This document contains the syllabus and other first-day information for…

INTRODUCTION TO CONTINUUM MECHANICS
ME EN 5530 (for upper-division undergraduates)
and
CONTINUUM MECHANICS
ME EN 6530 (for graduates)

The official syllabus begins on page 2. As a "teaser," it helps to offer an informal description of the course on this unofficial first page. Continuum mechanics is a general term for the equations governing material deformation and the forces or stresses required to achieve that deformation. Elementary courses in mechanics of materials often assume that materials are linearly elastic, which is a lousy assumption except when strains are extraordinarily small. Elementary mechanics courses also assume that the geometry is simplistic (e.g., simple beam or truss) and that the internal deformations are magically known (such as when it is assumed in beam theory that plane sections remain plane). Continuum mechanics, on the other hand, does not make these kinds of assumptions. Continuum mechanics allows deformations to be arbitrarily large and material response to be nonlinear and dissipative. Elementary mechanics is shown to be a special case of this more general theory.

A course on continuum mechanics carefully develops the equations that govern general deformations. We will not cover methods for actually solving those equations, which is the subject of other courses such as PDEs and the Finite Element Method (FEM). Even if you never learn to write an FEM code, your knowledge of Continuum Mechanics will make you a much better FEM analyst because you will know the equations that an FEM code is solving, and you will understand why the code requires certain inputs. You will also understand the meanings of the code's outputs and be prepared to run verification tests of the code before launching naïvely into full-scale simulations that you can't trust.

About half of a Continuum Mechanics course is a mathematics course on tensor analysis. Learning it opens up the world beyond this subject. You will find that the same concepts crop up in virtually every aspect of engineering analysis. At its core, tensor analysis is an application of general techniques for dealing with many variables at once, each of which depends on many other variables – for example, six stress components depend on six strain components and other things such as temperature and materials processing variables, all of which vary in space and time. Tensors help to manage the chaos.

This introductory Continuum Mechanics course does not cover specific material models in much depth. Instead, it covers general principles such as frame-indifference and thermodynamics that apply to all material models. Advanced constitutive modeling would be the subject of a subsequent course that has this one as a pre-requisite.

Alert: this course was formerly listed as ME_EN 7510, but it has been changed to ME_EN 5530/6530 for several reasons. First, other universities frequently offer Continuum Mechanics as a "blend" course available to both upper-division undergraduates and first-year graduates. Second, this change accommodates more advanced topics at the 7000 level through development of a new course in Nonlinear Material Behavior that will require ME_EN 6530 as a prerequisite.

ME EN 5530 INTRODUCTION TO CONTINUUM MECHANICS
ME EN 6530 CONTINUUM MECHANICS

Spring 2015, Tues & Thurs 03:40 PM-05:00 PM , MEB 2325 , 3 credit hours
Course materials and assignments distributed via Canvas

Instructor: Rebecca Brannon, 2134 MEB, Cell: 801-662-8340, email via Canvas only.
Office hours: after class, TBD by polling students , by appointment, or drop-in *if instructor is available*)

Course descriptions and prerequisites

5530 Introduction to Continuum Mechanics (3) Prerequisites: C- or better in (ME EN 3300 AND (MATH 2210 OR MATH 1260 OR MATH 1280 OR MATH 1321 OR MATH 3140)) AND Full Major Status in Mechanical Engineering. Corequisites: C- or better in (MATH 3140 OR MATH 3150). Introduction to Cartesian tensors, state of stress, kinematics of deformation. General principles of mechanics. Constitutive equations of elasticity, viscoelasticity, plasticity, and fluid mechanics. Meets with ME EN 6530.

6530 Continuum Mechanics (3) Prerequisites: Graduate Status in Mechanical Engineering OR Instructor Consent. Meets with ME EN 5530. Introduction to Cartesian tensors, state of stress, kinematics of deformation. General principles of mechanics. Constitutive equations of elasticity, viscoelasticity, plasticity, and fluid mechanics. See ME EN 5530 prerequisites for expected undergraduate coursework.

