

The University of Texas at Tyler
Department of Civil Engineering

CENG 3306: Mechanics of Materials

Course Syllabus (Fall 2023)

Updated: August 21, 2023

Time & Venue	Lecture Times: MoWeFr, 11:15 a.m. – 12:10 p.m., HEC B210 If you miss a scheduled class, you are still responsible for the material
Instructor	Dr. Shariful Huq Office: HEC A204 Email: shuq@uttyler.edu Phone: (903) 566-6701 Office hours: TuTh 1:00 pm – 5:00 pm or By Appointment You are encouraged to seek additional instructional help. My goal is to be commonly available to you for assistance, so feel free to email me, my email address is shuq@uttyler.edu . The best way to contact me is via email.
Teaching Assistant	TBA
Note to Student about a Syllabus	This syllabus is a statement of intent about how the course will be taught this semester. It outlines what we will cover, what you will need to do in the course, and it explains what and when you must do it to successfully complete the course and get a great final grade. This syllabus is intended to protect you from arbitrary or untimely changes in course requirements and due dates. But I reserve the right to make changes as necessary to the syllabus with announcement of changes. As we learned during 2020 (Covid-19 era), there are many circumstances outside of our direct course control that may require changes to this syllabus in content and schedule. These will always be announced in advance and the syllabus will be updated on Canvas so all can be aware of the required changes.
Important Covid-19 Information for Classrooms and Laboratories	<i>It is important to take the necessary precautions to ensure a healthy and successful year.</i> UT Tyler continues to urge you to protect yourselves against the flu, COVID and any new threats that may be developing. Be diligent about preventive measures such as washing hands, covering sneezes/coughs, social distancing and vaccinations, which have proven to be successful in slowing the spread of viruses. <i>Encourage those who don't feel well to stay home, and if they show symptoms, ask them to get tested for the flu or COVID. Self-isolation is important to reduce exposure</i> (CDC quarantine/isolation guidelines). Please work with your faculty members to maintain coursework and please consult existing campus resources for support.

Recording of Class Sessions	Class lectures may be recorded by the instructor for use by students enrolled in this course. Recordings that contain personally identifiable information or other information subject to FERPA shall not be shared with individuals not enrolled in this course unless appropriate consent is obtained from all relevant students. Class recordings are reserved only for the use of students enrolled in the course and only for educational purposes. Course recordings should not be shared outside of the course in any form without express permission.
Course Website	Canvas will be used to manage the course material for the semester. There you will find homework assignments, HW/Quiz solutions, handouts, and other material pertaining to the class. Collected homework will be graded either for points or completion only. Please check canvas regularly.
Catalog Description	Stress and strain; uni-axially loaded members; normal and shear stresses; torsion; flexural behavior; beam deflections; buckling of columns; pressure vessels; combined loading; failure criteria; shear/moment diagrams of beams.
Learning Objectives	<p>A. Block I: Fundamentals of Stress and Strain, Axial Loads</p> <ol style="list-style-type: none"> 1. Determine internal forces (axial forces, shears, moments, & torques) in a structural member. 2. Analyze/design a centric axially loaded (2 force) member. 3. Plot / interpret normal stress-normal strain (σ vs ϵ) and shear stress-shear strain (τ vs γ) curves. 4. Given a state of stress at a point, determine the principle stresses (σ_1 & σ_2) and the maximum in-plane shear stress (τ_{max}), the angle to the principal plane (θ_p), and the state of stress on any plane (θ) through the point ($\sigma_{x'}$, $\sigma_{y'}$ & $\tau_{x'y'}$). 5. Given a state of strain at a point, determine the principle strains (ϵ_1 & ϵ_2) and the maximum in-plane shear strain (γ_{max}), the angle to the principal plane (θ_p), and the state of strain on any plane (θ) through the point ($\epsilon_{x'}$, $\epsilon_{y'}$ & $\gamma_{x'y'}$). 6. Determine the axial deformations (δ) and/or normal stress (σ) in a centric axially loaded 2-force member and/or due to change in temperature in the member. 7. Analyze a statically indeterminate structure, based on compatibility of axial deformations (δ). <p>B. Block II: Torsion and Bending</p> <ol style="list-style-type: none"> 8. Determine maximum stresses ($\sigma_{max} = K*\sigma_{avg}$) at stress concentrations due to geometric anomalies such as holes and fillets. 9. Use a stress-cycle (S - N) diagram to predict the fatigue life of a structure.

