

CIVE/ENVE 4918 Design Project – Course Syllabus

1. Key Personnel and Schedule

Course Coordinator – CIVE 4918

Shawn Kenny, Ph.D., P.Eng.
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Course Co-Coordinator – ENVE 4918

Paul Simms, Ph.D., P.Eng.
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CEE Project Supervisors

ACSE Professors Gunay, O'Brien & Santana; CIVE Professors Hajiloo, Hossain, Ismail, Khoo, Lau, Rayhani, Sarkar, Sherwood, & Zalok; ENVE Professors Basu, Simms & Van Geel

Teaching Assistants (TA) – CIVE 4918

Group #s: TBD
TA Contact Info TBD

Teaching Assistants (TA) – ENVE 4918

Group #s: TBD
TA Contact Info TBD

Lectures Thursday 1605-1755 (every 2nd week)
Attendance is mandatory.
See §7 Course Evaluation and §10 Carleton University & Course Policies.

PA Sessions Monday 0835-1125 (each week)
Project Supervisors will define the mode and media used for engagement.
Attendance is mandatory.
See §7 Course Evaluation and §10 Carleton University & Course Policies.

2. Undergraduate Calendar Description

<https://calendar.carleton.ca/search/?P=CIVE%204918>
<https://calendar.carleton.ca/search/?P=ENVE%204918>

Teams of students develop professional level experience through a design project that incorporates fundamentals acquired in previous mathematics, science, engineering, and complementary studies courses. A final report and oral presentations are required. Includes: Experiential Learning Activity. Prerequisite(s): ECOR 3800 and fourth-year status in Engineering. Certain projects may have additional requirements.

3. Overview and Learning Outcomes

The course provides an opportunity for engineering students, with fourth year status, to demonstrate transfer of learning; through the integration and application of knowledge and skills acquired and developed over the course of the engineering program, to solve an open-ended practical (real world) problem. Spanning two academic terms, in this capstone project you will utilise the engineering design process to formulate a problem statement, define goals, objectives and constraints, generate possible solutions, select and assess a short-list of preferred alternative solutions, and, lastly, identify, develop and refine a preferred engineering design solution.

The capstone design project seeks to further develop and enhance your graduate attributes and professional skills. Upon successful completion of this course, the student will be able to:

- apply your engineering knowledge base and technical skills when solving engineering problems,
- utilize appropriate engineering methods and tools (e.g., experiment, analysis,) and apply critical thinking to reach substantiated conclusions that solve engineering problems,
- develop reliable engineered design solutions with confidence in predictable outcomes that integrate best practices, codes and standards,
- understand the significance and assess the interaction of factors (e.g. cultural, economic, environmental, societal, safety, sustainability, technical) that may impact the engineering design process or outcomes,
- develop an understanding of the roles and responsibilities of the engineering profession in society,
- apply engineering economics (e.g., capital, time value, depreciation), business practices (e.g., risk and change management), and engineering project management practices (e.g., scheduling, milestones, resource/time allocation, procurement), and
- develop and refine teamwork and communication skills (e.g., reading, writing, speaking, active listening) across all stakeholder backgrounds and perspectives (i.e., engineering profession, clients, public).

The Canadian Engineering Accreditation Board (CEAB) defines design as :”...an ability to design solutions for complex, open ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.”

As part of the [CEAB accreditation process](#) we will measure and assess graduate attributes (i.e., technical, professional and personal attributes) we seek to develop and refine throughout your undergraduate engineering program. The graduate attributes are evaluated using defined rubrics that are focused on teaching and learning outcomes. The graduate attribute assessment does not influence your grade assessment as defined in the course syllabus.

4. Course Resources

The majority of course material (e.g., announcements, reporting requirements, reference material, grading) will be posted on the cuLearn course site. Material (e.g., notes, textbooks and other resources) acquired from previous courses can be used for technical guidance during the design project. Other reference material has also been identified that will provide guidance across a range of subject areas (e.g., communications, engineering economics, project management, cost estimating, systems analysis and design synthesis) that will support your design project activities.