REQUIRED: An ability to use a symbolic mathematics program. All examples will use *Mathematica* software (www.wolfram.com), so any other choice is at student's risk.
TEXTBOOK: free electronic manuscripts developed from course notes of previous years (student feedback consistently favored these notes over a variety of pricey textbooks).
Other resources for beginners: Mase, Smelser, & Mase (2009) , Lai, Rubin, Krempl (2009)
Good references for this material, once learned: Gurtin and Fried (2010), Bonet & Wood (2008), Malvern (1977), Holzapfel (2000)

Grading:	Weight
(H) Homework	20
(Q) In-class and online quizzes	20
(M_1) Midterm Exam #1	25
(M_2) Midterm Exam #2	25
(F) Final Exam *(Date and time as listed in Academic Calendar)*	45
(L_1) Lowest among H, Q, E_1, E_2, and F	−20
(L_2) Second lowest among H, Q, E_1, E_2, and F	−15
TOTAL=	**100**

Formula: SCORE = $(20H+20Q+25M_1+25M_2+45F - 20L_1 - 15L_2) / 100$, where each of H, Q, E_1, E_2, and F is graded on a 100-point scale. This formula allows you to skip homework or quizzes altogether (or to score poorly on a midterm) without ruining your chances of getting an A in the course (if other grades are A). The net course score is assigned a letter grade according to the following table.

0-59	60-62	63-66	67-69	70-72	73-76	77-79	80-82	83-86	87-89	90-92	93-96	97-100
E	D-	D	D+	C-	C	C+	B-	B	B+	A-	A	A

The instructor reserves the right to lower the score required for any letter grade. There is no curve.

Course Objectives: *By the end of this course, you are expected to...*

1. Demonstrate knowledge of the physical meanings, principles, and mathematics of continuous media represented as solids, liquids, and gases.
2. Formulate and solve basic problems using the language and methods of continuum mechanics. Be able to combine distinct concepts and to introduce reasonable assumptions when faced with ambiguity in data or instructions.
3. Set up and discuss solvability of complicated continuum boundary value problems.
   (A Continuum Mechanics course focuses on obtaining a well-posed complete set of equations. Except in simplistic cases, actually solving them is the subject of other courses such as PDEs and FEM)
4. Articulate basic principles and equations applicable to all constitutive models. State capabilities and limitations of the specific constitutive models covered in this course.
5. Articulate the applicability limits of continuum mechanics.
6. ME EN 6530 (GRADS): Independently build upon lecture topics by solving problems in supplemental reading materials (as assigned, mostly curvilinear notation), and locate and write critiques of continuum-mechanics manuscripts in the open literature.

Homework Format

An assignment is a set of homework problems. A homework problem will be given a grade of zero if it is incoherent or if it fails to follow the following format (each of these 3 sections must be clearly identified as such):

Problem: What information is given, and what is sought?
You may directly quote the assignment if you wish.

Solution: Word explanations *must* accompany each equation,
and the final result should be boxed if possible.

Discussion: The discussion must be a commentary about the solution methods and/or the result. Write this part like the upperclassmen/graduates that you are – using coherent English sentences similar to what you would find in a textbook solution to the same problem. Possible things to talk about are

- How might the result be used in applications? Can you quote a publication in the literature that has used this result?
- Are there important limitations to the result worth noting?
- Is the answer reasonable? This could be "sanity checks" such as: the magnitude and sign are reasonable (but, for credit, you must state *why* they are reasonable), the solution reduces as expected in a special case, all steps in the derivation obey indicial notation rules, the same solution is obtained in two very different ways (e.g., by hand and by using math software), the physical units for all steps are correct, *etc.* In deciding what to write, think of what you would say in your defense if your engineering firm were being sued with the claim that your answer is wrong – how would you convince them otherwise?

Acknowledgement (as needed): You must acknowledge assistance from or collaboration with other students and/or from finding all or part of the solution from a resource not part of this class (proper bibliographic citation is required). Failure to provide acknowledgement is academic misconduct. Regardless of collaboration and/or external resources, you must write solutions in *your own words*.