	<p>10. Determine longitudinal stress (σ_l) and hoop stress (σ_h) for a thin-walled pressure vessel.</p> <p>11. Analyze and design circular members in torsion, including calculating shear stresses (τ) and angles of twist (ϕ).</p> <p>12. Analyze a statically indeterminate torsional member, based on compatibility of torsional deformations (i.e., the angle of twist)</p> <p>13. Draw shear and bending moment diagrams for a beam.</p> <p>14. Determine normal flexure stresses (σ) for a beam.</p> <p>15. Determine the maximum elastic internal bending moment (MME) for a beam.</p> <p>16. For inelastic conditions, determine the partially-plastic internal bending moment (MPP) and the fully-plastic internal bending moment (MFP) for a beam.</p> <p>17. Determine transverse shear stress (τ) at any point on a beam cross section.</p> <p>18. Design a prismatic beam.</p> <p>C. Block III: Beam Deflections and Buckling</p> <p>19. Determine the elastic curve function for beam deflections.</p> <p>20. Calculate beam deflections.</p> <p>21. Analyze a statically indeterminate beam, based on compatibility of bending deformations.</p> <p>22. Calculate stresses in a member subjected to combined loading due to axial, torsional, internal pressure (i.e., thin wall pressure vessels), and/or bending forces.</p> <p>23. Analyze/design columns.</p>
Prerequisite/Corequisite	ENGR 2301: Engineering Statics
Required Text	Textbook: Mechanics of Materials, Tenth Edition, R.C. Hibbeler, ISBN 978-0-13-431965-0
Supplementary Material (Not Required)	Mastering Engineering: Mechanics of materials online
Schedule (Subject to Change)	See schedule posted on Canvas

<p>Course Topics (Subject to Change)</p>	<p style="text-align: center;"><u>TOPICS</u></p> <p>I. Fundamentals of Stress and Strain Internal Forces Normal and Shear Stress Introduction to Design Strain Mechanical Properties of Materials Stress Transformation I Stress Transformation II Strain Transformation I Strain Transformation II</p> <p>II. Axial Loads and Torsional Loads Fatigue & Stress Concentrations Thin-Walled Pressure Vessels Axial Deformation I Axial Deformation II Elastic Torsion I Elastic Torsion II Theories of Failure Statically Indeterminate Torsion Members Inelastic Torsion</p> <p>III. Bending Shear and Bending Moment Diagrams I Shear and Bending Moment Diagrams II Elastic Bending, I Elastic Bending II Inelastic Bending by Equilibrium Transverse Shear Stress I Transverse Shear Stress II Design of Prismatic Beams Combined Loading, I Combined Loading II</p> <p>IV. Beam Deflections and Buckling Introduction to Beam Deflections Beam Deflection by Moment-Curvature Functions Beam Deflection by Superposition Column Buckling Course Overview / Course Critique</p>
<p>Homework</p>	<p>Homework will be assigned on a regular basis. Homework will be collected and graded either for points or completion only. To receive full completion grade - Homework must be uploaded in canvas by the due date and time. No late homework will be accepted except when arrangements are made with the instructor ahead of time. Solutions will be posted on canvas.</p>

Exams	<p>There will be 3 midterm examinations (held during the scheduled class time) and one final 2-hour examination. The exams are TENITATIVELY scheduled for:</p> <table data-bbox="630 306 1206 449"><tr><td>Exam 1:</td><td>September 25th</td></tr><tr><td>Exam 2:</td><td>October 16th</td></tr><tr><td>Exam 3:</td><td>November 17th</td></tr><tr><td>Final Exam:</td><td>TBA</td></tr></table> <p>Midterm exam dates may be moved up or pushed back depending on the progress of the lectures. Solutions to exams will NOT be posted, however, you can review the solution in my office.</p>	Exam 1:	September 25th	Exam 2:	October 16th	Exam 3:	November 17th	Final Exam:	TBA
Exam 1:	September 25th								
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Exam 3:	November 17th								
Final Exam:	TBA								
Re-schedule of Examination	<p><u>Final Exam:</u> There is no make-up or rescheduling.</p> <p><u>Mid-term Exams:</u> Each student is only allowed one make-up exam. That is, he/she can only make-up Exam 1 or Exam 2 or Exam 3. Make-up will be arranged if you inform the instructor prior to or on the day before the exam, with a strong valid reason. Examples of strong valid reasons (unexpected events and cannot be rescheduled) are <u>official UT Tyler travel, accident, illness, child-birth, passing of an immediate family member, jury duty, or court appearance.</u> You will be required to show documentary evidence for the valid reason (e.g., <u>official university letter, doctor’s letter, letter from funeral home, police report, court letter</u> etc.). Events that can be pre-scheduled or rescheduled are not considered valid reasons. Examples of non-valid reasons are <u>traffic, wedding, driving test, sending car for service, clash with another course schedule,</u> etc. Job interviews will be considered on a case-by-case basis (again, with documentary evidence). If an emergency happens during the exam day, you should contact the instructor at the earliest possible time (or call the HEC Engineering office, or contact one of your classmates or TA who will then inform the instructor). Any make-up exam will be given on the Study/Dead Day (December 4, 2023).</p> <p>To compensate for the fact that you may apply what you learn in the entire course when answering make-up Exams 1 or 2 or 3, the make-up exam will be more difficult than the original exam.</p> <p>Students who fail to show up for the make-up or final exam with an invalid reason will be given 0 points for that exam; or for a valid reason an incomplete “I” grade. He/she must take the exam the next time this course is being offered to have the “I” grade changed to a letter grade. All assessment components and marks will be retained for the calculation of the final letter grade. The letter grade will be benchmarked against the same class for the semester in which the exam had been missed.</p>								

