ENGR/MAE 150
Mechanics of Structures
Spring 2019

Dear Students,

Welcome to Mechanics of Structures! I am excited to have you in my class, and I hope you will find it an enjoyable and challenging learning experience. My beliefs about teaching center around three main components: 1) teaching you as a "whole student," 2) teaching you to "learn how to learn," and 3) providing opportunities for authentic learning.

For #1, this means that I want to support your learning in mechanics of structures, but also support your learning of other engineering skills, including professionalism and communication. This also means that I understand you have other things (other classes, personal life) going on, which is why I drop your lowest scores on a number of assignments.

For #2, I will guide you to think about your learning so that you can take what you learn in this class and apply it in new contexts. It is impossible to cover all the material you may need to learn for your future, but by knowing how to learn, you will be prepared to find the resources and knowledge to solve any problem you encounter in your future career.

For #3, I want to provide you with authentic learning experiences, which is why I make connections to the real world through application activities an essential component of this class. As engineers, you will need to communicate your ideas to your colleagues both orally and in written form. To make these communication experiences useful, they will be connected to examples of the course content in the world around you.

Below, you will find most of the details you will need for this course, including how to get in contact with me and the teaching assistants, how your grade will be calculated, and the schedule for the quarter.

This course and its policies are designed with the hopes of creating a fun and effective learning environment. With that goal in mind, I reserve the right to modify the course in a reasonable manner to improve the experience. If any aspect of the course is not working for you, please let me know.

I am looking forward to learning with you!
Professor Buswell

Instructor: Natascha T. Buswell, Ph.D.
Email: nbuswell@uci.edu
Office: Engineering Gateway S3232
Phone: (949) 824-2285
Office Hours: Thursdays from 9:00 to 11:00 AM in Calit2 3008
and by appointment*

Teaching Assistants: Shant Danielian
Email: shantd@uci.edu
Office Hours: Tuesdays from 3:00 to 4:00 PM in EG 3161
and by appointment*

Grader: Chih-I Cheng
Email: chihic@uci.edu
Office Hours: By appointment*

* When requesting to meet by appointment, please include 3 – 5 time options that work for you in your email request. These appointments can be arranged to be in-person or by phone/video.

Class Meetings: Monday/Wednesday/Friday from 2:00 AM – 2:50 PM in ALP 1300

Discussions: Tuesday from 5:00 – 5:50 PM in SE2 1306
Tuesday from 7:00 – 7:50 PM in ALP 2500
Tuesday from 8:00 – 8:50 PM in ALP 2500

Course Flow:
In a typical week, the flow of the course will be:

- Homework and Application Activities due Mondays at 1:30 PM (before class) on material covered in the previous week.
- Individual Quiz on material covered in the previous week on Tuesdays in discussion (upload immediately after self- / peer-grading) – only counts toward participation credit.
- New material on Monday/Wednesday/Friday – to be quizzed on next week (Tuesday)

Textbook: R.C. Hibbeler, Mechanics of Materials, 10th Ed., Prentice Hall, 2016.

Description and Objective: The objective of this course is to introduce students to basic mechanics of materials, a.k.a, strength of materials. Application of fundamental concepts to the solution of relevant engineering problems is emphasized throughout the course. The overall objectives of the course are for students to be able to:

- draw axial force, shear, and bending moment diagrams of members subject to simple and combined loading;
- use internal forces to model normal and shear stress distributions in frame and machine components under various loadings including pure shear, axial, torsion, and bending loading;

- use published material properties such as Young's modulus, Poisson's ratio, and yield stress and to relate stresses to strains;
- analyze displacement or deflection and use constraints on deformation quantities to calculate forces on bodies supported in a statically indeterminate manner;
- transform stresses and strains at a point between differently oriented coordinate systems;
- size structural elements and determine allowable loads on components based on considerations of critical values of stress, factors of safety, and failure criteria;
- develop a systematic approach to solving problems, including careful sketching, precise mathematical notation, and clear presentation of solutions;
- identify applications of mechanics of materials content in the real world;
- work in teams and understand what makes a good team member;
- write about the elements of real-world engineering projects that relate to the material learned in this course;
- understand how diversity and ethics impact the field of engineering and mechanics of materials.