Other Course Policies

0. Please don't ask for exceptions to the homework format rules or to any of the following policies. They are designed to protect fairness (i.e., consistency), not undermine it. The grading formula already has above-average "cushion" to accommodate a reasonable number of "special circumstances" a student might have (like travel, illness, family needs, etc.). This "no exceptions" policy also emulates the environment of professional practice, which is what you are paying to learn here at the U.
1. Know how to access the Canvas course materials. Look for "go to this class" in your CIS homepage.
2. All email communication must be through Canvas (click "inbox" in the upper-right of the Canvas website). Anything sent directly to the instructor's email outside of Canvas will be rejected. If your message so urgent that a response delay of a few days is intolerable, then call or send a text message the instructor. Ensure that your official university email address (u123456@utah.edu) will reach you, as this is what is used by Canvas.
3. If you use an Avatar in Canvas, *please* have it show a front view of only your face (no abstract icons and no images shared with anyone else's face).
4. Coming to class is the best way to learn the material, so attendance is expected. While skeleton notes or slides of the lectures might be provided online, detailed lecture notes will not necessarily be provided. If you miss class, it is your responsibility to obtain this information from another student.
5. Never use red or green pen on any written work (as these are the colors used in grading).
6. Bring a calculator to every class. Forgetting it will make it tough to pass in-class quizzes and exams. Depending on what resources can be accessed by all students, this rule might be changed early in the class to require all students to have access to the internet (via laptop or smart phone) during lecture.
7. *Mathematica* (or similar) symbolic and graphing software is required. Any software analysis must be accompanied by words and traditional handwritten or typeset equations documenting exactly what the code is doing. To do this in *Mathematica*, use FORMAT>STYLE>TEXT to obtain a cell that is for text commentaries. You can copy/paste graphics into a text cell in case you wish to show some handwritten work or other non-*Mathematica* graphic in your answer. Before you upload a *Mathematica* file, always execute CELL>DELETE ALL OUTPUT (this keeps your commands in place, but removes output to significantly reducing file size). Any software besides *Mathematica* must be turned in both in native form (*e.g.*, ".m" file for Matlab, ".py" file for python, *etc.*) and as a PDF copy.
8. Big hats and cell phones should be off. Contribute to an effective classroom environment. Your neighbors are here to learn, so behavior that is disrespectful or disruptive to other students or the teaching team is not tolerated during class. Refrain from using cell phones, music/video players, laptops (if typing noise is loud), etc. during class. Various "Sound Manager" apps for smart phones are awesome to avoid inadvertent "beeps" during class. Be on time. If you must arrive late, then minimize the disruption by sitting in the back. If you arrive late, please refrain from asking questions until after the lecture (your question might have been answered in the beginning part that you missed). Please sit in the back if you are a "foot wiggler," "pencil spinner/tapper," "groaner," etc. Don't talk to your neighbor during lecture – you may think you are whispering, but people often complain about their fellow students being too noisy during class. If you have a question/comment for your neighbor, there's a good chance that the rest of the class will want to hear it to, so raise your hand and bring it up for all to hear.
9. All midterm exams and quizzes are closed book and closed notes. The only allowed electronic aid might be a calculator, but even that might be prohibited. If a calculator is allowed during an exam, the only features of your calculator that you may use are the basic functions (exponentials, trig functions, logarithms, matrix functions, etc.) that are standard on any scientific calculator. If your calculator has other features (e.g., internet access, ability to store and display formulas, audio, etc.) then those features must not be used. Any student caught using such features during a closed book exam or quiz will fail the entire course. For the final exam, a small number of formulas will be provided, but no other formula sheets are allowed. Any student caught accessing non-provided information – whether written, audible, or electronic – will fail the entire course. Be honorable. Be ethical.
10. No makeup exams will be given without a documented university-sanctioned excuse (like official university travel) and advanced (more than one week) written permission from the instructor. An exam missed through unfortunate circumstances that could not accommodate advanced permission (such as broken-down car, overslept, family crisis, sudden illness contracted less than 24 hours before the exam, etc.) will not be re-administered, but will instead be counted as L_1 in the course scoring formula (so it should not *per se* significantly affect your chance at a good course grade). If a makeup exam is given, the instructor reserves the right to administer all or part of it as an oral exam.
11. TECHNICAL COMMUNICATION SKILLS ARE CRUCIAL! This upper division course naturally includes coaching on professional presentation of technical information. Points will be taken if you fail to explain all steps of your solution, regardless of whether or not you got the right answer. A penalty will be imposed for any of the following style problems: incoherent logic, unintelligible or excessively small handwriting, graphs without axes labels, failure to provide units for results (in problems for which units should be expected to be consistent), misspelling or misuse of technical terms (such as confusing principal/principle, criterion/criteria, scalar/scaler), etc. Make hand-drawn diagrams large enough to legibly annotate with distances, angles, and other pertinent labels. Distances and angles that are labeled as symbols must include a positive or negative in the label so that the annotation would be positive when numerical values are substituted into the picture as it is drawn. Example: if θ represents an angle that is positive counter-clockwise measured from the x-axis, then it should be labeled as θ in a diagram for which the arrow actually is drawn counter-clockwise from the x-axis, but it should be labeled $-\theta$ if the arrow is drawn in the clockwise direction. In engineering work, precision of language and correctness of equations is of paramount importance. Therefore, imprecise or improperly used technical terms (such as saying "necessary" when you mean "sufficient") or incorrect use of an equality sign (such as equating a scalar to a vector) will result in

