

**CARLETON UNIVERSITY**  
**DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING**

**COURSE OUTLINE**  
**CIVE 2200 - Mechanics of Solids I (Fall 2020)**

The objective of this course is to introduce students to the basic theories in Mechanics of Materials of solid bodies that are relevant to structural analysis and design.

Instructor: Jack T. Vandenberg M.Eng., P.Eng.

Office: 3054 MC. Phone: 613-520-2600 ext. 3896. [Jack.Vandenberg@Carleton.ca](mailto:Jack.Vandenberg@Carleton.ca)

PASS Facilitator: Jordan Stanfield

**Lectures**

Section A: Wednesdays and Fridays 11:30 am – 1:00 pm.

Section B: Tuesdays and Thursdays 6:00 – 7:30 pm.

Teaching Assistants Contact Information and Office Hours: When finalized will be posted on cuLearn.

**Textbook**

Russell C. Hibbeler, Mechanics of Materials, 10<sup>th</sup> edition, Prentice Hall, 2014, ISBN 10: 0-13-325442-9, ISBN 13: 978-0-13-325442-6. An e-copy will be available to purchase through Pearson Education.

**Course Format (lectures + 3 lab sessions and 8 or 9 PA sessions)**

- Lectures are structured to go over the theory first, and then solve a number of relevant problems.
- There will be either a lab or a PA session once per week during each 3 hour session.
- The labs will be completed in pairs with one lab report per pair. Lab reports are due one week after your lab at the beginning of your PA session. **NOTE: There are no formal lab reports required.**
- Recommended textbook problems to solve will be provided on cuLearn weekly.
- There will be six or seven quizzes during the PA sessions (typically every week except the weeks you have a lab). Students are encouraged to ask any questions to the TA before the quizzes. Quizzes will be administered through Mastering Engineering.
- PA sessions start week of September 14-18, first quiz will occur week of September 21-25.
- Mid-term examination – tentatively Saturday November 7, 9:30 – 11:30 am.
- 3 hour Final Examination – to be scheduled.

**Grading**

- |                         |      |
|-------------------------|------|
| • 5 Laboratory reports: | 10%  |
| • Mid-Term Exam:        | 25%  |
| • 6-7 Quizzes:          | 15%  |
| • Final Examination:    | 50%  |
| TOTAL:                  | 100% |

**How to be successful in this Course:**

1. Check cuLearn frequently, including your marks.
2. Attend all lectures and tutorials. Attempt the recommended problems in advance of each PA session.
3. Do the recommended problems weekly so you don't get behind.
4. Attend the labs and hand them in on time.
5. Prepare well for the mid-term and final examination.

Lab	Laboratory Topic (Note: there are lab handouts and short video links that describe each lab – check cuLearn)
1	Behaviour of engineering materials: Ultimate strength and Load-deformation characteristics
2	Estimation of the elastic properties of materials using strain measurement techniques (strain gages)
3	Load-deformation behaviour of beams (Flexure)
4	Stress-strain relationship of thin-walled cylindrical pressure vessels
5	Behaviour of axially loaded compression members

Labs 1 and 2 will be completed the week of September 28 – October 2 (ie., both are done during the three hours allocated for the lab).  
 Labs 3 and 4 will be completed the week of November 9 – 13 (ie., both are done during the three hours allocated for the lab).  
 Lab 5 will be completed the week of November 23-27.

Week #	Tentative Lecture Topic
1	Introduction; Stress; average normal and shear stress; allowable stress; Strain; normal and shear strain Mechanical properties; stress-strain relationship; Hooke's Law.
2	Poisson's ratio; shear stress-strain relationship, other behaviours; Axially loaded member- statically determinate and indeterminate; St. Venant's Principle; Principle of Superposition; thermal stress; stress concentration.
3	Bending; beam static – beam reactions; axial, shear and moment diagram – direct and graphical method.
4	Beams in bending; flexure formula; moment of inertia; unsymmetrical bending.
5	Unsymmetrical bending - continue; shear stresses in beams: Transverse shear; Shear formula.
6	Shear flow in built-up and thin-walled members; Beam deflection; elastic curve.
7	Deflection by integration; Deflection by moment-area method; Principle of superposition.
8	Thin-walled pressure vessel - Generalized Hooke's Law.
9	Torsion of circular members; torsion formula; power; angle of twist; statically determinate and indeterminate; thin-walled tubes; Combined loading.
10	Columns; elastic buckling - Inelastic buckling - Design of columns.
11	Stress transformation; principal stresses; maximum in-plane shear stress; Mohr's circle.
12	Strain transformation; Mohr's circle; Strain rosettes; Theories of failure.

**Notes:**

1. Switching between labs or between PA sessions is not permitted. TAs will be monitoring this and you will not receive credit for lab reports or quizzes if you are in the wrong lab/PA session.
2. All issues regarding grades for the labs, quizzes and midterm must be resolved within one week from their return.
3. To pass the course, a minimum mark of 33% in the final exam is required and a minimum of 50% of both term work and final exam combined. The final examination is for evaluation purposes only, and the paper will not be returned.

**Academic Accommodations for Students with Disabilities**

The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your **Letter of Accommodation** at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation. **Requests made within two weeks will be reviewed on a case-by-case basis.** After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website ([www.carleton.ca/pmc](http://www.carleton.ca/pmc)) for the deadline to request accommodations for the formally-scheduled exam.

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

**Pregnancy obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website:

<http://www2.carleton.ca/equity/>

**Religious obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website:

<http://www2.carleton.ca/equity/>

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at <http://www2.carleton.ca/equity/>

**Instructional Offences:** Please consult the university undergraduate calendar for definitions and penalties.