Prerequisites: Newtonian mechanics, kinematics and dynamics of motion. Statics of solid bodies and structures. Differential and integral calculus of real functions in real variables. Linear algebra: elementary matrix manipulations. Familiarity with scientific programming. It is important that you have a good grasp of the material from Statics, with particular emphasis on the following topics:

> Drawing Free Body Diagrams; Internal Forces; Equilibrium of Rigid Bodies; First Area Moment and Centroids; Frames and Machines; Moment of Inertia

Electronic Content and Communication: Canvas will be used for posting notes, homework problem sets and solutions, handouts, grades, and reflections. Piazza will be used for questions about the course, including homework questions. If you have a personal question, please email instructors. If you have not received a response within 2 days (M-F), you can assume your email was missed. In this case, please send a follow-up email.

How to Succeed in this Class: In this class, I expect you to learn a lot, including engineering problem solving and professional skills. The best way for you to prepare for this class is to block off specific time in your schedule to study the material, work on your homework problem sets, write your reflections, and prepare for quizzes and exams. A general rule is to expect to spend two (2) hours of time outside of class working on course materials for every hour you are in class. This means you can expect to spend at least nine (9) hours on this course every week

It will be beneficial for you to find people in the class to collaborate with on assignments and engage in peer-learning. Make sure to get the contact information of your group mates so that you can work on class-related activities outside of class with your peers.

Grading: In this class, you will demonstrate your understanding of the course material in numerous ways. This is intended so that you have multiple opportunities to demonstrate what you are learning in various settings and contexts.

Homework		7%
Application Activities		8%
Reflections		5%
Individual Quizzes		10%
Office Hours		1%
Teaching Evaluations		2%
Exam 1		20%
Exam 2		22%
Final		25%
Extra Credit	up to	5%
	TOTAL	105%

The grades will be determined by the following percentages:

100%-105% - A+	83%-86.9%- B	70%-72.9%- C-
93%-99.9% - A	80%-82.9%- B-	67%-69.9%- D+
90%-92.9%- A-	77%-79.9%- C+	63%-66.9%- D
87%-89.9%- B+	73%-76.9%- C	0% -62.9%- F

Homework (7%): Homework Problem Sets will be assigned on a weekly basis and will be graded based on completion. Completing the homework will provide you with the opportunity to practice the skills that will be assessed in the quizzes and exams. You are encouraged to collaborate with your group mates and other students in the class.

Please format your work in a clear way. Illegible work will not be graded. Homework is due on **Mondays by 1:30 PM**. Upload your work on Canvas by scanning or taking a picture of your handwritten solutions. Hard copies will not be accepted. The lowest homework assignment score will be dropped, so you may miss one without impacting your grade.

Solutions to the homework will be made available immediately after the submission deadline on Canvas.

Application Activities (8%): Weekly application activities will be assigned and are due on **Mondays by 1:30 PM** via Canvas. We will discuss application activities in class every Monday. The lowest application activity assignment score will be dropped, so you may miss one without impacting your grade.

Reflections (5%): The reflection assignments are a time for you to "write to learn" about the course topics. Each Friday at the end of class, you will reflect on your learning by answering two questions: 1) What is going well in the class? 2) What is still confusing? You are expected to answer these questions with complete sentences. These reflections will be completed on Canvas and are **due by 11:59 PM on Fridays**. The lowest reflection score will be dropped, so you may miss one without impacting your grade.

Individual Quizzes (10%): In this class, you will be expected to be able to solve mechanics of structures problems on your own (as demonstrated by Exam 1, Exam 2, and the Final Exam). To prepare for these exams, there will be a series of weekly quizzes in class. You will complete an individual quiz (in discussion on Tuesdays) every week.

The solutions will be discussed immediately after the quizzes, and you will either self-grade or peer-grade your neighbor's work with a different color pen/marker. By the end of the class, you are expected to take a picture of your quiz with marked up grading and upload it to Canvas OR you can turn in your quiz to the instructor. Participating in the quiz will earn you full credit regardless of your graded score – the purpose of this assessment is for you to get practice in a quiz environment and see what types of questions will be asked on an exam.

You may bring in one handwritten support sheet on one page of 8.5"x11" copy paper. One quiz will be dropped, so you may miss one without impacting your grade.

Office Hours (1%): Office hours are held in large rooms where many students can come together, ask questions, and work on homework. You are expected to visit the instructor's or TA's office hours ONE TIME during the course of the quarter. You will be asked to share a "fun fact" about yourself to get this credit, but you are not required to stay for the duration of office hours. As your instructional team, we would like to meet all students in the class individually – with a class of ~150, our best way of doing this is to meet you all during office hours.

