

Western University - Faculty of Engineering
Department of Civil and Environmental Engineering

CEE 4441 - Civil Engineering Design Project - Course Outline 2023/2024

This course is the capstone design for the undergraduate program in the Department. The general objectives are for students to:

- Analyze and interpret data and information provided by others to determine project-specific design criteria and parameters. [PA2, D1]
- Perform an open-ended analysis of a civil engineering structure or system and make recommendations based on engineering principles and judgment including comparison of options. [D1, D2, D3, D4, PR1, EPM1, EPM2]
- Gain experience functioning on multi-disciplinary teams that may include participating consulting engineers, architects and landscape architects. [ITW1, ITW2, ITW3]
- Understand professional and ethical responsibility through the refinement of the design to address the public needs. [IESE1]
- Develop the ability to carry out literature search to find information necessary for completing the project. [D1, LL1, LL2]
- Develop an ability to use the techniques, skills and modern engineering tools necessary for engineering practice. [ET1, ET2, LL1, LL2]
- Improve communication skills by: [CS2, CS3]
 - Meeting regularly with external and internal advisors.
 - Documenting design decisions in clear and concise calculations and notes.
 - Planning and preparing drawings, specifications, and a final report, including cost estimate, that completely describes the proposed design.
 - Presenting and defending the final design before peers and the general public.
 - Keeping records of time spent on various aspects of the project.
 - Allotting the distribution of grades to the individual members of the design team.

Calendar Copy:

Students undertake a comprehensive engineering design project which involves the creative, interactive process of designing a structure/system to meet a specific need subject to economic, health, safety, and environmental constraints. Each group of students is required to write an engineering report and deliver a public lecture.

Prerequisites: Completion of Year III of the Civil Engineering Program

Antirequisites: CBE 4497, ECE 4416, MME 4499, SE 4450, ES 4499

Corequisites: None

Note: It is the **student's responsibility** to ensure that all prerequisite, corequisite and antirequisite conditions are met. Unless you have either the requisites for this course or written special permission from your Dean to enrol in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustments to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Course Coordinator:

Dr. J. Southen, Ph.D, P.Eng.

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Environmental Projects: Dr. M. Dagnew

Contact Hours:

1 lecture hour/week; 4 laboratory hours/week; meetings with advisors.

Project Teams:

The maximum size of a project team is five students. Teams with less than four members are not encouraged.

Lectures and Laboratory:

Lectures will be generally be held in-person at the designated location and time found in the academic timetable. Zoom may be used for guest speakers, if required. A link for Zoom meetings will be provided on the course Owl site. Notification of scheduled lectures will be given in advance - students are expected to attend all lectures. The assigned laboratory time will be spent: attending special lectures, working on the project, meeting with advisors, making presentations, and carrying out activities related to the design.

Textbooks and References:

No specific textbooks are assigned. References include pertinent codes and standards, government publications and legislation and other technical references from Taylor Library. Students are encouraged to contact staff at Taylor Library for any questions regarding literature and references.

Library staff will give a session on literature and information search near the start of the course. Further details will be supplied by the course coordinator.

Computing:

Students are required to use personal computers running a Windows environment and other computing facilities available in the Civil Engineering Design Room (SEB 16) and the Faculty of Engineering Computing Laboratories. SEB 16 can be booked through the Civil & Environmental Engineering Department office (SEB 3005). Students should not remove any materials from the room and should keep it in a clean and tidy condition.

Site Visit:

A site visit may be arranged during the laboratory time early in the course. Transportation will not be provided; students will need to make their own way to the project site of interest should they choose to attend. City of London engineers will be present during the site visit to provide background information about the projects. Details regarding the site visits and how to sign up will be provided on the course OWL site.

Units:

SI units will be used in lectures, tutorials, calculations and drawings.

