mastering Engineering.

Each week you will be assigned the following:

- Reading in the textbook,
- Flipped content lecture videos posted on Blackboard,
- A set of homework problems in Mastering Engineering

These will be posted on Blackboard typically.

3.0 Grading

There will be two grading equations used to calculate two raw final grade scores. You will be given the higher of these two raw grades. The raw scores will be calculated as given in the table below

	Raw 1	Raw 2
In-class exams (4)	60%	30%
Quizzes and attendance	15%	20%
Projects	10%	25%
Homework (Mastering Engineering)	15%	25%

3.1 Exams

There will be three in class exams given during the semester as well as a final exam. The final exam is not cumulative but has the same weight as the other exams. Online exams will be taken during the assigned time for the class (or for the final exam period).

Exams will be corrected and returned through Gradescope (www.gradescope.com). You will need to set up an account and join this classes section (P52ENR).

3.2 Quizzes and Attendance

Attendance is required in this class. There will be unannounced short quizzes (approx. 15 minutes) periodically in class. The quiz material will be based on prior reading or homework. These are to be done individually, there will be no discussion between students on this.

3.3 Projects

There will be two projects assigned in this class. These will involve using finite element software to solve problems that we are also solving with a mechanics of materials approach. Also, we will be collecting experimental data to also validate your finite element and mechanics of materials solutions. In industry, all of these approaches are employed and by being exposed to all of these approaches you will gain a much deeper understanding of the course material.

These projects will be assigned, and a specific report format will be required.

3.4 Homework - Mastering Engineering

Mastering Engineering is required for this class. After the first week, students who are not enrolled in Mastering Engineering will be dropped from the class.

<https://www.pearsonmylabandmastering.com/northamerica/masteringengineering>

Course Name: MECH 2322 002 - Mechanics of Materials

Course ID: **chessa04903**

Course Materials: Modified Mastering Engineering for Mechanics of Materials 10th Edition

For each week there will be assigned reading and homework. The homework will be assigned through Mastering Engineering. The readings will be posted in Blackboard. The readings and homework are expected to be completed before the class. We will not collect the homework, but the

material will show up on the unannounced quizzes. Read previous section on the policies regarding Mastering Engineering.

4.0 Course Resources

The majority of the course materials will be assigned on Blackboard. This will include a spreadsheet of the assigned readings, homework and lecture materials as well as the projects, flipped content (videos).

4.1 Flipped Content

To maximize the amount of lecture time for solving problems we will “flip” the derivations and basic concepts. This material is essential for successfully completing this course but can be covered on your own time. This “flipped” content is largely videos posted online.

4.2 YouTube Videos and Video Solutions

There are several topics where the derivations and basic concepts can be quite lengthy to cover in class. For these areas, we will post the derivations on Dr. Chessa’s YouTube channel. This material will be denoted on the Lecture Plan

<https://www.youtube.com/playlist?list=PL6C4D2143EF51383D>

There is also some very good reinforcement content on the following Pearson content site <http://pearsonhighered.com/engineering-resources/>

4.3 Fusion 360

You are expected to have access to Autodesk Fusion 360. We will use this for various finite element projects in this class. If you do not already have an account with Fusion 360 please set one up at the following address <https://www.autodesk.com/products/fusion-360/students-teachers-educators>.

4.5 Course Tutoring

Please note there are course-specific tutoring services available in the ACES center provided by the Mechanical Engineering Department. If you are having some difficulties in this class you are strongly encouraged to attend these tutoring sessions. Tutoring is free to you; the Department pays them. If tutors are not used, the Department may stop funding them. Both tutoring will be given online for the remainder of the semester. The department advising will be given in the Mechanical Engineering Advising Blackboard Shell. To get information on the Mechanical Engineering tutoring sessions please email METutors@utep.edu. The ACES tutoring will be done through MS Teams.

5.0 Course Policies

Most of these course policies are consistent with the Mechanical Engineering standard course policies. Please read them carefully.

5.1 Academic Honesty

During exams and quizzes, you are not allowed to use any form of wifi-enabled electronic device, including cell phones or other electronic communication devices or methods (wristwatches, earbuds, etc.).

If you are suspected of scholastic dishonesty you may or may not be directly confronted about your conduct by the instructor or proctor. You will, however, be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) and your exam may not be admissible. Your grade in the class may not be available until OSCCR makes a final ruling, this may adversely impact your ability to enroll in other classes.

Scholastic dishonesty on homework, lab assignments, and all other class assignments will be held to the same standards and requirements of academic honesty as quizzes and exams.

5.2 Class Attendance Policy

Attendance is mandatory. Anyone with 5 or more absences will be dropped from the class. A drop for not attending will count toward the State Allowed Six Drop Limit. If you are failing the class at the time of the drop you may also be given a WF designation. Be advised that a drop could adversely impact visa status, financial aid, and other programs.

As per UTEP rules, you may be asked to show a UTEP ID at any time during class. Anyone who is present and not registered in the class will be subject to disciplinary action unless the instructor gives prior approval.