These resources are available online through the Carleton University library:

Communications

- Alley, M. (2013). The Craft of Scientific Presentations: Critical Steps to Succeed and Critical Errors to Avoid. 2nd Edition, Springer, <https://doi.org/10.1007/978-1-4419-8279-7>
<https://www.assertion-evidence.com/>
<https://www.craftofscientificwriting.com/>
- Laplante, P. (2019). Technical Writing. Boca Raton: CRC Press, <https://doi-org.proxy.library.carleton.ca/10.1201/9780429467394>

Engineering Economics

- Whitman, D.L. and Terry, R.E. (2012). Fundamentals of Engineering Economics and Decision Analysis. Synthesis Lectures on Engineering, <https://doi.org/10.2200/S00410ED1V01Y201203ENG018>
- Yates, J. (2017). Engineering Economics. Boca Raton: CRC Press, <https://doi-org.proxy.library.carleton.ca/10.1201/9781315368283>

Design Approach

- Amador-Jimenez, L. (2016). Civil Engineering Systems Analysis. CRC Press, e-ISBN 9781315381428, <https://doi-org.proxy.library.carleton.ca/10.1201/9781315381428>
- Dieter, G.E. and Schmidt, L.C. (2009). Engineering Design. McGraw-Hill Higher, ISBN 0072837039.
- Ossenbruggen, P.J. (1984). Systems Analysis for Civil Engineers. New York: Wiley, ISBN 0471098892.

Project Management

- Lessard, C and Lessard J. (2007). Project Management for Engineering Design Synthesis Lectures on Engineering. Morgan & Claypool Publishers, <https://doi.org/10.2200/S00075ED1V01Y200612ENG002>

Follow this [link](#) for accessing library resources during the virtual course delivery.

All materials, used or referenced in your study, must have the appropriate [citation](#); otherwise you may have [plagiarized](#) your work, which is an academic offence under the [Academic Integrity Policy](#) of Carleton University. For the design project we will use the [IEEE citation style](#) but there may be a need to use other [citation formats](#). (e.g. Data, Statistics, Maps and Government Information).

Note: All course materials (e.g., assignments, course outline, posted notes, as well as quiz, exam and corresponding solutions) are provided under [copyright©](#) for personal use (academic study) only. Reproduction, distribution, or transmittal of course materials by any means, without explicit documentation expressing allowance from the copyright holder is a violation of copyright law. This action is an academic offence of the [Academic Integrity Policy](#) of Carleton University and [Code of Conduct](#) (Category 2 Offence). If you have any questions about fair dealing and your rights to use work for educational purposes, please contact copyright@carleton.ca.

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5. Lecture Progression (Tentative)

The planned lecture progression and course milestones are illustrated in Table 1.

Table 1. Lecture Progression		
Lec #	Date	Topic
1	09/09/21	Awareness: Introduce concepts on the engineering design process, team building & brainstorming
2	23/09/21	Momentum: Establish the problem definition, design goals, conceptualization & communications (writing)
3	07/10/21	Clarity: Based on project goals, define the objectives, constraints & metrics, create a decision basis and conduct options analysis
4	21/10/21	Integration: Address other factors (e.g., sustainability, resilience, climate change, risk, society)
Fall Term Break: October 25-29, 2021		
5	04/11/21	Risk Analysis: Qualitative and quantitative approaches to estimation, prediction and uncertainty
6	18/11/21	Engineering Best Practices: Use of external resources, internal procedures, guidelines, standards and codes
7	02/12/21	Group Dynamics and Culture: Engagement, vision, motivation & action
University Break: December 13, 2021 – January 09, 2022		
8	13/01/22	Major Projects: An overview of the major processes and elements of an impact assessment framework
9	27/01/22	Philosophy 101: Engineering ethics in technology & society
10	10/02/22	TBD: Industry Speaker
Winter Term Break: February 21-25, 2022		
11	03/03/22	TBD: Industry Speaker
N/A	March 17, 24, & 31	Final Design Project Presentations

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6. Course Milestones

The project milestones are summarized in Table 2. The lecture progression and milestone map is summarized in Table 3.