a penalty. All analyses must be accompanied by word explanations comparable to what you would write if explaining the rationale for each step in a technical report or journal article. Citing or writing superfluous equations that are not an essential part of the solution will result in a penalty. If you write down an equation, but (upon review) discover that you didn't need it, then you must scratch it out to avoid the penalty. If you want to have it there for your own personal reference, you may enclose it in a "cloud" shaped box to indicate that you do not want it to be graded. You may also include such work in the "discussion" section.

12. Turned-in work must be neat and legible, written on only one side of the paper with all pages stapled in the correct order and the student's nickname (assigned in the first week on Canvas) on the first page. The paper should be flat and of standard letter or A4 size, and not ripped out of a spiral notebook. Make letters and symbols larger than 2mm at their widest point. Make plus/minus signs clear and not overlapping equal signs. Make perpendicular lines look perpendicular. Make straight lines look reasonably straight. Make curved lines clearly curved, with places of zero slope obviously horizontal there. An assignment not meeting these requirements will not be graded (and the score will be recorded as a zero). Electronically submitted work must be concatenated into no more than TWO uploaded files: a single PDF and/or a single *Mathematica* (or similar) native software file. If you don't know how to combine multiple PDF files, get instruction from the CADE lab.
13. Getting the right answer for the wrong reasons will result in more points off than simply getting the wrong answer. If you get the wrong answer and include a VALID observation to show that you know it must be wrong, then you might lose fewer points; be cautious with this option because more points will be taken if your statement is invalid..
14. Collaboration is encouraged, but this does not sanction copying. You are allowed to submit only work that you have completed individually unless specifically instructed to work in a team. Submitting any work that is not the result of your own effort and wording is academic misconduct, subject to sanctions consistent with university policy.
15. Late homework policy: Unless otherwise announced, homework is due one week after it is assigned. Late homework is not accepted. To make up for this tough stance, the following strange formula will be used:

$$\text{homework grade (on scale from 0 to 100)} = 50\left[1+\frac{h}{H}-\text{Exp}\left(\frac{-h}{H-h}\right)\right]$$