Teaching Evaluations (2%): You will be asked to do a number of evaluations in this course, including a mid-quarter and final course evaluation for the instructor, and a final evaluation for the TA. Providing feedback to your instructors helps improve the class.

Exams: For exams, these factors ALL contribute to the grade:

- Conceptually sound problem-solving approach,
- Numerical accuracy of results, and
- Neatness of the presentation and description of the procedure.

Please, format your work in a clear way. Illegible work will not be graded. A correct solution obtained with a wrong or unclear methodology will be given no credit. Conversely, numerical mistakes associated with sound and reasonable approaches will result in partial credit.

Exam 1 (20%), Exam 2 (22%), and Final Exam (25%): The final exam has been scheduled by the registrar's office for **Wednesday, June 12th, 2019 from 10:30-12:30 PM**.

You can prepare for exams by studying your homework practice problems and quizzes. You are encouraged to study with your classmates – learning is social and you will learn the most when working with others.

For each exam, you are allowed to bring in one 8½"x11" piece of paper with **handwritten** notes. You will be required to turn in this page with your exams.

Regrade Requests: You may request a regrade for exams if you believe your exam was graded incorrectly. If you would like a regrade, you must submit your written request and a scan of your

exam via email to Prof. Buswell or a TA within one week of getting your exam returned. This written request must include a detailed description of the grading error and point Prof. Buswell or the TA to the exact areas of the exam that need attention.

Late Submission Policy: Late submissions (those that are submitted within one week of the original due date) of homework, application activities, quizzes may be accepted and will be graded for up to 50% of the possible points.

Extra Credit Assignment (up to 5%):

You can earn extra credit in this class if you read a book related to the course material and write a report/critique. More detailed information about the assignment (including the grading rubric) are available on Canvas.

> The approved book option is: *Built* by Roma Agrawal; Other books (related to mechanics of materials) are welcome, but please email me your proposed book by Friday, April 26th. The due date for this assignment **is Friday, June 7th, 2019**. This assignment may be turned in at any time during the quarter, and you may only do one book report for extra credit.

Professor Buswell has 9 copies of *Built* available to be borrowed for up to two weeks at a time. These copies are available to borrow from Ms. Magaly Montanez at the front desk on the 3rd floor of the MAE suite (EG 3200) Monday-Friday between 8am - 12pm; and 1pm - 5pm.

Course Policies

Mental Health: Being an engineering student can cause stress and anxiety. If you are experiencing symptoms that are affecting your performance in this class, please come talk with me. You will not need to share any details with me, but I am here to talk and point you to resources on campus that can help. You can get help by calling (949) 824-6457 or visiting the Counseling Center at 203 Student Services I to make an appointment. For more information, visit: http://www.counseling.uci.edu

Class Discussion: Students are expected to participate actively in class. When students share ideas and experiences, all students benefit.

Equity and Respect: In this course, I will encourage you to examine your perspectives and values as individuals, students, and aspiring professionals situated in a variety of contexts. As we experience self-discovery and learn about one another, I encourage everyone to strive for a classroom climate where differences are acknowledged, respected and appreciated. Our classroom must be open and hospitable to all members of the class, and we will strive to practice the attitudes and behaviors characteristic of professionals.

Additionally, students should expect me, the instructor, and the TAs to treat them professionally and with respect. Students are encouraged to attend office hours, and in all interactions, should have their questions and concerns taken seriously. We will also do our best to give timely and appropriate feedback on all assessments.

Electronic Devices: You are expected to bring an electronic device (laptop, phone, tablet) to class every day in order to complete in-class activities. You may use your laptop and/or tablet computer for work related to this course during class. Please silence your cell-phones for the duration of each class period.

Emergency Provisions: In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. Here are ways to get information about changes in this course: Canvas course web page, instructors' e-mail, and instructors' office phone.

University Policies

We will follow all UC and UCI polices as described by the University Registrar. (https://www.reg.uci.edu/navigation/policies.html)

Academic Integrity Policy: "All academic integrity cases will be processed through the Office of Student Conduct under the Academic Honesty Policy." Please see Academic Integrity Policy (https://aisc.uci.edu/students/academic-integrity/)

Students with Disabilities: "The UCI Disabilities Services Center (DSC) is the office designated to address the needs of students with disabilities and their appropriate accommodations. Students are charged with the responsibility to inform faculty of their accommodation needs in a timely manner and may do so via the verification letter listing appropriate accommodations. Faculty and instructors are obligated by law and this policy to facilitate appropriate accommodations and may be responsible for providing elements of accommodations." Please see (http://senate.uci.edu/uci-academic-senate-manual/part-iii-appendices/#appendixVI).

