Course Syllabus
MAE 598 Continuum Mechanics

Class Time: MW 10:30-11:45am (ECG G335)

Course Objectives: To provide advanced treatment of the fundamental, unifying concepts of the mechanics of continua in order to facilitate further study in specialized fields such as aerodynamics, mechanics of viscous fluids, elasticity, plasticity, and continuum damage mechanics.

Instructor: Dr. K.N. Solanki, ERC 351, (480) 965-1869, kiran.solanki@asu.edu

Office Hours: MW 1:30:-3:00 pm or by appointment

Course site: A course website containing your assignments, solutions, and grades will be on blackboard

Textbook: G. Thomas Mase, Ronald E. Smelser, George E. Mase, Continuum Mechanics for Engineers, 3rd Ed., CRC Press, Taylor and Francis Group, ISBN 978-1-4200-8538-9

Grading:

homework	20%
mid exam (in class)	25%
project	25%
final exam (comprehensive)	30% (Friday, Dec 14 (7:30 - 9:20 AM))

A: 90-100; B: 80-89.9; C: 70-79.9; D: 60-69.9; F: < 60

Project: Students will be required to complete a course project. The course project is a critical literature review of a specific topic that has significant relevance to continuum theory. Project results will be disseminated via a written report and an oral presentation (during the regular class period at the end of the semester). **It is very important in a critical literature review not only to present an overview of the latest work in the literature but to identify opportunities for advancement or improvement.**

It is the responsibility of each group (three student max) to generate a topic for the critical literature review. Topics that relate to the student's area of research are acceptable and encouraged. All topics must be approved by Professor Solanki.

- Approval: All project topics must be approved by Professor Solanki. Please submit a project title and abstract (~200 words) electronically by September 12.
- Report: 10-15 pages (with sufficient references). Reports are due electronically to Professor Solanki by November 30.
- Presentation: ~15 minutes to be given in class between December 3st and December 11th. Sign-up sheet will be distributed later in the semester.
- Grading: Project grades will be a composite of both oral and written reports.

Attendance Policy: Attendance is required for all lecture sessions. For university excused absences, students must notify instructor prior to the absence in writing with proofs (if possible). All students are responsible for the materials covered in all lectures.

General Class Policies:

- A set of homework problems will be assigned weekly/bi-weekly. Following homework collection, full solutions to all homework problems will be made available via the web.
- No late homework will be accepted
- Homework must be written and organized in a professional manner or points will be deducted. When grading your homework, I should be able to trace your thought process throughout the homework problem. Comment your solutions as you work!
- Staple your homework; failure to staple any assignment will result in a zero grade
- Computer Use in Classroom: Laptops are not to be open during class!
- Test /Grading Discrepancies: When tests or assignments are returned to you, you have a period of two weeks to bring any grading discrepancies to me.

ASU Honor Code: "As an Arizona State University student I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do." For additional information, please visit: https://provost.asu.edu/academicintegrity

Course Outline:

1. Fundamentals of Cartesian Tensors, Tensor Derivatives, Green-Gauss Theorem.
2. Definition of Strain, Eulerian and Lagrangian Coordinate Systems, Polar Decomposition Theorem, Rate of Deformation, Principal Strain, and Linear Compatibility Equations.
3. Definition of Stress, Cauchy and Nominal Stresses; Balance Laws: Mass, Linear and Angular Momentum, Energy; Principal stresses, Deviatoric and Hydrostatic Stress; Reynolds Transport Theorem, Singular Surfaces in a Continuum.
4. First and Second Laws of Thermodynamics for a Continuum; Equations of State; Coupled Thermomechanics; Boundary Conditions; Fundamental Restrictions on Constitutive Laws (Equipresence, Local Action, Objectivity, etc.).
5. Fundamentals of Linear Elastic Behavior of Solids, Material Symmetries, Variational Principals.
6. Fundamentals of Continuum Damage Mechanics using Internal State Variables.
7. Fundamentals of Newtonian Fluids, Inviscid and Viscous Compressible Flow; Navier-Stokes Equations, Ideal and Rotational Flows.
8. Fundamentals of Non-Newtonian Fluids.