



## Syllabus for ME220-01: Continuum Mechanics

Spring 2017

Instructor: Sachin Goyal

**Designation:**

**Catalog Description:**

This course will introduce continuum approach to engineering with mathematical foundation of tensors, vectors and transformations, kinematics and strain, concept of stress, balance principles and objectivity. The examples will sharpen the skills to mathematically formulate, analyze and solve problems in elasticity.

**Text Books and Other Required Materials:**

Nonlinear Solid Mechanics, A Continuum Approach for Engineering by Gerhard A. Holzapfel, John Wiley and Sons, Ltd.  
(<http://www.wiley.com/WileyCDA/WileyTitle/productCd-0471823198.html>)

Additional suggested resources (optional):

- 1.) [http://web.mit.edu/abeyaratne/Volumes/RCA\\_Vol\\_I\\_Math.pdf](http://web.mit.edu/abeyaratne/Volumes/RCA_Vol_I_Math.pdf)
- 2.) [http://web.mit.edu/abeyaratne/Volumes/RCA\\_Vol\\_II.pdf](http://web.mit.edu/abeyaratne/Volumes/RCA_Vol_II.pdf)
- 3.) <http://www.me.berkeley.edu/csml/PMNnotes/ME185Naghdi.pdf>

**Course Objectives/  
Student Learning**

**Outcomes:**

After successful completion of this class, students will be able to:

1. Apply the mathematical foundation of vectors and tensors in the context of continuum mechanics problems.
2. Formulate, analyze and solve problems in elasticity.

**Program Learning**

**Outcomes:**

**Prerequisites by Topic:**

Mechanics of Solids, Linear Algebra, MATLAB Proficiency

**Course Policies:**

1. No individual extension allowed on the deadlines. 2. Collaboration on assignments is highly encouraged, unless otherwise advised. 3. Quizzes and exams will be open-book, unless otherwise advised.

**Academic Dishonesty Statement:**

a. Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work.

b. You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e mail, an e mail attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action.

c. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the

examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

**Disability Statement:**

Accommodations for Students with Disabilities: The University of California Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity. I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations.

**Topics:**

- 1.) Algebra of Tensors and vectors with coordinate transformation (mathematical underpinning of continuum mechanics)
- 2.) Kinematics and concept of strain
- 3.) Concept of stress
- 4.) Balance principles (including balance of energy in continuum thermodynamics, master balance principle, etc.)
- 5.) Aspects of objectivity, problems in elasticity
- 6.) Hyperelastic materials

**Class/laboratory Schedule:**

Tuesdays 5:30-6:45pm and Thursdays 4:30-5:45pm (Location: CLSSRM 272)

**Midterm/Final Exam Schedule:**

Refer to the Course Calendar

**Course Calendar:**

<https://goo.gl/ayD8zQ>

The course calendar will be updated as the semester progresses.

Office hours and all important URL links will be listed in the course calendar.

**Professional Component:**

Theory and concept: 80-100%; Computational skills: 0-20% (Tentative)

**Assessment/Grading Policy:**

Assignments (in the form of in-class pop quizzes): 80%

Active participation: 20%

Refer to the problem bank URL provided in the course calendar. The entire approach for both of the above two grading elements with respect to the problem bank is explained in the first lecture.

**Coordinator:**

Prof. Sachin Goyal

**Contact Information:**

New S&E Bldg. (SE2), RM 271, Email: [sgoyal2@ucmerced.edu](mailto:sgoyal2@ucmerced.edu)

**Office Hours:**

Office hours may change, and will be announced and updated in the course calendar.

Location: New S&E Bldg. (SE2), RM 271