

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

**COURSE OUTLINE**  
**CIVE 2200 - Mechanics of Solids I (Fall 2024)**

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

Office: 3054 MC. Phone: 613-520-2600 x 3896 [jack.vandenberg@Carleton.ca](mailto:jack.vandenberg@Carleton.ca)

**Lectures**

Section A: Tuesdays and Thursdays 2:30-4:00pm.

Section B: Mondays 6:00 - 9:00 pm.

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

**Textbook**

Russell C. Hibbeler, Mechanics of Materials, 10<sup>th</sup> edition, Prentice Hall.

**Course Format (lectures + 3 lab sessions and 8 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 (tutorial) once per week during each 3 hour 'lab' 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 Brightspace weekly.
- There will be six 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.
- Mid-term examination – tentatively Saturday October 26<sup>th</sup>, 9:30 – 11:30 am.
- 3-hour Final Examination – to be scheduled by the university. The exam will occur during the regular exam period in December.

**Grading**

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

**Labs**

Lab	Laboratory Topic (Note: there are lab handouts and short video links that describe each lab – check Brightspace)
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

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.

#### COURSE POLICIES

##### Classroom Behaviour:

During the lectures, students are required to observe standards of behaviour expected in a university environment and in the profession of engineering. Please maintain a professional, quiet, attentive and engaging classroom environment.

##### Communications:

Course materials will be distributed through the course's Brightspace page. Lecture slides will be made available before class; however, the presented material (e.g. solutions and calculations) in the lectures will not be accessible through the slides alone.

All electronic communications with the instructor must be through your official Carleton email account (ie. Your Carleton email account). In your email, include your full name, student number, course, and section number (e.g. CIVE2200A). Professionalism is expected in all course communications; messages with informal language or improper grammar and spelling will not receive a response.

##### Attendance and Absences:

This course follows the topics required by the curriculum at a very fast pace. Every lecture presents a new topic which is based on the previous lectures. Students should closely follow the course progress. Please note that the attendance in quizzes and examinations is mandatory and you will lose the designated mark to the quiz or the exam that you have missed. In case of emergency (e.g. serious illness), proper communications with your instructor is mandatory. Acceptable documentation is required to justify your absence within three days of the date of the quiz or midterm. In case of illness, a completed self-declaration form will be required (<https://carleton.ca/registrar/special-requests/deferral/>). You must obtain approval prior to the test/quiz/exam if you cannot write at the scheduled time (except in cases of unexpected emergencies). If you miss a quiz and present acceptable documentation, the weight of the missed component will be reweighted to the final exam. If you miss the midterm and present acceptable documentation, there will be a deferred midterm, the exact time of which will be confirmed later.

##### Appeals:

All grade appeals in this course must be made within seven days of the posting or return of the graded component (quiz, lab report, midterm, etc). Appeals are to be addressed to the marking TA first. The final exam is for evaluation purposes only, and the paper will

not be returned or made available to students by the instructors after it is marked. You will be able to make arrangements with the instructor to see your marked final examination after the grades have been made available.

## Graduate Attributes

The Canadian Engineering Accreditation Board (CEAB) requires graduates of undergraduate engineering programs to possess 12 attributes. Courses in all four years of our programs evaluate students' progress towards acquiring these attributes. Aggregate data (typically, the data collected in all sections of a course during an academic year) is used for accreditation purposes and to guide improvements to our programs. Some of the assessments used to measure GAs may also contribute to final grades; however, the GA measurements for individual students are not used to determine the student's year-to-year progression through the program nor eligibility to graduate.

## Academic Integrity and Plagerism

- a) Please consult the Faculty of Engineering and Design information page about the Academic Integrity policy and our procedures: <https://carleton.ca/engineering-design/current-students/fed-academic-integrity> Violations of the Academic Integrity Policy will result in the assignment of a penalty such as reduced grades, the assignment of an F in a course, a suspension or, expulsion.
- b) One of the main objectives of the Academic Integrity Policy is to ensure that **the work you submit is your own**. As a result, it is important to write your own solutions when studying and preparing with other students and to avoid plagiarism in your submissions. The University Academic Integrity Policy defines plagiarism as “presenting, whether intentionally or not, the ideas, expression of ideas or work of others as one’s own.” This includes reproducing or paraphrasing portions of someone else’s published or unpublished material, regardless of the source, and presenting these as one’s own without proper citation or reference to the original source.

Examples of violations of the policy include, but are not limited to:

- any submission prepared in whole or in part, by someone else;
- using another’s data or research findings without appropriate acknowledgement;
- submitting a computer program developed in whole or in part by someone else, with or without modifications, as one’s own; and
- failing to acknowledge sources of information through the use of proper citations when using another’s work and/or failing to use quotations marks.

## Copyright

The materials (including the course outline and any slides, posted notes, videos, labs, project, assignments, quizzes, exams and solutions) created for this course and posted on this web site are intended for personal use and may not be reproduced or redistributed or posted on any web site without prior written permission from the author(s).

## Learning and Working Environment

The University and all members of the University community share responsibility for ensuring that the University’s educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please contact the [Department of Equity and Inclusive Communities](#) at [equity@carleton.ca](mailto:equity@carleton.ca)

We will strive to create an environment of mutual respect for all through equity, diversity, and inclusion within this course. The space which we work in will be safe for everyone. Please be considerate of everyone’s personal beliefs, choices, and opinions.