Table 2. Milestones		
#	Deliverable	Due Date ¹
M1	Team Initiation	12/09/21
M2	Conception Report	1/10/21
M3	Feasibility Report	12/11/21
M4	Interim Presentation	29/11/21 – 10/12/21
M5	Design Basis Report	28/01/21
M6	Detailed Design Report	11/03/21
M7	Final Presentation	17/03/22 – 31/03/22
M8	Final Report	10/04/21

¹All course material is due at 5PM (Ottawa time) on the due date. A late penalty of 5% (cumulative) will be imposed for each 24-hour period past the due date (e.g., up to 24 hours is a 5% penalty; 24+ hours to 48 hours is a 10% penalty).

Table 3. Lecture Progression and Milestone Map

Fall Term 2020														
Month	S				O				N				D	
Week Start Date	6	13	20	27	4	11	18	25	1	8	15	22	29	6
Lecture Number	1		2		3		4		5		6		7	
Milestone Number	1			2						3				4

Winter Term 2021														
Month	J					F				M				A
Week Start Date	3	10	17	24	31	7	14	21	28	7	14	21	28	4
Lecture Number		8		9		10			11					
Milestone Number				5						6		7		8

Milestone Number: 1 Team Initiation; 2 Conception Report; 3 Feasibility Report; 4 Interim Presentation
5 Design Basis Report; 6 Detailed Design Report; 7 Final Presentation; 8 Final Report

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7. Course Evaluation

The course evaluation is summarized in Table 4.

Table 4. Course Evaluation		
Assessment Element	Description [Primary Evaluator]	Weight
Individual Rating – Performance ¹	Evaluates individual performance as part of a project team. [Project Supervisor]	25%
Team Rating – Four Interim Reports ^{2,4}	Evaluates the quality of four interim reports (Conception, Feasibility, Design Basis, and Detailed Design reports) submitted over two academic terms. [Project Supervisor]	40%
Team Rating – Final Report ^{2,4}	Evaluates the quality of the final report. [Project Supervisor]	15%
Team & Individual Rating – Interim Presentation ^{3,4}	Evaluates the quality of the communication skills of the project team and individual for the interim presentation. [Project Supervisor]	10%
Team & Individual Rating – Final Presentation ^{3,4}	Evaluates the quality of the communication skills of the project team and individual for the final presentation. [Professors and TAs]	10%

Table 4 Course Evaluation Notes:

¹Although the course is centered around group activities, individual students will be assessed based on three performance indicators including (1) attendance, (2) individual performance, and (3) peer review.

Attendance (5% grade) will be recorded during lectures where the attendance grade component will be established at the end of the Winter semester. A Project Registry template is posted on the cuLearn course website site under Resources for your use (suggested but not mandatory). The Project Registry (or other documentation agreed upon by the project team and Project Supervisor) will be maintained by the Project Team Leader (or assigned project group member). The primary function of the Project Registry is to document action items, meeting objective and agenda, and highlight any constraint, delay or issue being confronted. After each group meeting or project review meeting, the Project Team Leader (or assigned project group member) will submit the Project Registry to the Project Supervisor (or assigned TA).

Individual performance (15% grade) measures the demonstrated level of active participation, engagement, and professionalism by an individual as part of a project team. The grade evaluations will be conducted at three milestones including the fall semester break, winter semester break and near the end of the winter semester using the same weighting (i.e., 5% each).

The Project Supervisor will lead the evaluation and may integrate the assigned Teaching Assistant (TA) in the grading process. The primary information used to assess individual performance will be reported by each student through a description of how you have satisfied the competency metrics (see the Individual Performance Assessment template on the cuLearn course website site under General Information), which will be submitted as an appendix to each of the four Interim Reports and Final Report ^(see Notes 4,5,6). The Project Supervisor may incorporate feedback from external parties (e.g. TA, group peers, and mentors), and assess data recorded in the Project Registry.

