UNIVERSITY OF RHODE ISLAND
CVE 220 MECHANICS OF MATERIALS
2023 J-Term

Instructor: George Tsiatas
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Class Days/Times: Asynchronous Online Course
Credits: 3
Prerequisites: MCE 262 (Statics)

CATALOGUE DESCRIPTION:

Mechanical properties of materials; analysis of members under axial, torsional, and transverse loads; stress and strain; beam deflections, and introduction to statically indeterminate beams and buckling of columns. Pre: MCE 262.

COURSE OBJECTIVES:

The objective of this course is to develop the formal theory of linear elastic mechanics including equilibrium, kinematics and constitutive equations. Applications in structural members subject to axial, torsional and flexural deformations.

COURSE OUTCOMES:

Students who successfully complete CVE 220 will be able to:

- Calculate normal and shear stresses and strains in structures under linear, elastic conditions.
- Use results of a tension test to determine properties of different materials.
- Utilize basic properties of materials such as modulus of elasticity and Poisson's ratio to solve problems related to isotropic elasticity.
- Calculate stresses, strains, and deformations in axially loaded members under various loads and temperature effects.
- Calculate stresses, strains and deformations in circular shafts and thin-walled tubes under torsion.
- Draw shear and bending moment diagrams of beams.
- Calculate bending and shear stresses in beams
- Calculate the principal stresses and their corresponding directions at a point in a structural member subject to various forces.
- Determine deflections of beams.
- Determine the buckling load of simple columns.
- Solve simple indeterminate problems.

ABET OUTCOMES:

Outcome 1:   An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

REQUIRED TEXTBOOK:

Mechanics of Materials, 10th edition, by R.C. Hibbeler, Pearson, 2017 available in hardcopy or loose-leaf.
The most economic option is an eText version with ISBN 9780134321141
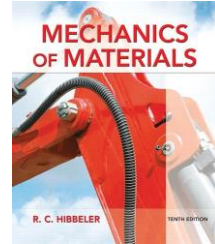
TECHNOLOGY REQUIREMENTS:

You will be using the URI Course Management System by Brightspace. Computer access to the internet is required to successfully navigate this course.

Powerpoint software is needed for the project. Note that currently enrolled students at URI have access to Office 365 which includes Microsoft Powerpoint and Word (https://web.uri.edu/its/office-365/).

You will also need the ability to scan your work into pdf documents and upload them on the course site. Students without a dedicated scanner could scan the work using their cellphone and convert the scans into pdf files using various apps including CamScanner (free for basic functions)

BRIGHTSPACE HELP:
Students wishing to review tutorials on the various tools and navigation options in Brightspace should visit the Brightspace Tutorials for Students YouTube playlist.

CLASSROOM PROTOCOL:

For this online course, Brightspace is our "classroom." In the online learning environment, "attendance" is measured by your PRESENCE in the site as well as your CONTRIBUTIONS to the site. The importance of regular logins and active participation cannot be overstated. This is more so during the J-Term offering. You are expected to contribute to the forum discussions for each Unit as well as the Project.

I will gauge your participation by your regular, on-time forum postings and responses, and timely assignment submissions. If you have never taken an online course, "hanging out" on Brightspace will take some getting used to, and it will be easy to forget about the course from

time to time. I recommend that you get in the habit of daily attendance online to maximize your successful completion of the course. Please refer to the **Schedule of Readings, Assignments, Quizzes, Exams** at the end of this syllabus and on the Brightspace site for details on how and when you will be expected to contribute to the course.

ONLINE LEARNING:

The best way to begin this course is to complete the **START HERE** section before the start of the class. This includes the syllabus, technology related topics and background information from Statics.