## Academic Accommodations

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

**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).

You should request your academic accommodations in the [Ventus Student Portal](#), for each course at the beginning of every term. For in-term tests or midterms, please request accommodations at least two (2) weeks before the first test or midterm. Please consult the [PMC website](#) for the deadline to request accommodations for the formally-scheduled exam (if applicable).

**Accommodation for Student Activities:** Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor 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, see the [Senate Policy on Accommodation for Student Activities \(PDF\)](#).

**Pregnancy Obligation:** Please contact your instructor 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, please review the [Student Guide to Academic Accommodation \(PDF\)](#).

**Religious Obligation:** Please contact your instructor 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, please review the [Student Guide to Academic Accommodation \(PDF\)](#).

**Survivors of Sexual Violence:** As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit the [Sexual Violence Prevention & Survivor Support](#).

## Engineering Academic Advising

[The Engineering Academic Support Service](#) assists undergraduate engineering students with course selection, registration, and learning support from first-year through to graduation.

Academic Advisors Contact can be found here: <https://carleton.ca/engineering-design/current-students/undergrad-academic-support/undergraduate-advisors/>.

## Student Mental Health and Wellness

As a university student you may experience a range of mental health challenges that can significantly impact your academic success and overall well-being. Carleton's [Wellness Services Navigator](#) is designed to help students connect with mental health and wellness resources.

If you need to talk to someone from the department for more information and support with connecting to resources, you can contact the following faculty members, depending on your program. Or contact the department at [CEEUGChair@cunet.carleton.ca](mailto:CEEUGChair@cunet.carleton.ca).

**ACSE:** Prof. [Elie Azar](#)

Email: [Elie.Azar@carleton.ca](mailto:Elie.Azar@carleton.ca), Office: 3432 Mackenzie

**CIVE:** Prof. [Heng Khoo](#)

Email: [heng.khoo@carleton.ca](mailto:heng.khoo@carleton.ca), Office: 3364 Mackenzie

**ENVE:** Prof. [Shoeleh Shams](#)

Email: [shoelehshams@cunet.Carleton.ca](mailto:shoelehshams@cunet.Carleton.ca), Office: 4242 Mackenzie

Here is a list of on-campus and off-campus recourses:

1. **Carleton's Wellness Desk:** Located at [204A MacOdrum Library](#), is a space for students to learn about resources, connect with our Wellness Coordinator, and decompress during stressful times of the year. You can pop into the Wellness Desk any time during its hours of operation – no appointments necessary! <https://wellness.carleton.ca/mental-health/wellness-desk/>

2. **Carleton's Health and Counselling Services:** To book an appointment contact the main clinic by calling (613) 520-6674. If urgent, let the Patient Care Coordinator know or go in person to the main clinic (2500 Carleton Technology and Training Centre Building) and indicate that they are in crisis and need to speak to someone right away. <https://carleton.ca/health/>
3. **Residence Counselling and Wellness Service:** Counselling services specifically for students in residence. <https://carleton.ca/health/residence-counselling/>
4. **Therapy Dogs:** Carleton's therapy dogs are around campus with their owners (who are Carleton University staff and faculty) to comfort and provide support to help you thrive as a university student. <https://carleton.ca/wellness/dogs/>
5. [Emergencies and Crisis](#) and [Emergency Numbers](#)
6. **Good2Talk (1-866-925-5454):** Good2Talk is a free, confidential helpline providing professional counselling and information and referrals for mental health, addictions and well-being to post-secondary students in Ontario, 24/7/36 <https://good2talk.ca/>
7. **Empower Me:** Undergraduate students have access to free counselling services in the community through Empower Me, either in person, by telephone, video-counselling or e-counselling. **This free service is accessible 24/7, 365 days per year.** Call **1-844-741-6389 (toll free)** to make an appointment with a counsellor in the community. More information is available <https://students.carleton.ca/services/empower-me-counselling-services/>
8. **The Walk-In Counselling Clinic (off-campus community resource):** The walk-in Counselling Clinic have offices in various locations across Ottawa and the greater Champlain region that are open 7 days a week. Individuals will be assisted, with no appointment, on a first-come, first-serve basis during the Walk-in Counselling Clinic hours. The Walk-in Counselling Clinic **offers services in many languages** and is free and confidential. More information can be found at: <https://walkincounselling.com/>
9. **Distress Centre of Ottawa and Region:** Available 10am-11pm, 7 days/week, 365 days/year. **Distress Line:** 613-238-3311, **Crisis Line:** 613-722-6914 or 1-866-996-0991, **Text:** 343-306-5550. <https://www.dcottawa.on.ca/>
10. **Distress and Crisis Ontario, Available for chat 2 pm – 2 am EST.** <https://www.dcontario.org/>
11. **BounceBack Ontario (Toll-Free: 1-866-345-0224)** is a free skill-building program managed by the Canadian Mental Health Association (CMHA). It is designed to help adults and youth 15+ manage low mood, mild to moderate depression and anxiety, stress or worry. Delivered over the phone with a coach and through online videos, you will get access to tools that will support you on your path to mental wellness. <https://bouncebackontario.ca/>.