If you are a person with special circumstances that may affect your class performance (e.g., visual, hearing or learning disabilities, language differences, etc.) please let me know so that we can discuss and make appropriate accommodations.

Incomplete Grades: "The grade Incomplete (I) may be assigned when a student's work is of passing quality but is incomplete for good cause. The student must make arrangements with their instructor to complete the coursework within a period of no more than 12 months following the term in which the grade Incomplete was originally awarded, or prior to the end of the quarter immediately preceding award of the degree, whichever comes first. The instructor is not obligated to allow the maximum time period. The student should not reenroll in the course to make up the Incomplete." Please see (https://www.reg.uci.edu/grades/gradingpolicy.html) for more information.

Tentative Schedule:

Week	Date	Class	Activities/Assignments	Topics (corresponding readings)
1	1-Apr	Lecture		Introductions, Statics, Stress (1.1-1.3), Axial-Stress (1.4), Average Shear Stress (1.5)
	2-Apr	Discussion	Quiz 1	
	3-Apr	Lecture		
	5-Apr	Lecture		
2	8-Apr	Lecture	Homework and AA due at 1:30 PM	Allowable Stress (1.6-1.7), Normal/Shear Strain (2.1-2.2), Mechanical properties (3.1-3.3, 3.5-3.6), Axial Loading
	9-Apr	Discussion	Quiz 2	
	10-Apr	Lecture		
	12-Apr	Lecture	Reflection 2 due; Homework 2 due Sunday	
3	15-Apr	Lecture	Homework and AA due at 1:30 PM	Superposition (4.3), Statically Indeterminate (4.4-4.5), Thermal Stress (4.6), Stress Concentration (4.7)
	16-Apr	Discussion	Quiz 3	
	17-Apr	Lecture		
	19-Apr	Lecture		
4	22-Apr	Lecture	Homework and AA due at 1:30 PM	Torsion (5.1-5.3), Angle of Twist (5.4), Statically Indeterminate Torsion (5.5)
	23-Apr	Discussion	Quiz 4	
	24-Apr	Lecture		
	26-Apr	Lecture	MiDTERM 1 in CLASS	
5	29-Apr	Lecture	Homework and AA due at 1:30 PM	Shear-Moment Diagrams (6.1-6.2), Bending (6.3), Flexure Formula (6.4)
	30-Apr	Discussion	Quiz 5	
	1-May	Lecture		
	3-May	Lecture		
6	6-May	Lecture	Homework and AA due at 1:30 PM	Transverse Shear (7.1-7.2), Pressure Vessels (8.1), Combined Loading (8.2)
	7-May	Discussion	Quiz 6	
	8-May	Lecture		
	10-May	Lecture		
7	13-May	Lecture	Homework and AA due at 1:30 PM	Plane Stress (9.1), Stress Transformation (9.2), Principal Stress (9.3)
	14-May	Discussion	Quiz 7	
	15-May	Lecture		
	17-May	Lecture	MIDTERM 2 in CLASS	
8	20-May	Lecture	Homework and AA due at 1:30 PM	Mohr's Circle (9.4), Absolutue Max Shear (9.5), Plane Strain (10.1), Strain Transformation (10.2), Mohr's Circle (10.3),
	21-May	Discussion	Quiz 8	
	22-May	Lecture		
	24-May	Lecture		
9	27-May	Holiday	NO CLASS	Rosettes (10.5), Generalized Hooke's Law (10.6), Failure Theories (10.7), Beam Deflection (12.1-12.2,12.5)
	28-May	Discussion	Homework and AA due at 1:30 PM; Quiz 9	
	29-May	Lecture		
	31-May	Lecture		
10	3-Jun	Lecture	Homework and AA due at 1:30 PM	Column Buckling (13.1-13.3), Review
	4-Jun	Discussion	Quiz 10	
	5-Jun	Lecture		
	7-Jun	Lecture		
	10-Jun		Homework and AA due at 1:30 PM	
Final	June 12th	Final Exam	10:30 - 12:30 PM	