GEORGIA INSTITUE OF TECHNOLOGY

COE 3001 MECHANICS OF DEFORMABLE BODIES

Summer 2019

Instructor: Professor Shuman Xia; shuman.xia@me.gatech.edu

Lectures: MTWR, 9:30 am - 10:25 am

Instructor's Office hours: Thursday 10:30 am - 12:30pm

Prerequisite: Statics (COE2001) or equivalent


Web Resources:
All handouts, homeworks & solutions will be available at http://canvas.gatech.edu/.

Homework:
Homework problem sets are assigned on Canvas (http://canvas.gatech.edu/) bi-weekly and are due IN CLASS (see the table below for assignment and due dates). You MUST hand in your solutions on time to receive full credit. Late problem sets will not be accepted unless there is a legitimate reason (e.g., hospitalization, emergency, etc.); contact me as soon as possible to coordinate late submission.

<table>
<thead>
<tr>
<th>Assignment Date</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>HW #1 May 16</td>
<td>May 29</td>
</tr>
<tr>
<td>HW #2 May 29</td>
<td>Jun 12</td>
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<tr>
<td>HW #3 Jun 12</td>
<td>Jun 26</td>
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<tr>
<td>HW #4 Jun 26</td>
<td>Jul 10</td>
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<tr>
<td>HW #5 Jul 10</td>
<td>Jul 24</td>
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</tbody>
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Tests:
There will be two mid-term exams and one final exam. These will be closed books & lecture notes. One page of handwritten notes (one side) is permitted for each mid-term exam, two pages (one side) for the final exam.

• There is no make-up if you miss a mid-term exam. If you have a valid and documented excuse, your final exam score will be used to substitute for the missed mid-term exam. Also, there is no make-up for the final exam, unless some exceptional, well documented situation arises.

• Calculators (programmable or not) are allowed in the mid-term and final exams. But you are not allowed to use smart phones, ipad, laptops or tablets.
• If you require special accommodations (ADAPTS), you must notify me ASAP.

Absences for Medical Reasons:
In the event of a medical emergency or an illness that is severe enough to require medical attention, you are responsible for contacting the Office of VP for Student Life (Dean of Students) as soon as possible to report the medical issue or emergency, providing dated documentation from a medical professional and requesting assistance in notifying me. The medical documentation will be handled confidentially within the Office of the Dean of Students and will inform a decision as to whether communication with me is appropriate. Briefly put, you will work with the Office of the Dean of Students to have them verify that you were ill, then the Dean’s office will interact with me.

Attendance:
Class attendance is mandatory, and will be checked randomly five times throughout the semester. Attendance will be graded as follows:

| No absence | 100 |
| One absence | 100 |
| Two absences | 80 |
| Three absences | 60 |
| Four absences | 30 |
| Five absences | 0 |

Absences with a valid, documented excuse will not be counted.

Grading:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Attendance</td>
<td>3%</td>
</tr>
<tr>
<td>Homework</td>
<td>12%</td>
</tr>
<tr>
<td>Mid-term Exam 1 (Monday, June 17, 9:30 am - 10:25 am)</td>
<td>20%</td>
</tr>
<tr>
<td>Mid-term Exam 2 (Monday, July 8, 9:30 am - 10:25 am)</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>45%</td>
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Scale:
Final scores will be calculated as weighted average of the above components, and mapped into letter grades. The mapping is not more demanding than a scale of

A: ≥90 ; B: ≥80 ; C: ≥70 ; D: ≥60 ; F: < 60.

Honesty:
You are welcome, and encouraged, to work on the assignment problems with fellow students. A good way to learn the material is in small study groups. Such groups work best if members have attempted the problems individually before meeting as a group. The assignment solution that you turn in should reflect your own understanding, and not that of your fellow students. In other words, do not copy directly from other students. The mid-term and final exams are to be completed ALONE. Plagiarizing is defined by the Merriam Webster dictionary as “to steal and pass off (the ideas or words of another) as one’s own: use (another's production) without crediting the source”. Guidelines about what constitutes a violation of academic dishonesty on your tests, projects, quizzes, homeworks, etc., are provided in the GT Academic Honor Code [http://policylibrary.gatech.edu/student-](http://policylibrary.gatech.edu/student-).
affairs/academic-honor-code). If caught plagiarizing, you will be dealt with according to the honor code.

**Other Policies:**
- No assignments can be dropped or changed.
- Documented excuse is a note from the Dean of Students, or approved Institute activities (Section IV.B.3 of the Student Rules and Regulations).
- For all work that is submitted for grading, if part of the work is missing; or if the work is incomplete; or if the work is not presented in an understandable way, you will get little or no partial credit.
Lecture Outline

Introduction

Stress and Strain (Sections 1.1-1.9)
- Definition of stress and strain
- Stress-strain diagram
- Elasticity, plasticity and Hooke’s Law
- Structure design, allowable stress and load

Axial Deformation (Sections 2.1-2.7)
- Deformation of axially loaded member
- Statically indeterminate structure
- Thermal deformation
- Stresses on inclined section

Torsion (Sections 3.1-3.9)
- Torsion of circular bar
- Stresses and strains in pure shear

Stress and Strain Transformation at a Point (Sections 7.1-7.5)
- Principal stress, Maximum shear stress
- Mohr’s circle
- Principal strain, maximum shear strain
- Pressure vessel (Sections 8.1-8.3)

Bending
- Shear Force and Bending Moment Diagram (Sections 4.1-4.5)

Stress and Strain in Beam (Sections 5.1-5.10)
- Normal stress in beams - flexure formula
- Properties of sections - moment of inertia
- Shear stress in beams

Beam Deflection (Sections 9.1-9.5)
- Curvature and beam deflection equation
- Boundary conditions
- Statically indeterminate beams (Sections 10.1-10.4)
- Energy methods

Column Buckling (Sections 11.1-11.4)
- Energy and equilibrium
- Buckling of columns with different boundary conditions