where h is your total amassed homework points and H is the total number of available homework points. Suppose, for example, that you earn 74% of the available homework points (h=0.74H). Rather than getting a "C" by a conventional grading scale, the above formula would improve your homework grade to a "B". On the other hand, if your raw homework score is very low, like 30%, or very high, like 95%, then this formula will not boost your grade by much. Thus, this formula is specifically designed to encourage appropriate "life balance" in the sense that it won't help you if you neglect this class, nor will it help you if give so much attention to this class that your score is nearly perfect. If you are getting an extremely high score in this class, you probably need to redirect more of your time to other obligations (like research deliverables for your PhD or taking your family to the movies).
16. No makeup quizzes will be given. To accommodate a reasonable number of missed quizzes, the quizzes will be set a curved grade using the nonlinear same nonlinear formula as described above for the homework.
17. If your exam or homework solution shows more than one answer, then points will be marked off for the wrong answers even if the right one is visible. Scratch out or erase anything you don't want to be graded.
18. Avoid equality abuse. Never use an equal sign (=) between two things that are not equal (e.g., never equate a scalar and a vector); exception: you can use equal, plus, and minus to show geometrical concepts (like saying that an annulus "equals" a large solid cylinder minus a smaller solid cylinder. Never use an equal sign to equate two things that are not quantifiable; for example, instead of saying something like "equilibrium = force balance," just use an arrow to stand for the word "implies" as in "equilibrium ⇨ force balance." Use a two-way arrow if appropriate to say, for example, "equilibrium ⇔ force and moment balance." Of course, don't use an arrow (⇨ or ⇔) where an equal sign (=) is needed.
19. If you appeal the grade given on an assignment or exam, the instructor reserves the right to re-grade and re-check *all* parts of the work to confirm consistency with the grading rubric. Accordingly, it is possible that your grade could go *down* after a grading challenge.
20. Points will be lost for units errors (e.g., adding or equating things with different physical dimensions, assigning the wrong units to a quantity, quoting a formula with incompatible dimensions, etc.). This class often uses formulas (especially definitions of mappings) that have inconsistent units. In that case, start your solution with the phrase "assume SI units." Alternatively, feel free to revise the formula to impose consistent units.
21. Points will be lost for failure to use the right number of significant digits. Unless otherwise specified, use at least 6 digits in calculations, and then round your final BOXED answer to 3 significant digits.
22. You must provide a proper free body diagram (FBD) (no matter how simple or obvious) whenever possible. Supports must be removed from FBDs and replaced with appropriate reaction forces and/or reaction moments, whether discrete or distributed.
23. On homework, exams, or quizzes, points may be taken for notation errors (e.g., forgetting tildes to denote vectors, using tildes (or arrows) where they should be omitted, etc.) Notation in your work must be consistent with whatever notation is used in this class. For example, do not multiply two numbers by writing a dot (·) or cross (×) between them, because those notations are reserved for vector operations. Just use parentheses. This class uses a notation like $2\underline{\mathbf{e}}_1 - 7\underline{\mathbf{e}}_2 + 3\underline{\mathbf{e}}_3$ to denote vectors in handwritten work; alternative notations like $\{2, -7, 3\}$ are not allowed in handwritten work (but okay in computer programs for which the input syntax requires it). If the lecture notes use a notation that is different from what you might have seen elsewhere, always use what is provided in lecture. Use proper scientific notation like 23.0×10^{-7} (do not use computer notation like 23e-7 unless you are

actually using a computer). This class uses practically every letter of the alphabet, including upper/lower-case and Roman/Greek, so points will be marked off if you change letters or change case [e.g., if we used *r* in class, then you lose points for writing *R*, if we wrote tan(x) in class, then you lose points for writing TAN(x) or Tan(x).] Make sure your Greek and Roman letters are distinct; for example, there must be a clear difference between *B* and β, and *n*, *h*, and η, etc. The free course textbook includes an appendix with suggestions for good handwriting.

