Course and Instructor Information

Course Title: Mechanics of Materials  
Credits: #3  
Format: (Online)  
Prerequisites: CE 2110, Enrollment in the school of engineering  
Professor: Sarira Motaref, Ph.D., P.E., Associate Professor in Residence  
Email: Sarira.motaref@uconn.edu  
Telephone: 860-486-2731  
Office location: Engineering II, room 310  
Office Hours/Availability: with previous appointment via Blackboard Collaborate Ultra (available in HuskyCT class section). Please email to sarira.motaref@uconn.edu to set up your appointment.

Teacher Assistants:
Toby Poole, Toby.Poole@uconn.edu, office hours: Monday and Wednesday 2:30PM-4PM, Blackboard Collaborate Ultra (available in HuskyCT class section)

Michael Vaccaro, michael.t.vaccaro@uconn.edu, office hour: Tuesday and Thursday, 2PM-3:30PM, Blackboard Collaborate Ultra (available in HuskyCT class section)

Course Materials

Required Materials:
E-Book: Mechanics of Materials  
By Ferdinand Beer and E. Russell Johnston, Jr. and John DeWolf and David Mazurek  
ISBN10: 1260113272  
ISBN13: 9781260113273  
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Section 1
https://connect.mheducation.com/class/s-motaref-spring-2020

Texts are available through a local or online bookstore. The UConn book store carries many materials that can be shipped via its online Textbooks To Go service. For more information, see Textbooks and Materials on our Enrolled Students page.
Course Organization:
The class is a flipped. It means that the lectures will be delivered online and students will come to the class for recitation (if needed), problem solving and to address their questions on assignments.

Class includes total of 14 weeks, 33 Lectures, [01/22/2020 to 05/01/2020]

Class Outlines
1. Watch a video (approximately 10 min.) lecturing concepts and background information.
2. Watch a video (approximately 10-20 min.) solving sample problems.
4. Complete Assignments (available in HuskyCT) before deadline using your smart book account.
5. Benefit from extra problem solving activity via live sessions (Collaborate Ultra) or pre-recorded videos.
6. Attend the class to practice problem solving skill and submit in class group HWs.
7. Complete self-quizzes. (Please see section: In-class Home works (self-quiz).
8. Take 3 midterm exams and a Final Exam [online via Lockdown browser and Respondous monitor].
9. Take online quizzes via HuskyCT.

In-Class Activities

Active learning method is utilized in this class. The class sessions involves with problem solving (by students) individually and in teamwork. Instructors and TAs will guide you during problem solving. The solution to the problems will be presented either in class or detailed solutions will be available after deadline in Connect.

To effectively use the class sessions, please follow the instruction below.

1. Having calculator/pencil/eraser in class session is mandatory.
2. You are supposed to watch the lecture video and sample solving video before attending the class. You can find lecture number from Calendar.
3. In-Class HW should be completed by teams and submitted during class.
4. Install Sketchfab application on your smartphone. We show and discuss some 3D models during class using this application.
5. Extra class problem activity will be offered via live session (collaborate ultra) or pre-recorded videos.
6. Send your questions on the watched videos to instructor at least 2 hours before your class session. Instructor will have a recitation on that topic if it is necessary.

Course Description
Simple and combined stress, torsion, flexure and deflection of beams, continuous and restrained beams, combined axial and bending loads, columns.

Mechanics of Materials, also called strength of materials, is a subject which deals with the behavior of solid objects subject to stresses and strains. The study of Mechanics of materials often refers to various methods of calculating the stresses and strains in structural members, such as beams, columns, and shafts. The methods employed to predict the response of a structure under loading and its susceptibility to various failure modes takes into account the properties of the materials such as its yield strength, ultimate strength, Young's Modulus, and Poisson's ratio; in addition the mechanical element's macroscopic properties (geometric properties), such as its length, width, thickness, boundary constraints and abrupt changes in geometry such as holes are considered.

Course Objectives

By the end of the semester, students should be able to:
1. Explain basic concepts of stress, strain and their relations based on linear elasticity
2. Calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions
3. Calculate stresses and deformation of a torsional bar
4. Sketch shear-moment diagrams of a beam and find the maximum moment/shear and their locations
5. Calculate normal and shear stresses on any cross-section of a beam
6. Apply Mohr’s circle to calculate principal stresses and angles in plane stress cases.
7. Calculate stresses on a structure under combined loadings
8. Calculate deflections of a beam under combined loads by using methods of moment-area and superposition
9. Recognize stability and buckling phenomena for a slender member under an axial compressive force.