The course itself is divided into **10 units**. Each of the 10 Units contains the learning objectives for that unit, assigned readings, videos, and links to other important content on the internet, written assignments, quizzes, and discussion activities. Unit 10 includes the Final Exam. The following lists the detailed schedule:

SCHEDULE OF TOPICS

UNIT/Date	Topic	Readings	Assignments
START HERE	Prerequisites from statics. Forces, supports, free body diagrams, equations of equilibrium, statically determinate vs statically indeterminate structures. (To be completed before the first day of class)	Hibbeler: 1.1, 1.2 Watch the Statics Review video under START HERE	Practice problems on statics Practice Quiz Introduce yourself to the class
UNIT 1 (1/2)	Introduction. Tension, compression, shear and associated stresses and strains. Mechanical properties of materials.	Hibbeler: 1.3, 1.4, 1.5, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6	Practice problems Discussion Forum for Unit 1 Written Assignment 1 Quiz 1
UNIT 2 (1/3)	Axially Loaded Members, thermal effects, indeterminate problems.	Hibbeler: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6	Practice problems Discussion Forum for Unit 2 Quiz 2
UNIT 3 (1/5)	Torsional deformation of circular shafts. Torsion formula. Angle of twist. Indeterminate problems. Power transmission. Torsion of thin-walled tubes.	Hibbeler: 5.1, 5.2, 5.3, 5.4, 5.5	Practice problems Discussion Forum for Unit 3 Quiz 3

UNIT 4 (1/7)	Beams, shear force and bending moment diagrams.	Hibbeler: 6.1, 6.2	Practice problems Discussion Forum for Unit 4 Written Assignment 2 Quiz 4
UNIT 5 (1/10)	Bending deformations. The flexure formula. Bending and shear stresses. Composite sections.	Hibbeler: 6.3, 6.4, 6.6, 7.1, 7.2	Practice problems Discussion Forum for Unit 5 Quiz 5
UNIT 6 (1/12)	Beam stresses continued. Applications with combined stresses. Pressure vessels.	Hibbeler: 6.6, 7.3, 8.1, 8.2	Practice problems Discussion Forum for Unit 6 Quiz 6
UNIT 7 (1/15)	Stress transformations.	Hibbeler: 9.1-9.3	Practice problems Discussion Forum for Unit 7 Quiz 7 assigned
UNIT 8 (1/17)	Stress transformations continued. Mohr's circle. Generalized Hooke's Law.	Hibbeler: 9.4, 9.5, 10.6	Practice problems Discussion Forum for Unit 8 Written Assignment 3 Quiz 8
UNIT 9 (1/18)	Beam displacements. The double integration method. Introduction to buckling of columns.	Hibbeler: 12.1, 12.2, 13.1-13.3	Practice problems Discussion Forum for Unit 9 Quiz 9
(1/20)	Review Final Exam		Practice Problems Final Exam

ASSIGNMENTS AND GRADING POLICY

9 Quizzes	45%
3 Written Assignments	15%
Final Comprehensive Exam	30%
Participation in discussions and forums	10%

GRADING SCALE:

A (≥92), A- (90-91), B+ (87-89), B (83-86), B- (80-82), C+ (77-79), C (73-76), C- (70-72), D+ (67-69), D (60-66), F (≤60)

DESCRIPTION OF ASSIGNMENTS:

Each Unit, starting with UNIT 1 will open by 12:01 am on the date indicated. For each unit students will study all reading assignments, online video presentations and other information posted on Brightspace. They will also work on the practice problems. For each unit there will be a Quiz on Brightspace based on the material covered in the specific unit as well as a discussion Forum for questions related to the practice problems and the material of the unit.

There are three written assignments. Students need to convert high quality scans of their work into pdf files and upload them on the course Brightspace site.

The final exam will be comprehensive. The final exam and the 9 quizzes will be timed.

Students are expected to contribute to the Discussion Forums for all Units as well as for the project. The 10% participation credit will be allocated based on the quality and quantity of your postings and readings. While attending a "live" class you hear all questions and comments made. In an online class this is duplicated by reading all forum posts not just the ones that you place.