24. Submitted work will be frequently photographed or scanned, either to serve as a record for quality assessments (like ABET) or to serve as a control against which to compare in re-grading appeals. Any evidence of alteration of work in comparison to these photographs or scans will result in disciplinary actions for academic misconduct; such actions will be consistent with university policies and procedures.
25. If you have been given a grade (on an assignment, an exam, or the whole course) that you believe is inconsistent with this syllabus, then a *written* appeal for a grading review is required before any in-person appeal can be scheduled. The instructor reserves the right to deny such an appeal without granting an in-person meeting, in which case the student may, of course, proceed with any subsequent appeals via university-sanctioned procedures outlined in the Student Handbook.
26. A penalty will be imposed for "floaters" (i.e., expressions shown in written work without clear meaning or context) even if your final result is correct. Floaters are often scratch calculations sitting there without an equal sign. Another example of a floater would be a diagram or formula that is visible on the page, but not used in the solution. Scratch out any calculation that turns out to not be pertinent to the solution.
27. In this class, the words "prove" and "show" have precise meanings. If a homework or exam question instructs you to "prove" something, then you must do so without using the thing being proved as part of the analysis (you're allowed to do that when the question says "show"). Example: to show that x=2 is a solution to $3x^2-x=10$, you can just substitute x=2 in the left-hand side and demonstrate that the result is 10. To *prove* that x=2 is a solution, you must use the quadratic formula.
28. All analyses must use exclusively methods, identities, and notation taught in lecture. While it is okay to refer to the literature to confirm your results, you may not use information found in the literature as part of your solution unless specifically instructed to do so. Moreover, you may not use any information in the class textbook or in any of the provided resource materials that is not specifically covered in lecture. Of course, this is not how you will ultimately work in professional practice, but this rule is enforced to ensure you acquire skills necessary to *independently confirm* what you find in the literature. The requirement to use the same notation as used in lecture is enforced to help you learn to flex your style to speak to clients using *their* preferred style, not yours.
29. Any of the things listed above may result in ever-increasing penalties for repeated instances of the same type of error. Penalties are additive so that errors of different types will result in larger penalties. You could even accumulate so many penalty points that your solution earns zero credit even if your final answer is correct. Penalties also accumulate from problem-to-problem; for example, if you make the same type of mistake in two different problems, then both of those problems may be penalized. This is fair since it ensures that penalties are applied as percentages.
30. Academic misconduct may result in a failing grade, dismissal from the program or the University, revocation of the student's degree or certificate, or other sanctions. See the Student Handbook for further details.
31. If you have personal or academic burdens that adversely affect your performance, then follow instructions in the "College of Engineering Guidelines," found later in this syllabus, to secure official written university approval for special accommodations. Otherwise, if formal university-sanctioned accommodation paperwork is not secured, please refrain from even mentioning personal pressures affecting your performance. If your reasons for low performance (or absence from lecture) are not excusable by university policy, then do not tell the instructor about whatever hardships you might be facing, not even as a "just to let you know" gesture. Examples of unexcused and non-accommodated personal burdens that should NEVER be shared with the instructor include: personal travel plans that conflict with lecture or exam dates, exhausting athletics practices, new baby in the family, any injury or illness that is not excused through proper university paperwork for health-related absences, a heavy course load interfering with the amount of time that can be dedicated to this course, many years having passed since you last did a Taylor series (or similar prerequisite skill), excitement about the boy-scout jamboree/comicon coming this week, community softball tournament interferes with final exam date, getting married, house fire destroyed your textbook, etc. Unless there is proper paperwork conforming to a specific university policy demanding special-circumstance accommodation, then it is improper to tell the instructor about your personal problems.
32. Refrain from telling the instructor how hard you are working on the class. No part of the grading scheme awards points for effort. All points are awarded exclusively for accomplishments in assignments, quizzes, and exams. These accomplishments must be attained during the regularly scheduled term for the class. The instructor cannot ethically improve a final course grade through any "extra work" done after the class is finished. A grade of "incomplete" will not be given unless a student is passing the class at the time that an "incomplete" is requested.
33. This course syllabus may be revised during the semester to correct typos, clarify course policies, etc. All such revisions will be posted in the Syllabus link on Canvas and announced to the class. If any statement in this syllabus is deemed to be illegal or inconsistent with university policies, then that statement is nullified while the remainder of the syllabus remains in effect.