Course Deadlines and Evaluation

The due dates and mark breakdown are as listed below. All dates subject to change if necessary:

	<u>Date</u>	<u>Mark</u>
<u>INDIVIDUAL WORK:</u>		
Logbook	TBD	5%
Preliminary Calculations (as part of the Draft Final Design Portfolio)	08 Dec 2023	<u>15%</u>
		20%
<u>GROUP WORK:</u>		
Preliminary Proposal	18 Sep 2023	0%
Final Proposal	13 Oct 2023	5%
Draft of Final Design Portfolio (Design Brief & Drawings)	08 Dec 2023	10%
(Note: By 1 January 2024, 30% of course marks are awarded)		
Oral Presentation & Defence of Draft Portfolio	12 Jan 2024	5%
Review of Another Group's Draft Portfolio (Written Critique)	19 Jan 2024	5%
Oral Presentation at CEE Design Day	16 Feb 2024	5%
Project Presentation at City of London Competition	TBD	<u>0%</u>
		30%
<u>FINAL SUBMISSION:</u>		
Final Design Portfolio: March, 2024 (see note 6)		
Covering Letter & Final Design Brief	10%	
Calculations	20%	
Drawings	15%	
Display Poster	<u>5%</u>	
		<u>50%*</u>
		100%

NOTES:

1. Students who do not participate sufficiently in regular meetings with their Advisors shall not pass the course.
2. Students who do not achieve a passing grade on each of the three course components (individual work, group work, and final submission) shall not pass the course. They shall be assigned a mark of 48% or the aggregate mark whichever is less.
3. Criteria for the various submissions are described later in this document.
4. The penalty for late submission shall be 10% per day; thus, if any submission is more than 5 days late it cannot receive a passing grade.
5. The mark for the final group submission (the maximum indicated thus "**") shall be multiplied by the number of group members and the product allocated to the members in proportion to each member's contribution to the work. At the end of the course, group members must individually recommend in writing, with stated reasons, a suitable allocation to be used. A summary of the work done by each member with reference to the final report must be attached. If no such recommendations are provided, an equal distribution of marks will be used.
6. The deadline for final submission is ONE WEEK after the City of London Design Competition. The date of the City of London Design Competition (either end of February or beginning of March) will be announced before the end of January, 2023.

Criteria and Evaluation of Course Submissions

1. Logbook (one hardcopy or electronic submission per student)

Each student shall keep a bound logbook (or electronic equivalent) containing (at a minimum) the following sections:

- a) Details of meetings - date, time, duration, those present, main topics, action items.
- b) Details of CEE 4441 lectures (including the lecture on literature and information search) attended - date, time, speaker, topic, notes.
- c) Details of work on the Design Project - date, duration, and *aspects of work done personally*.

2. Preliminary Proposal (one electronic submission per team)

The preliminary proposal should be made by electronic submission to the course OWL site and shall include:

- a) Group name.
- b) Names of Group Members.
- c) Name and e-mail of Group Leader, who will be responsible for regular reporting to the Faculty Advisor and Faculty Coordinators.
- d) Ranked preference of topic for the design project, including proposed structure scheme if applicable (e.g. 1st choice: Victoria St. Bridge (steel box girder); 2nd choice: Hyde Park Rd. Roundabout; 3rd choice: Coves ESA Pedestrian Bridge (cable stayed)). While all efforts will be made to ensure that teams receive their first choice of project, **the course coordinator reserves the right for the final assignment design team membership and the assignment of the topic of the design project.**

3. Final Proposal (one electronic submission per team)

The final design proposal shall indicate:

- a) Description of the project
- b) Work done by each group member to date.
- c) Identification of outstanding tasks (work still to be done including drawings and specifications).
- d) Assignment of outstanding tasks to group members.
- e) Proposed mechanism for coordination of the activities of each group member.
- f) Schedule for remaining work.

The evaluation of the final design proposal shall be based on content, layout, completeness, and the use of English. The marking rubric will be posted on Owl.

4. Preliminary Calculations and Draft of Final Design Portfolio (project approximately 80% complete) (one electronic submission per team)

A draft of Sections 6.1, 6.2 and 6.3 of the final design portfolio (see point 6., below) must be submitted on the date specified in the Course Deadlines section. For this submission, neatly drawn hand sketches can replace CAD drawings, though CAD drawings are preferred. One copy shall be directly given to the student reviewing team. One electronic copy in pdf format shall be uploaded through OWL. All three sections shall be combined into a single pdf file, including clear scans of any written calculations. This portfolio will be provided to the Faculty Advisor of the team for marking, and to the two Faculty Advisors who will be evaluating the presentation and oral defense of the team in January.