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**Course Outline (and Calendar if Applicable)**

**Course Modules**

| Lecture 1: Introduction to Normal and Shear Stress (CH-1) |
| Lecture 2: Normal and Shear Stress Components (CH-1) |
| Lecture 3: Stress-Strain Diagram (CH-2) |
| Lecture 4: Hook’s law and deformation of member under axial loading (CH-2) |
| Lecture 5: Stress Calculation in Statically Indeterminate Elements (CH-2) |
| Lecture 6: Elements under temperature, Poisson’s Ratio, and Shearing strain (CH-2) |
| Lecture 7: Stress Concentration; Plastic Deformation (CH-2) |
| Lecture 8: Torsion (CH3) |
| Lecture 9: Angle of Twist, Indeterminate Shafts (CH-3) |
| Lecture 10: Design of Transmission shaft (CH-3) |
| **Midterm Exam 1-Refer to you course Calendar for date (Chapters 1 to 3)** |
| Lecture 11: Stresses and Deformations under pure bending (CH-4) |
| Lecture 12: Neutral axis location and second moment of inertia (CH-4) |
| Lecture 13: Composite Materials under bending, curvature (ρ) (CH-4) |
| Lecture 14: Eccentric Axial Loading (CH-4) |
| Lecture 15: Shear and Bending-Moment Diagrams (CH-5) |
| Lecture 16: Beam analysis method of cut, method of integration (CH-5) |
| Lecture 17: Relations Among w, V, and M (CH-5) |
| Lecture 18: Design of Prismatic Beams in Bending (CH-5) |
| Lecture 19: Shearing Stresses in a Beam (CH-6) |
| Lecture 20: Sharing Flow, Thin-Walled Members (CH-6) |
| Lecture 21: Shear Center (CH-6) |
| **Midterm Exam 2-Refer to you course Calendar for date (Chapters 4, 5, 6)** |
| Lecture 22: Transformation of Plane Stress, Principal plane, (CH-7) |
| Lecture 23: Mohr’s Circle for Plane Stress (CH-7) |
| Lecture 24: Three-Dimensional Stress Analysis; Fracture Criteria (CH-7) |
| Lecture 25: Stresses in Thin-Walled Pressure Vessels (CH-7) |
| Lecture 26: Deflection of Beams, Equation of the elastic curve (CH-9) |
| Lecture 27: Application of Equation of Elastic Curve in Beams (CH-9) |
| Lecture 28: Application of equation of elastic curve in indeterminate beams (CH-9) |
Lecture 29: Method of Superposition (CH-9)
Lecture 30: Columns: Euler’s Formula (CH-10)
Lecture 31: Stability of structures (CH-10)
Lecture 32: Columns with other end conditions, Design of Columns (CH-10)
Lecture 33: Design of Columns Under an Eccentric Load (CH-10)

Midterm Exam 3—Refer to your course Calendar for date (Chapters 7, 9, 10)

Course Requirements and Grading

Summary of Course Grading:

<table>
<thead>
<tr>
<th>Course Components</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home works (13 sets)</td>
<td>25%</td>
</tr>
<tr>
<td>Quizzes (9 sets)</td>
<td>15%</td>
</tr>
<tr>
<td>In-Class HW (9 to 13 sets) (Updated)</td>
<td>15%</td>
</tr>
<tr>
<td>Midterm exams (3 sets)</td>
<td>45%</td>
</tr>
<tr>
<td>**Final exam (Optional)</td>
<td>See the description below</td>
</tr>
<tr>
<td>**Comprehension of Concepts Assignments (Smart Book) (Optional)</td>
<td>Bonus</td>
</tr>
</tbody>
</table>

**Please see descriptions below about Reading assignments, and Final Exam.

Home works

- There are 13 sets of Home works during the semester. Each set includes 4 to 7 homework problems.
- Homeworks are available under Connect access. You can receive hints, check your work before each submission. Detailed feedback will be available to you after due date.
- The due date is on every Sundays (until 11:59PM) or Wednesdays in the week of Midterm exams. The due dates are available on calendar. The calendar file is located in HuskyCT under Syllabus & Calendar.
- Deadlines are firm. NO REQUEST FOR DEADLINE EXTENTION will be accepted. Please start your HW early. Reach out to the instructors or TAs for additional help before the deadline.

Quizzes

- There are 9 sets of quizzes available in HuskyCT. You need to complete each quiz at the end of each chapter Deadlines are usually on Tuesdays at 11:59PM. Please refer to class calendar.
- You will have 2 attempts to complete each quiz. You see your wrong answers after the first attempt. The highest grade between 2 attempts will be recorded as your grade.
- Deadlines are firm. NO REQUEST FOR DEADLINE EXTENTION will be accepted.

