

Syllabus – Spring 2018

Course and Instructor Information

Course Title: Mechanics of Materials

Credits: 3

Format: (Traditional with Flipped content available)

Prerequisites: CE 2110 and Enrollment in the School of Engineering

Class meets: MWF 10:10AM – 11:00 PM in Castleman 212

Professor:

Richard Christenson (richard.christenson@uconn.edu), Castleman 327; Office Hours: W 1-2PM

Teacher Assistant:

Angela Lanning, angela.lanning@uconn.edu, Office Hours: Tu 10-11AM; Th 2-3PM in Bronwell 310

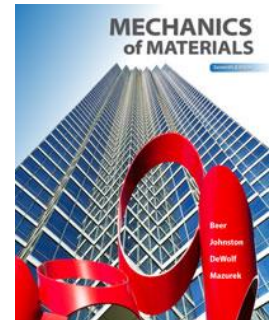
Course Materials

Texts are available through a local or online bookstore. The [UConn Co-op](#) 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.

Text book: Mechanics of Materials

Ferdinand P. Beer, E. Russell Johnston, Jr., David F. Mazurek, John T. Dewolf, McGraw -Hill, 7th Ed., 2015

ISBN: 0073398233, **Copyright year:** 2015.



Additional course readings and media are available within HuskyCT, through either an Internet link or Library Resources

Course Organization:

The class is a traditional lecture course. Each class period will consist of approximately 20 minutes of lecture and 30 minutes of working example problems. Online materials, from the flipped version of the course, will also be available to supplement the educational materials and resources available.

Class includes total of 14 weeks, 33 class periods, [01/17/2017 to 4/27/2017]

For each class period

1. Read material in the book PRIOR to the class (page numbers provided on course schedule).
2. Watch a video (approximately 10 min.) lecturing concepts and background information.
3. Watch a video (approximately 10-20 min.) solving sample problems.
4. Solve weekly problems and submit them online.
5. For available self-assessment, online quizzes will be made available every other week.
6. Take 2 midterm exams and 1 final exam [in class].

In Class Activities

Active learning method is utilized in this class. The class sessions involve problem solving. To effectively use the class sessions, please bring **calculator/pencil/eraser** to each class.

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.

Course Outline

| Date | Period | Sections | Topics | Video | HW Due |
|---------------------|--------|-----------|---|-------|--------|
| Jan 17 | 1 | 1.1-2 | Stresses Under Axial Load | 1 | |
| Jan 19 | 2 | 1.3-5 | Components of Stress + Factor of Safety | 2 | |
| Jan 22 | 3 | 2.1 | Stress-Strain Diagram | 3 | |
| Jan 24 | 4 | 2.5 | Generalized Hooke's Law | 4 | |
| Jan 26 | 5 | 2.2 | Statically Indeterminate Problems (Quiz 1) | 5 | 1 |
| Jan 29 | 6 | 2.3-4 | Temperature, Poisson's Ratio, Shear strain | 6 | |
| Jan 31 | 7 | 2.11-2.12 | Stress Concentrations + Plastic Behavior | 7 | |
| Feb 2 | 8 | 3.1 | Stresses in Torsion | 8 | 2 |
| Feb 5 | 9 | 3.2-3 | Angle of Twist + Statically Indeterminate Shafts | 9 | |
| Feb 7 | 10 | 3.4-5 | Design of Transmission shaft | 10 | |
| Feb 9 | 11 | 4.1-2 | Stress & Deformation under pure bending (Quiz 2) | 11 | 3 |
| Feb 12 | 12 | 4.3 | Stresses and Deformations in the Elastic Range | 12 | |
| Feb 14 | 13 | 4.4 | Members Made of Several Materials | 13 | |
| Feb 16 | 14 | 4.7 | Eccentric Axial Load | 14 | 4 |
| Feb 19 | 15 | 5.1 | Shear and Bending Moment Diagrams I (Quiz 3) | 15 | |
| Feb 21 | 16 | 5.1 | Shear and Bending Moment Diagrams II | 16 | |
| Feb 23 | 17 | 5.2 | Relations Among w , V , and M | 17 | 5 |
| Feb 26 | 18 | 5.3 | Design of Prismatic Beams in Bending | 18 | |
| Feb 28 | 19 | -- | REVIEW | -- | |
| Mar 2 | 20 | -- | MIDTERM EXAM NUMBER 1 | -- | |
| Mar 5 | 21 | 6.1 | Shearing Stresses in a Beam | 19 | |
| Mar 7 | 22 | 6.3-4 | Shear Flow, Thin-Walled Members (Quiz 4) | 20 | |
| Mar 9 | 23 | 7.1 | Transformation of Plane Stress | 22 | 6 |
| Spring Break | | | | | |
| Mar 19 | 24 | 7.2 | Mohr's Circle | 23 | |
| Mar 21 | 25 | 7.3-4 | 3-D Stress | 24 | |
| Mar 23 | 26 | 7.6 | Pressure Vessels (Quiz 5) | 25 | 7 |
| Mar 26 | 27 | 8.1 | Principal Stresses in Beams | -- | |
| Mar 28 | 28 | 8.2 | Design of Shafts | -- | |
| Mar 30 | 29 | 8.3 | Combined Loadings | -- | 8 |
| Apr 2 | 30 | 9.1 | Deflections of Beams by Integration | 26 | |
| Apr 4 | 31 | 9.1 | Application of Equation of Elastic Curve in Beams | 27 | |
| Apr 6 | 32 | 9.2 | Indeterminate Beams | 28 | 9 |
| Apr 9 | 33 | 9.4 | Method of Superposition | 29 | |
| Apr 11 | 34 | -- | REVIEW | -- | |
| Apr 13 | 35 | -- | MIDTERM EXAM NUMBER 2 | -- | |
| Apr 16 | 36 | 10.1 | Stability of Structures | 30 | |
| Apr 18 | 37 | 10.3 | Centric Load Design (Quiz 6) | 31 | |
| Apr 20 | 38 | 10.4 | Eccentric Load Design | 32-33 | 10 |
| Apr 23 | 39 | 11.1-3 | Strain Energy | -- | |
| Apr 25 | 40 | 11.4 | Impact Loads | -- | |
| Apr 27 | 41 | ---- | FINAL REVIEW | -- | 11 |
| TBD | | | FINAL EXAMINATION | | |