5.3 Excused Absence for Exams

The UTEP catalog allows Exam Absence to be excused ONLY for university-recognized Activities and very specific other situations. Medical absence is NOT allowed in the UTEP catalog. For consistency with the catalog, students will NOT be excused from exams due to illness.

5.4 DSS

If you feel you may have a disability which will make it difficult for you to carry out the work as I have outlined and/or if you need special accommodations/assistance due to a disability, please contact the C Center for Accommodations and Support Services (CASS) at 747-5148, go to Room 106E Union, or email cass@utep.edu.

5.5 Harassment Policy

The University (see Handbook of Operating Procedures 1.2.2.4) has a zero-tolerance policy for harassment. Engagement in any behavior considered harassment will be reported to the proper authorities. In addition to generally understood forms of harassment, the department also treats the following behavior as harassment:

- Repeated emails and/or calls regarding subjects that have already been addressed. Once a decision has been made or a question answered, a student who continues to ask the same question will be given a warning by the recipient of the email/call. If the student continues, the behavior will be reported. Questions that seek understanding of course material are not harassment; but repeated questions about a grade or an administrative decision are.
- Grades are NOT negotiable, ever. If you believe a grading mistake has been made, you must follow the process described in the UTEP catalog. Any request for a grade elevation that is NOT based on a mistake is considered harassment and will be reported immediately.
- Remaining in an office after the occupant requests you leave is considered harassment and potentially threatening. You will be reported immediately without warning and depending on the severity, may be reported to law enforcement.

Similar behavior towards department staff and student advisors will also be treated as harassment, including persistent phone calls, emails, and badgering. Department staff and student advisors are there to help students and should be treated with due respect.

5.6 COVID-19 Precautions

Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors. The Student Health Center is equipped to provide COVID 19 testing.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area, and will be available at no charge on campus during the first week of classes. For more information about the current rates, testing, and vaccinations, please visit epstrong.org

Preliminary Lecture Plan

(this will change; see Blackboard for an up-to-date version)

<i>Lect</i>	<i>Date</i>	<i>Topics to be covered</i>	<i>Reading</i> ¹	<i>Notes</i>
1	T Aug 24	Course overview and policies, syllabus	None	
2	Th Aug 26	Equilibrium of a deformable body; FBD; Sum Forces & Moments; Support Reactions	1.2	
3	T Aug 31	Stress; axial loaded bar; shear; double shear and single shear on pins	1.3 - 1.5	FEA project No. 1 to be assigned, Week 1 homework is due
4	Th Sept 2	Factor of Safety; Allowable Stress	1.6*	
5	T Sept 7	Strain; Normal Strain; Shear strain	2.2	Week 2 homework is due
6	Th Sept 9	Review		
7	T Sept 14	Exam 1		
8	Th Sept 16	Tension Test, Shear test Hooke's Law, Strain Energy, Poisson's ratio	3.1 - 3.5	FEA Project No. 1 is due (upload to Blackboard as pdf)
9	T Sept 21	Axial load, axial elongation	4.1, 4.2	
10	Th Sept 23	Statically indeterminate member	4.3 4.4	Video on section 4.5 Force Method Analysis (https://www.youtube.com/watch?v=1lg0jqisEXY&feature=youtu.be)
11	T Sept 28	Stress Concentrations/Thermal Stresses	4.6, 4.7	
12	Th Sept 30	Torsion	5.1*, 5.2*, 5.3*	Flipped derivations and J calc
13	T Oct 5	Angle of twist, statically indeterminate	5.4*, 5.5	Flipped twist derivation
14	Th Oct 7	Review	5.1*, 5.2*	Flipped derivations and J calc
15	T Oct 12	Statically indeterminate torsion	5.4*, 5.5	Flipped twist derivation
16	Th Oct 14	Shear and bending moment	6.2	
17	T Oct 19	Exam 2	6.3*, 6.4	Flipped kinematics lect, Flipped flexure formula, flipped I calculation
18	Th Oct 21	Flexure formula and calculation of I	7.1, 2, 3*, 4*	Flipped derivation, possibly flip thin wall and open sections
19	T Oct 26	Transverse Shear	8.1	
20	Th Oct 28	Transverse Shear	9.1*, 2*, 3*	
21	T Oct 2	Thin wall PV	9.1*, 2*, 3*	
22	Th Nov 4	Combined loading		FEA Project No.2 is assigned (stress concentration factors)
23	T Nov 9	Exam 3	9.1*, 2*, 3*	
24	Th Nov 11	Plane stress		
25	T Nov 16	Mohr's circle		
26	Th Nov 18	Plane strain, strain rosettes	10.1*, 2*, 5	
27	T Nov 23	Beam deflection	12.1*, 12.2*, 12.4*	
28	Th Nov 25	Thanksgiving Break		
29	T Nov 30	Column buckling	10.1*, 2*, 5	
29	Th Dec 2	Tables		

¹ Reading is to be done before the assigned lecture. Unless otherwise stated all reading is from the text.

* Watch flipped content on Dr. Chessa's YouTube channel. This will have the detailed derivations and theoretical discussions.