Exam Rules	<p>Mid-Term and the Final Exam are closed notes. You are <u>only allowed to use</u> the FE packet, an NCEES approved calculator and your writing instruments (pencils, pens & erasers).</p> <p><u>You are NOT allowed to work with anyone on the exam. You must work independently. No use of the internet, textbook, notes or any other resources. Carry through all units in the problem. Any student found in violation of these rules and as such in violation of UT-Tyler student code of conduct will be subjected to penalties ranging from receiving a zero grade on the respective exam or suspension or expulsion from the university.</u></p> <p>Topics to be tested will be announced in class and on Canvas one week prior to the exam. The instructor will set questions from material taught in class. The meaning of “taught in class” includes verbal instructions or written notes on Canvas. It is very important that you attend the class activities and take additional notes.</p> <p>To discourage students from focusing narrowly on only a few questions, no practice exam will be given. There are enough self-practice problems as well in the textbook at the end of each chapter, which are not required as part of each homework assignment.</p>
Calculators	<p>The use of any electronic device, except an approved calculator, is not permitted during exams. Your exam will be collected, and your grade will be a zero if you are caught using a non-approved electronic device (Laptops, PDAs, MP3 players, cell phones, smart watches).</p> <p>In line with the Civil Engineering Department’s policy, only calculators permitted by NCEES for use in the <u>current semester’s FE exam</u> are permitted to be used for CENG 3306 examinations. No other model of calculator will be allowed. Models allowed by NCEES in the past but are no longer valid for the current FE exam are prohibited in the CENG 3306 exams. For a complete listing of permitted calculator models please check, https://ncees.org/exams/calculator/. It is the student’s responsibility to check the validity of his/her calculator model, purchase, and be familiar with the functions of the permitted calculators prior to the exam. If an unapproved calculator is found during any exam, it will be taken away immediately and only be returned to the student after the exam.</p>
Grade Scale	<p>Contributions towards final grade (out of 100%)</p> <ul style="list-style-type: none"> 20% Homework / Quizzes 10% Professional Practice* 45% Mid-term Exams (= 3 x 15%) 25% Final Examination (Comprehensive)

	<p>*Professional Practice Grade Breakdown: Your professional practice grade will be computed based upon your attendance (35%) plus participation in the course (35%) plus participation in professional organizational activity (30%) (such as ASCE, AISC events). The professional organizational activity grade of 30% will go towards joining and attending a minimum of 3 professional organizational events and submission of one mini report describing the meeting contents. I will provide a document template and an example of what needs to be submitted. For attendance during class meetings, towards the end of the meeting students will be called by names, and marked absent if not in attendance.</p> <p>In grading the homework, assignments, tests, exams, etc., no credit will be given to methods not covered in this class, although these methods, tables, formulae may appear in the textbook. Errors or outdated material in the textbook should not be the reason for claiming full credit on work done.</p> <p>To protect your confidentiality, graded homework, assignments, and exams will not be placed in open area for collection. They will only be distributed by the instructor during class or office hours. Graded homework, assignments, and exams not collected before the final exam week will be disposed according to UT Tyler policy.</p> <p>Letter grades will be assigned based on the final course grade:</p> <ul style="list-style-type: none">A 90 and aboveB 80 to 89.99C 70 to 79.99D 60 to 69.99F below 60 <p>No letter grade will be released until it is official on PeopleSoft.</p> <p>NOTE: There will be no makeup work or extra credit allowed/granted at the end of or during the semester unless allowed/granted to everyone by the instructor. All assignments must be turned in at the appropriate time to receive credit</p> <p>“If necessary, I reserve the right to adjust the grade scale at the end of the semester to your benefit”</p>
Final Day to Withdraw	The final day to withdraw from the course without penalty is October 30th, 2023