Summary of Course Grading:

| Course Components | Weight |
|-------------------|--------|
| Homework | 10% |
| Midterm Exams | 60% |
| Final | 30% |

Note: Students earning average of 93 and higher from 2 midterm exams do not need to take the final exam. The average of 2 midterms will be used as the final exam grade in calculation of their final grade. The final exam is mandatory for all other students.

Homework

There are 11 sets of Homework during the semester. Each set includes 3 to 7 homework problems. You will upload HWs to HuskyCT under “Assignments” and will get feedback online. You need to upload your assignments before the due date to HuskyCT. The due date is Friday at the beginning of class (**10:10AM**) one week after the material is covered in class. The due dates are listed on the calendar. The calendar file is located in HuskyCT under Syllabus & Calendar. **No late HWs** will be accepted.

DO NOT EMAIL YOUR LATE HOMEWORK TO INSTRUCTOR OR TAs.

- To receive full credit on your homework, you must:
 - Write neatly;
 - Note any given values and the value you seek to calculate;
 - Write your solution including all equations and calculations; and,
 - Circle or box your final answer.
 - A subset of the homework may be graded.
 - You need to scan your homework and save as a **single pdf file** using the scanner located in Homer library or your smartphone device. The scanners in library are free to use, available 8AM-midnight, and are located in Plaza level by the idesk and second level by the commons desk.
 - Homework statements are available both in each assignment and also under Course Resources/Homework Statements in HuskyCT.
 - Homework Solutions will be available to you after due date under Course Resources/Homework Solutions.
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- ✓ Homework is provided so that you can learn the material. It is by working on your own solutions that you learn.
 - ✓ The assigned homework problems are critical to your learning and to your being able to do well in the course.
 - ✓ It is unethical to plagiarize homework. The Engineering Code of Ethics, essential to all that we do as engineers, states that it is unethical to submit work done by others as your own. This means that you must not copy solutions done by your classmates, and you must not use other sources for solutions, i.e. solution manuals in any form.
 - ✓ Discussing homework solutions with other students is acceptable and encouraged, as long as you do your own work. The goal is for you to learn to solve problems on your own.

Self-Assessment Quizzes

- **Online** quizzes (total of 6 quizzes) are available for your self-assessment throughout the semester
- Each quiz contains 10 questions. Questions are multiple choices. You have 30 minutes for each quiz attempt.
- Online quizzes will be available to you for a one week period following the last class day that material is presented. The latest quiz attempt should start before 11:59PM of the due date. You can have unlimited attempts. After each attempt, you can see your wrong answers.
- Quiz solution will be available to you in HuskyCT under **Course Resources/Quiz Solutions** after due dates.

Midterm exams

- **In-Class** Midterm exams (2 Midterm exams):
 - Midterm exams contain 4-5 questions. You have 50 minutes to answer questions.
 - Exams are NOT open book/open notes. 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
 - There are review sessions in the class before midterm exams. You can send your questions to the instructor in advance to be addressed in the review sessions.
 - 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).

Final Exam

Final Exam in class: Comprehensive exam, Date and Time to be announced (2 hours) [Week 1 to Week 14]

Grading Scale: (subjected to change – grade range may be lowered, not increased)

| Grade | Letter Grade | GPA |
|---------|--------------|-----|
| 93-100 | A | 4.0 |
| 90-92.9 | A- | 3.7 |
| 87-89.9 | B+ | 3.3 |
| 83-86.9 | B | 3.0 |
| 80-82.9 | B- | 2.7 |
| 77-79.9 | C+ | 2.3 |
| 73-76.9 | C | 2.0 |
| 70-72.9 | C- | 1.7 |
| 67-69.9 | D+ | 1.3 |
| 63-66.9 | D | 1.0 |
| 60-62.9 | D- | 0.7 |
| <60 | F | 0.0 |

Due Dates and Late Policy

All course due dates are identified in HuskyCT. 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.

Feedback and Grades

You will receive online feedbacks on your homework 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 homeworks, quizzes, and midterm exams will be available in HuskyCT under Course Resources.

Student Responsibilities and 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 the:

- [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/plugin-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/plugin-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.