Tip: If you find yourself spending hours trying to do the homework or if you are otherwise struggling with this course, then *use office hours* to get personalized coaching. Don't wait!

Sequence and relative emphasis of topics in this course

emphasis	Topic
2%	Introduction to continuum mechanics: the concept of averaging many small contributions to represent solids and fluids as continuous media, mass and density
24%	Points, vectors, and tensors in Euclidean space: matrix analysis, mathematical definition of a vector, indicial and direct notation, functional definition of a tensor via its effect when acting on a vector, engineering definition of a tensor via basis transformation relations, orthogonal and curvilinear coordinates, vector and tensor calculus
20%	Kinematics of points and deforming bodies: Deformation mappings and motions, configurations, deformation gradient tensor, push forward/ pull back operations applied to line, area and volume integrals, measures of strain, polar decomposition, stretch tensors, strain tensors, compatibility, rigid-body motions
8%	Stress measures: concept of traction, Cauchy tetrahedron argument, different stress measures, principal stresses and directions
15%	Balance and conservation laws in local and integral forms, including mass conservation, transport theorems for conservation of linear and angular momentum, energy balance, Reynolds transport theorem, boundary conditions, and the method of manufactured solutions for verifying continuum FEM codes.
9%	Constitutive equations, role of stress-strain relations in closing the governing equations, thermodynamic admissibility constraints, frame indifference (invariance under superimposed rigid-body motions), so-called objective stress rates, role of the second-law of thermodynamics in establishing admissibility constraints for constitutive models
8%	Linearization theory with simple applications in Hooke's law of elasticity and inviscid and Newtonian fluids.
8%	Fluid mechanics and heat transfer, thermoelasticity, Navier-Stokes equations, thermoelasticity
4%	Introduction to material nonlinearity and path dependence (rate-dependent poro-plasticity and smeared damage mechanics)
2%	Current Research on Continuum Mechanics, including motivations for non-continuum theories

Important dates

First lecture	Tues, January 13
Midterm EXAM #1	**Thur, March 5**
Last day to withdraw	Fri, March 6
Spring Break	Sun-Sun, March 15-22
Midterm EXAM #2	**Thurs, April 16**
Last day to reverse CR/NC option	Fri, April 24
Last lecture	Tues, April 28
Comprehensive final exam	Wed, May 6, 3:30-5:30 same room as class
Grades Available	Tues, May 19

NOTICES:

The above dates are provided only for convenience. For official dates, refer to the 2015 academic calendar at **http://registrar.utah.edu/academic-calendars/spring2015.php**. The instructor retains the right to revise this syllabus, with the proviso that students retain a right to reasonable notice of changes.

The Spring 2015 COE guidelines are available at the COE website, http://www.coe.utah.edu/wp-content/uploads/pdf/faculty/semester_guidelines.pdf.

COLLEGE OF ENGINEERING GUIDELINES

http://www.coe.utah.edu/wp-content/uploads/pdf/faculty/semester_guidelines.pdf **Spring Semester 2015**

Appeals Procedures

See the Code of Student Rights and Responsibilities, located in the Class Schedule or on the UofU Web site for more details

Appeals of Grades and other Academic Actions

If a student believes that an academic action is arbitrary or capricious he/she should discuss the action with the involved faculty member and attempt to resolve. If unable to resolve, the student may appeal the action in accordance with the following procedure:

1. Appeal to Department Chair (in writing) within 40 business days; chair must notify student of a decision within 15 days. If faculty member or student disagrees with decision, then,
2. Appeal to Academic Appeals Committee (see http://www.coe.utah.edu/current-undergrad/appeal.php for members of committee). See II Section D, Code of Student Rights and Responsibilities for details on Academic Appeals Committee hearings.