In-Class Home works (Self-Quiz)
• You have completed 7 in-class HW activities. There are 4 more activities for Lectures 23, 27, 29 and 32. One problem from previous exams related to the lecture will be posted to HuskyCT under "self-Quiz" tab on the left menu. You need to solve, scan and upload your solution in HuskyCT under Self-quiz tab before the deadline. Deadlines will be available under updated calendar and will be communicated with you via announcement.

• You will be assigned to a team of 3 (your team location and team number will be posted in the beginning of the class). A problem from the past exams related to the topic of that day (refer to the calendar) should be completed by the team in 15 minutes. Instructor and TAs provide guidance during this activity.

• Team members will be defined based on your last name or first name or student ID or major,... Be ready to work with different classmates during the semester!

• Each team submit 1 paper and the grade is assigned to all team members.

• You may miss up to 2 in-class HWs. You need to come to the next available office hours (of the instructor) and re-take this HW in her office.

Midterm exam

• **Online** Midterm exams (3 Midterm exams):

Midterm exam 1: Monday, February 24th, 2020 (50 minutes) [Chapters 1, 2, 3]
Midterm exam 2: Monday, March 30th, 2020 (50 minutes) [Chapters 4, 5, 6], 10AM-11AM US Eastern time.
Midterm exam 3: Monday, April 27th, 2020 (50 minutes) [Chapters 7, 9, 10], 10AM-11AM US Eastern time.

• Lockdown browser and Respondous Monitor will be used for the online exams. You need to have reliable internet connection and laptop with camera. Further instructions are available in HuskyCT/Online Exams.

• Midterm exams contain 4 questions. You have 50 minutes to answer questions.

• Exams are NOT open book/open notes. Equation Sheets will be provided. You can only have your calculator, pencil and eraser. Please DO NOT use Pen to answer questions. There is no restriction on the calculator model for the exam.

• Solution to midterm exams will be available in HuskyCT under Course Resources/Exam Solutions.

• **Make up exams** will be offered to students only in following cases:

  a) Students with disability can contact CSD to schedule exam in a private room with extended time. b) Athletic team members also can reschedule exam with a letter from their coach (in case of conflict between exams and their tournaments).

***Other case (Medical emergency, family emergency,...): with an official letter from hospital or doctors. Date: **Friday, April 24th** 10AM-11AM US Eastern time, Online, Materials: Comprehensive from all chapters.
Assessment on comprehension of Engineering concepts (Smart Book)[Optional]

There are assignments from the engineering concepts available in SmartBook via HuskyC. You will read and comprehend the engineering concepts and then complete the practice questions. You can earn 3 points towards your final grade if you complete all chapters by May 1st.

Final Exam [Optional]

Final exam is comprehensive from all chapters. Final exam grade can be replaced with one of your lowest grades from Midterm exams. There is no risk taking the final as the highest grade between the final and midterm exams will be selected to calculate your final grade. You may decide not to attend the final exam if you are happy with your midterm exams’ grades.

Date: Friday, May 8th, 8AM-9:30AM US Eastern time, Online Exam

Grading Scale: (It is subjected to change)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Letter Grade</th>
<th>GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>93-100</td>
<td>A</td>
<td>4.0</td>
</tr>
<tr>
<td>90-92</td>
<td>A-</td>
<td>3.7</td>
</tr>
<tr>
<td>87-89</td>
<td>B+</td>
<td>3.3</td>
</tr>
<tr>
<td>83-86</td>
<td>B</td>
<td>3.0</td>
</tr>
<tr>
<td>80-82</td>
<td>B-</td>
<td>2.7</td>
</tr>
<tr>
<td>77-79</td>
<td>C+</td>
<td>2.3</td>
</tr>
<tr>
<td>73-76</td>
<td>C</td>
<td>2.0</td>
</tr>
<tr>
<td>70-72</td>
<td>C-</td>
<td>1.7</td>
</tr>
<tr>
<td>67-69</td>
<td>D+</td>
<td>1.3</td>
</tr>
<tr>
<td>63-66</td>
<td>D</td>
<td>1.0</td>
</tr>
<tr>
<td>60-62</td>
<td>D-</td>
<td>0.7</td>
</tr>
<tr>
<td>&lt;60</td>
<td>F</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Due Dates and Late Policy

All course due dates are identified in the calendar available in HuskyCT under Syllabus& Calendars. Deadlines are based on Eastern Standard Time; if you are in a different time zone, please adjust your submittal times accordingly. The instructor reserves the right to change dates accordingly as the semester progresses. All changes will be communicated in an appropriate manner.