Between the draft submission and oral defense in January, the assigned student reviewing group and faculty advisors will formally review the draft of each final design portfolio. At the defense, the student review group and the faculty advisors will have the opportunity to ask questions. Students are expected to improve their Portfolio between the oral defence and final submission based on feedback from student and faculty reviewers.

5. Review of Draft Final Design Portfolio by Others (Written Critique) (one electronic copy to be submitted)

Each group shall prepare a written critique of the Draft Portfolio assigned to them for review. This critique shall be submitted after the oral defense of the Project. The critique should be in the form of a written report summarizing the reviewing group's professional evaluation of the submitted draft design portfolio. The focus should be on providing benefit to the client by identifying deficiencies in the original design and recommendations for improvement. **The critique should be submitted both to Owl and directly to the team being reviewed.** The marking rubric will be posted on Owl.

6. Final Design Portfolio

The final design portfolio consists of the cover letter, final design brief, calculations, drawings and display poster as described in detail below.

6.1 Final Design Brief

The length of the final design brief shall not exceed 12 typed pages (font size 12, single-spaced). Suggested contents are: Executive Summary; Introduction, Design Criteria, Particulars of Design and Analysis, Cost Estimate, and Recommendations (or Conclusions). The Design Criteria would include the design standards and technical references used; the particular design criteria adopted also must be indicated succinctly. The particulars of design/analysis would summarize the rationale behind the various design decisions. The evaluation of the final design brief shall be based on the format, layout, completeness, technical content and use of English.

6.2 Calculations

Calculations must be well organized, clear, complete, and done on calculation paper. Each calculation page shall be dated, and shall indicate the names or initials of the persons who performed and checked the calculations. A final calculation set, which must be current, checked and indexed, shall be submitted with the final design brief. Students are expected to submit checked calculations to their advisors as the design progresses, so that errors of a fundamental nature will be caught and corrected. The evaluation of calculations will be based on their clarity, completeness, technical content, originality, and accuracy.

6.3 Drawings

The portfolio shall include a full set of drawings which fully describe the design. Each student is required to prepare at least one original drawing. Each drawing shall be dated, and shall indicate the name or initials of the person who did the drawing and the person who checked the drawing. The evaluation of drawings will be based on their technical content, clarity, completeness, and quality of drafting.

6.4 Display Poster

Each student group is required to create a display poster that provides a clear and concise overview of their design solutions to the specific project. An electronic copy should be submitted to Owl. The size of the poster should be no larger than 900 mm × 600 mm. A hardcopy of the poster may be required; if so, student teams are responsible for any costs associated with printing – the Department will not reimburse groups for any costs incurred in producing the required submissions.

One electronic copy of the complete final design portfolio, including ALL of the above individual components, must be submitted.

7. Teamwork Survey

Each student will be required to complete one or more teamwork assessment survey(s) using the ITP Metrics platform. Details will be provided.

8. Design Experience Survey

Each student is required to complete a design experience survey to reflect on the knowledge and skills gained during the course of the project. **The survey will be made available online after the submission of the final design portfolio.**

9. Design Competition

The City of London Design Competition will be held in late February or early March, 2022. Presentation at the City of London Competition is mandatory for all teams.

10. Use of English

In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for improper use of English. Additionally poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

Plagiarism Checking:

The University of Western Ontario uses software for plagiarism checking. Students are required to submit their Laboratory Reports in electronic form to Turnitin.com for plagiarism checking.

Cheating:

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning. For more information on scholastic offenses, please see:

http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf

Attendance:

Any student who, in the opinion of the instructor, has not engaged sufficiently in class, laboratory, or tutorial periods will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

Accommodation:

Students with disabilities work with Accessible Education (formerly SSD) which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The accommodation policy can be found here: [Academic Accommodation for Students with Disabilities](#).