Census Date	The university requires that instructors to report the attendance to the register at various points in the semester. Therefore, on September 1st, 2023 , I will be taking attendance. Please make sure you are there for class on that date or notify ahead if you will not be there.
UT Tyler Honor Code	Every member of the UT Tyler community joins together to embrace: Honor and Integrity that will not allow me to lie, cheat, or steal, nor to accept the actions of those who do.
Student Standards of Academic Conduct	<p>Disciplinary proceedings may be initiated against any student who engages in scholastic dishonesty, including, but not limited to, cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.</p> <p>(i) "Cheating" includes, but is not limited to:</p> <ol style="list-style-type: none"> a. copying from another student's test paper; b. using, during a test, materials not authorized by the person giving the test; c. failure to comply with instructions given by the person administering the test; d. possession during a test of materials which are not authorized by the person giving the test, such as class notes or specifically designed "crib notes". The presence of textbooks constitutes a violation if they have been specifically prohibited by the person administering the test; e. using, buying, stealing, transporting, or soliciting in whole or part the contents of an un-administered test, test key, homework solution, or computer program; f. collaborating with or seeking aid from another student during a test or other assignment without authority; g. discussing the contents of an examination with another student who will take the examination; h. divulging the contents of an examination, for the purpose of preserving questions for use by another, when the instructors has designated that the examination is not to be removed from the examination room or not to be returned or to be kept by the student; i. substituting for another person, or permitting another person to substitute for oneself to take a course, a test, or any course-related assignment; j. paying or offering money or other valuable thing to,

	<p>or coercing another person to obtain an un-administered test, test key, homework solution, or computer program or information about an un-administered test, test key, home solution or computer program;</p> <p>k. falsifying research data, laboratory reports, and/or other academic work offered for credit;</p> <p>l. taking, keeping, misplacing, or damaging the property of The University of Texas at Tyler, or of another, if the student knows or reasonably should know that an unfair academic advantage would be gained by such conduct; and</p> <p>m. misrepresenting facts, including providing false grades or resumes, for the purpose of obtaining an academic or financial benefit or injuring another student academically or financially.</p> <p>(ii) “Plagiarism” includes, but is not limited to, the appropriation, buying, receiving as a gift, or obtaining by any means another’s work and the submission of it as one’s own academic work offered for credit.</p> <p>(iii) “Collusion” includes, but is not limited to, the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any section of the rules on scholastic dishonesty.</p> <p>All written work that is submitted will be subject to review by plagiarism software.</p>
<p>UT Tyler Resources for Students</p>	<ul style="list-style-type: none"> • UT Tyler Writing Center (903.565.5995), writingcenter@uttyler.edu • UT Tyler Tutoring Center (903.565.5964), tutoring@uttyler.edu • The Mathematics Learning Center, RBN 4021, this is the open access computer lab for math students, with tutors on duty to assist students who are enrolled in early-career courses. • UT Tyler Counseling Center (903.566.7254)
<p>Collection of Student Work</p>	<p>Throughout the semester I may collect student work (best, average, and worst) for the ABET course and outcomes notebooks. This will require me to make a copy of your work, keep your original and return a copy of the graded work to you. I will not draw attention as to what level of work you accomplished.</p>
<p>Students Rights and Responsibilities</p>	<p>To know and understand the policies that affect your rights and responsibilities as a student at UT Tyler, please follow this link:</p> <p>http://www.uttyler.edu/wellness/StudentRightsandResponsibilities.html</p>