No late assignments will be accepted. No makeup quiz will be offered.

Feedback and Grades

You will receive online feedbacks on your assignments and quizzes. Midterm exams and final exams results will be available to you in a week after the exam date. In addition solutions to all home works, quizzes, midterm exams, and final exams will be available in huskyCT under Course Resources.
As a member of the University of Connecticut student community, you are held to certain standards and academic policies. In addition, there are numerous resources available to help you succeed in your academic work. This section provides a brief overview to important standards, policies and resources.

**Student Code**

You are responsible for acting in accordance with the University of Connecticut's Student Code. Review and become familiar with these expectations. In particular, make sure you have read the section that applies to you on Academic Integrity:

- [Academic Integrity in Undergraduate Education and Research](#)
- [Academic Integrity in Graduate Education and Research](#)

Cheating and plagiarism are taken very seriously at the University of Connecticut. As a student, it is your responsibility to avoid plagiarism. If you need more information about the subject of plagiarism, use the following resources:

- [Plagiarism: How to Recognize it and How to Avoid It](#)
- [Instructional Module about Plagiarism](#)
- [University of Connecticut Libraries’ Student Instruction](#) (includes research, citing and writing resources)

**Copyright**

Copyrighted materials within the course are only for the use of students enrolled in the course for purposes associated with this course and may not be retained or further disseminated.

**Netiquette and Communication**

At all times, course communication with fellow students and the instructor are to be professional and courteous. It is expected that you proofread all your written communication, including discussion posts, assignment submissions, and mail messages. If you are new to online learning or need a netiquette refresher, please look at this guide titled, [The Core Rules of Netiquette](#).

**Adding or Dropping a Course**

If you should decide to add or drop a course, there are official procedures to follow:

- Matriculated students should add or drop a course through the [Student Administration System](#).
- Non-degree students should refer to [Non-Degree Add/Drop Information](#) located on the registrar’s website.

You must officially drop a course to avoid receiving an “F” on your permanent transcript. Simply discontinuing class or informing the instructor you want to drop does not constitute an official drop of the course. For more information, refer to:

- [Undergraduate Catalog](#)
- [Graduate Catalog](#)

**Academic Calendar**

The University's [Academic Calendar](#) contains important semester dates.

**Academic Support Resources**

[Technology and Academic Help](#) provides a guide to technical and academic assistance.

**Students with Disabilities**

Students needing special accommodations should work with the University's [Center for Students with Disabilities (CSD)](#). You may contact CSD by calling (860) 486-2020 or by emailing csd@uconn.edu. If your request for
accommodation is approved, CSD will send an accommodation letter directly to your instructor(s) so that special arrangements can be made. (Note: Student requests for accommodation must be filed each semester.)

Blackboard measures and evaluates accessibility using two sets of standards: the WCAG 2.0 standards issued by the World Wide Web Consortium (W3C) and Section 508 of the Rehabilitation Act issued in the United States federal government.” (Retrieved March 24, 2013 from http://www.blackboard.com/platforms/learn/resources/accessibility.aspx)

**Software Requirements and Technical Help**

- Word processing software
- Adobe Acrobat Reader
- Internet access

(add additional items as needed and link to http://ecampus.uconn.edu/plug-ins.html)

This course is completely facilitated online using the learning management platform, HuskyCT. If you have difficulty accessing HuskyCT, online students have access to the in person/live person support options available during regular business hours in the Digital Learning Center (www.dlc.uconn.edu). Students also have 24x7 access to live chat, phone and support documents through www.ecampus24x7.uconn.edu.

**Minimum Technical Skills**

To be successful in this course, you will need the following technical skills:

- Use electronic mail with attachments.
- Save files in commonly used word processing program formats.
- Copy and paste text, graphics or hyperlinks.
- Work within two or more browser windows simultaneously.
- Open and access PDF files.

(add additional items as needed and link to http://ecampus.uconn.edu/plug-ins.html)

University students are expected to demonstrate competency in Computer Technology. Explore the Computer Technology Competencies page for more information.

**Evaluation of the Course**

Students will be provided an opportunity to evaluate instruction in this course using the University’s standard procedures, which are administered by the Office of Institutional Research and Effectiveness (OIRE).

Additional informal formative surveys may also be administered within the course as an optional evaluation tool.