Academic Consideration for Student Absence

Students will have up to two (2) opportunities during the regular academic year to use an on-line portal to self-report an absence during the term, provided the following conditions are met: the absence is no more than 48 hours in duration, and the assessment for which consideration is being sought is worth 30% or less of the student's final grade. Students are expected to contact their instructors within 24 hours of the end of the period of the self-reported absence, unless noted on the syllabus. Students are not able to use the self-reporting option in the following circumstances:

- for exams scheduled by the Office of the Registrar (e.g., December and April exams)
- absence of a duration greater than 48 hours,
- assessments worth more than 30% of the student's final grade,
- if a student has already used the self-reporting portal twice during the academic year

If the conditions for a Self-Reported Absence are *not* met, students will need to provide a Student Medical Certificate if the absence is medical, or provide appropriate documentation if there are compassionate grounds for the absence in question. Students are encouraged to contact their Faculty academic counselling office to obtain more information about the relevant documentation. Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For Western University policy on Consideration for Student Absence, see [Policy on Academic Consideration for Student Absences - Undergraduate Students in First Entry Programs](#) and for the Student Medical Certificate (SMC), see:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

Religious Accommodation

Students should consult the University's list of recognized religious holidays, and should give reasonable notice in writing, prior to the holiday, to the Instructor and an Academic Counsellor if their course requirements will be affected by a religious observance. Additional information is given in the [Western Multicultural Calendar](#).

Use of Recordings:

Remote learning sessions for this course may be recorded. The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals under special circumstances. Please contact the instructor if you have any concerns related to session recordings.

Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

Conduct:

Some components of this course may involve online interactions. To ensure the best experience for both you and your classmates, please honour the following rules of etiquette:

- please “arrive” to class on time
- please use your computer and/or laptop if possible (as opposed to a cell phone or tablet)
- ensure that you are in a private location to protect the confidentiality of discussions in the event that a class discussion deals with sensitive or personal material
- to minimize background noise, kindly mute your microphone for the entire class until you are invited to speak, unless directed otherwise
- [suggested for classes larger than 30 students] In order to give us optimum bandwidth and web quality, please turn off your video camera for the entire class unless you are invited to speak
- [suggested for cases where video is used] please be prepared to turn your video camera off at the instructor’s request if the internet connection becomes unstable
- unless invited by your instructor, do **not** share your screen in the meeting

The course instructor will act as moderator for the class and will deal with any questions from participants. To participate please consider the following:

- if you wish to speak, use the “raise hand” function and wait for the instructor to acknowledge you before beginning your comment or question
- remember to unmute your microphone and turn on your video camera before speaking
- self-identify when speaking.
- remember to mute your mic and turn off your video camera after speaking (unless directed otherwise)

General considerations of “netiquette”:

- Keep in mind the different cultural and linguistic backgrounds of the students in the course.
- Be courteous toward the instructor, your colleagues, and authors whose work you are discussing.
- Be respectful of the diversity of viewpoints that you will encounter in the class and in your readings. The exchange of diverse ideas and opinions is part of the scholarly environment. “Flaming” is never appropriate.
- Be professional and scholarly in all online postings. Cite the ideas of others appropriately.

Note that disruptive behaviour of any type during online classes, including inappropriate use of the chat function, is unacceptable. Students found guilty of Zoom-bombing a class or of other serious online offenses may be subject to disciplinary measures under the Code of Student Conduct.

Contingency plan for an in-person class pivoting to 100% online learning:

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor.

Notice:

Students are responsible for regularly checking their email, course website (<https://owl.uwo.ca>) and notices posted outside the Civil and Environmental Engineering Department Office

Consultation:

Students are encouraged to discuss problems with their teaching assistant and/or the Instructor in tutorial sessions. Office hours will be arranged for the students to meet with the Instructor and teaching assistants. Other individual consultation can be arranged by appointment with the instructor.

Course Breakdown:

Engineering Design 100%

General Learning Objectives

(I – Introduce, T – Teach, E – Evaluate) All at the advanced level.

Knowledge Base	T	Individual and Team Work	E(A)	Ethics and Equity	
Problem Analysis	E(A)	Communication	E(A)	Economics and Project Management	E(A)
Investigation		Professionalism	E(A)	Life-Long Learning	E(A)
Design	E(A)	Impact on Society	E(A)		
Engineering Tools	T				