<p>Grade Replacement / Forgiveness and Census Date Polices:</p>	<p>Students repeating a course for grade forgiveness (grade replacement) must file a Grade Replacement Contract with the Enrollment Services Center (ADM 230) on or before the Census Date of the semester in which the course will be repeated. Grade Replacement Contracts are available in the Enrollment Services Center or at http://www.uttyler.edu/registrar. Each semester’s Census Date can be found on the Contract itself, on the Academic Calendar, or in the information pamphlets published each semester by the Office of the Registrar. Failure to file a Grade Replacement Contract will result in both the original and repeated grade being used to calculate your overall grade point average. Undergraduates are eligible to exercise grade replacement for only three course repeats during their career at UT Tyler; graduates are eligible for two grade replacements. Full policy details are printed on each Grade Replacement Contract.</p> <p>The Census Date is the deadline for many forms and enrollment actions that students need to be aware of. These include:</p> <ul style="list-style-type: none"> • Submitting Grade Replacement Contracts, Transient Forms, requests to withhold directory information, approvals for taking courses as Audit, Pass/Fail or Credit/No Credit. • Receiving 100% refunds for partial withdrawals. (There is no refund for these after the Census Date) • Schedule adjustments (section changes, adding a new class, dropping without a “W” grade) • Being reinstated or re-enrolled in classes after being dropped for non-payment • Completing the process for tuition exemptions or waivers through Financial Aid
<p>State-Mandated Course Drop Policy</p>	<p>Texas law prohibits a student who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. This includes courses dropped at another 2-year or 4-year Texas public college or university. For purposes of this rule, a dropped course is any course that is dropped after the census date (See Academic Calendar for the specific date).</p> <p>Exceptions to the 6-drop rule may be found in the catalog. Petitions for exemptions must be submitted to the Enrollment Services Center and must be accompanied by documentation of the extenuating circumstance. Please contact the Enrollment Services Center if you have any questions.</p>

<p>Disability/Accessibility Services</p>	<p>In accordance with Section 504 of the Rehabilitation Act, Americans with Disabilities Act (ADA), and the ADA Amendments Act (ADAAA), the University of Tyler at Texas offers accommodations to students with learning, physical and/or psychological disabilities. If you have a disability, including non-visible a diagnosis such as a learning disorder, chronic illness, TBI, PTSD, ADHD, or you have a history of modifications or accommodations in a previous educational environment, you are encouraged to visit: https://hood.accessiblelearning.com/UTTyler and fill out the <u>New Student</u> application.</p> <p>The Student Accessibility and Resources (SAR) office will contact you when your application has been submitted and an appointment with an Accessibility Case Manager. For more information, including filling out an application for services, please visit the SAR webpage at http://www.uttyler.edu/disabilityservices, the SAR office located in the University Center, # 3150 or call 903.566.7079.</p>
<p>Student Absence due to Religious Observance</p>	<p>Students who anticipate being absent from class due to a religious observance are requested to inform the instructor of such absences by the second-class meeting of the semester</p>
<p>Student Absence for University-Sponsored Events and Activities</p>	<p>If you intend to be absent for a university-sponsored event or activity, you (or the event sponsor) must notify the instructor at least two weeks prior to the date of the planned absence. At that time the instructor will set a date and time when make-up assignments will be completed.</p>
<p>Social Security and FERPA Statement</p>	<p>It is the policy of The University of Texas at Tyler to protect the confidential nature of social security numbers. The University has changed its computer programming so that all students have an identification number. The electronic transmission of grades (e.g., via e-mail) risks violation of the Family Educational Rights and Privacy Act; grades will not be transmitted electronically</p>
<p>Emergency Exits and Evacuation</p>	<p>Everyone is required to exit the building when a fire alarm goes off. Follow your instructor’s directions regarding the appropriate exit. If you require assistance during an evacuation, inform your instructor in the first week of class. Do Not re-enter the building unless given permission by University Police, Fire department, or Fire Prevention Services</p>

UT Tyler a Tobacco-Free University	Beginning August 15, 2016, all forms of tobacco will not be permitted on the UT Tyler main campus, branch campuses, and any property owned by UT Tyler. This applies to all members of the University community, including students, faculty, staff, University affiliates, contractors, and visitors. Forms of tobacco not permitted include cigarettes, cigars, pipes, water pipes (hookah), bidis, kreteks, electronic cigarettes, smokeless tobacco, snuff, chewing tobacco, and all other tobacco products. There are several cessation programs available to students looking to quit smoking, including counseling, quit lines, and group support. For more information on cessation programs please visit www.uttyler.edu/tobacco-free .
Campus Carry	We respect the right and privacy of students 21 and over who are duly licensed to carry concealed weapons in this class. License holders are expected to behave responsibly and keep a handgun secure and concealed. More information is available at: http://www.uttyler.edu/about/campus-carry/index.php .

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