Americans with Disabilities Act (ADA)

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you need accommodations in a class, reasonable prior notice needs to be given to the instructor and to the Center for Disability Services, 162 Olpin Union, 581-5020 (V/TDD) to make arrangements for accommodations. All written information in a course can be made available in alternative format with prior notification to the Center for Disability Services.

Repeating Courses

When a College of Engineering class is taken more than once, only the grade for the second attempt is counted. Grades of **W, I, or V** on the student's record count as having taken the class. Some departments enforce these guidelines for other courses as well (e.g., calculus, physics). See an advisor or departmental handbook. Students should note that anyone who takes a required class twice and does not have a satisfactory grade the second time may not be able to graduate.

Withdrawal Procedures

See the Class Schedule or web for more details ** Please note the difference between the terms "drop" and "withdraw". Drop implies that the student will not be held financially responsible and a "W" will not be listed on the transcript. Withdraw means that a "W" will appear on the student's transcript and tuition will be charged. **

Drop Period – No Penalty

Students may DROP any class without penalty or permission during the FIRST TEN calendar days of the term (Wednesday, January 21, 2015).

Withdrawal from Full Term Length Classes

Students may WITHDRAW from classes without petition until **Friday, March 6, 2015**. From January 21-26 a "W" will appear on the transcript but NO tuition will be charged. Between January 26 and March 6, a "W" will appear on the transcript AND tuition will be charged. Refer to Class Schedule, Tuition and Fees for tuition information.

Withdrawals after March 6 **will only be granted due to** compelling, nonacademic emergencies**. A petition and supporting documentation must be submitted to the Dean's Office, 1602 Warnock Engineering Building or University College (450 SSB) if you are a pre-major. Petitions must be received before the last day of classes (Wednesday, April 29).**

Withdrawal from Session I & Session II

See the web page for details:

http://registrar.utah.edu/academic-calendars/fall2013.php

Adding Classes

Please read carefully: All classes must be added within two weeks of the beginning of the semester (deadline: Monday, January 26). Late adds will be allowed January 27-February 2, requiring only the instructor's signature. Any request to add a class after February 2nd, will require signatures from the instructor, department, and Dean, and need to be accompanied by a petition letter to the Dean's office.

A $50 FEE WILL BE ASSESSED BY THE REGISTRAR'S OFFICE FOR ADDING CLASSES AFTER February 2nd. ***

ME EN 5530/6530 (CONTINUUM MECHANICS)
Student information & affirmation sheet

Student's Full Name (print legibly): _____
Name I prefer to go by: _____
UID: _____

I attest that...

☐ I have been given the course information (syllabus), which includes instructor contact information, prerequisites, course description with objectives & topics, evaluation and grading policies, important dates, and the College of Engineering Guidelines.

☐ I understand the course objectives that are listed in the syllabus.

☐ I understand that I might get a homework score of zero if my homework fails to conform to the homework format requirements listed in the syllabus. More broadly, I understand that the course policies in the syllabus indicate ways of losing points beyond mathematical or scientific concept errors. These include communication problems, such as notation (syntax) errors, unclear or missing explanations, etc.

☐ I understand that the instructor retains the right to revise the syllabus, with the proviso that students retain a right to reasonable notice of changes.

☐ I understand that all email communication to or from the instructor must be exclusively through Canvas. Accordingly, I assume full responsibility to ensure that emails sent to my university email uNID@utah.edu will reach me.

☐ I understand that assignments will require use of symbolic and plotting math software of my choice, but that in-class and textbook examples will provide instruction only on the use of *Mathematica*. If I choose to use any other software, like Matlab or Python, then I accept responsibility to learn it myself. I do not expect any coaching or debugging support from the instructor on any non-*Mathematica* software.

☐ I understand that students in ME EN 6530 (called GRADS) are responsible for some additional independent-study work on curvilinear coordinates and literature reviews.

☐ I will sign my work using my "nickname" (set on Canvas), not real name.

What I hope to learn from this class (perhaps list specific research topics that have motivated you to take this class):

_____ _____ _____
Name Signature Date