Do pay attention to deadlines which will be posted when a UNIT opens. Work needs to be uploaded on Brightspace by the deadline, typically before the next UNIT becomes available. Emailing late work to bypass the deadlines will not be accepted.

ACADEMIC SUPPORT SERVICES

Office of Disability Services

Any student with a documented disability is welcome to contact me early in the semester so that we may work out reasonable accommodations to support your success in this course. Students should also contact Disability Services for Students, Office of Student Life, 330 Memorial Union, 401-874-2098.

From the University Manual: **6.40.10 and 6.40.11 Accommodations for Qualified Students With Disabilities.**

> Students are expected to notify faculty at the onset of the semester if any special considerations are required in the classroom. If any special considerations are required for examinations, it is expected the student will notify the faculty a week before the examination with the appropriate paperwork.

PROFESSIONAL CONDUCT

Cheating and plagiarism are serious academic offenses, which are deal with firmly by the College and University. Scholastic integrity presumes that students are honest in all academic work. **Cheating** is the failure to give credit for work not done independently (i.e., submitting a

paper written by someone other than yourself), unauthorized communication during an examination, or the claiming of credit for work not done (i.e., falsifying information). **Plagiarism** is the failure to give credit for another person's written or oral statement, thereby falsely presuming that such work is originally and solely your own.

Students are expected to be honest in all academic work. A student's name on any written work, quiz or exam shall be regarded as assurance that the work is the result of the student's own independent thought and study. Work should be stated in the student's own words, properly attributed to its source. Students have an obligation to know how to quote, paraphrase, summarize, cite and reference the work of others with integrity. The following are examples of academic dishonesty.

- Using material, directly or paraphrasing, from published sources (print or electronic) without appropriate citation;
- Claiming disproportionate credit for work not done independently;
- Unauthorized possession or access to exams;
- Unauthorized communication during exams;
- Unauthorized use of another's work or preparing work for another student;
- Taking an exam for another student;
- Altering or attempting to alter grades;
- The use of notes or electronic devices to gain an unauthorized advantage during exams;
- Fabricating or falsifying facts, data or references;
- Facilitating or aiding another's academic dishonesty;
- Submitting the same paper for more than one course without prior approval from the Instructor.

Honesty is expected in work done in any academic setting including online, internships, co-ops, study abroad, independent studies, research projects, practica, or other experiential placements.

Please note the following section from the **University Manual:**

> **8.27.17.** Instructors shall have the explicit duty to take action in known cases of cheating or plagiarism. The instructor shall have the right to fail a student on the assignment on which the instructor has determined that a student has cheated or plagiarized. The circumstances of this failure shall be reported to the student's academic dean, the instructor's dean, and the Office of Student Life. The student may appeal the matter to the instructor's dean, and the decision by the dean shall be expeditious and final.

Such action will be initiated by the instructor if it is determined that any written assignment is copied or falsified or inappropriately referenced.

Any good writer's handbook as well as reputable online resources will offer help on matters of plagiarism and instruct you on how to acknowledge source material. If you need more help understanding when to cite something or how to indicate your references, PLEASE ASK.

Please note: Students are responsible for being familiar with and adhering to the published "**Community Standards of Behavior: University Policies and Regulations**" which can be accessed in the **University Student Handbook.**

Professionalism in expected in all forum discussions. Do adhere in standard "netiquette" rules such as:

- Consider the context and your audience
- Keep your messages short and to the point
- Avoid capital letters as it will come across as though you are shouting
- Do not attack the writer of a post with derogatory language
- Think things through before replying back to an offensive post
- Speak up if you have questions
- Get involved and participate on a daily basis
- Make sure to read responses carefully

Please note:

Course content and outlines, exams, and assignments created by instructors should be considered the instructors' intellectual property. Also, several materials such as graphics, photographs, problems, etc have been taken from the textbook. These are copyrighted by the publisher and although they can be used freely for educational purposes they should not be distributed, shared in any public domain or third party website, or sold without prior written consent.