The final (5% grade) component will be based on peer review (i.e., project team members evaluating other project team members through a confidential grading system), which will be conducted near the end of the winter semester.

In order to pass the course, each student must achieve greater than or equal to 30% of the 45% composite weighting for the two Individual Rating elements (i.e., Attendance & Performance) and two Presentation elements (i.e., Interim & Final Presentation). Failure to meet or exceed the 30% target will result in an assigned letter grade of F.

²Report guidelines are provided on the cuLearn course (under Conception, Feasibility, Design Basis, and Detailed Design folders). Although the reports are submitted as group deliverables, individual grades may be adjusted as warranted based on the Individual Performance Contributions ^(see Note 2). See §8 Group Selection on the project group selection process.

³Presentation guidelines and the grading rubric are posted on the cuLearn course site (under Presentations folder). The Interim Presentation will be presented to your Project Supervisor who may invite other external parties (e.g., TA, mentor, other Professors, external stakeholders such as industry, government, and municipalities). The Final presentation will be presented to a wider audience (e.g., Project Supervisor, TA, mentor, other Professors, external stakeholders such as industry, government, and municipalities).

⁴For e-mail correspondence (see also §10 Carleton University & Course Policies), please use the following format in your email subject line: *4918 Group # Subject Heading*.

8. Group Selection

Students will form groups using the self-selection tool (see information posted on the cuLearn course website site under Task 1: Initiation) to create project teams. The project team self-selection should be completed as per the course milestones (see §6 Course Milestones). Each project team should have 6 team members. The Project Coordinators may have to re-organize project teams through re-distribution of individuals among different groups or assign individuals to groups.

9. CSCE National Capstone Design Competition

A National Capstone Design Competition is held during the Canadian Society for Civil Engineering (CSCE) Annual Conference. The competition is based on the CIVE/ENVE 4918 Design Project and is open to all senior undergraduate students in an accredited Canadian civil engineering program. Carleton University can nominate a single entry (team) for the national competition within any speciality area of the field (Structural, Construction, Geotechnical, Geomechanics, Hydraulics and Water Resources, Transportation or Environmental Engineering) for design projects completed during the current academic year. The National Capstone Design Competition provides an opportunity for two project team members to attend the CSCE Annual Conference and present their study (to peers, conference attendees and competition judges) in a poster session – it is uncertain what the format will be this year due to the effects of Covid-19.

Any project team that has an interest to participate in the CSCE National Capstone Design Competition, please contact the Course Coordinator (Dr. Shawn Kenny). If multiple teams are interested, then an internal competition will be required as each university can only nominate one entry.

10. Carleton University & Course Policies

This section summarizes key university and course policies. As a student you must be aware of and follow the [regulations](#) of Carleton University for academic behaviour and understand your [rights and responsibilities](#) for non-academic behaviour.

Academic Integrity

The [Carleton University Academic Integrity Policy](#) addresses the expected behaviour of students with respect to [academic integrity](#), which is essential to the university environment. This policy reflects the values we hold to be important in the pursuit of engagement, learning, and scholarship. Violations of this policy can have a range of repercussions and outcomes (e.g. resubmission of work, change in grade, withdrawal from course(s), suspension).

Academic Petition

For extenuating circumstances that affect your ability to meet your academic obligations, you have the option to submit a [petition](#).

Appeal of Grade

Before initiating the [Appeal of Grade](#) process, seek resolution through communication with (1) the assigned Teaching Assistant (TA), and, if the issue remains unresolved, (2) the Primary Evaluator based on Table 3 §7 Course Evaluation.

Communications

Course materials will be distributed through the course's cuLearn page and are protected provided under [copyright©](#) for personal (academic study) use only. All electronic communications must be conducted through official Carleton university resources (e.g. email accounts, cuLearn). [Professionalism](#) is expected in all course communications. The Announcements forum on the cuLearn course page will be the primary communication tool.

Copyright on Materials

All course materials (e.g., assignments, course outline, posted notes, projects, as well as the quiz, exam and solutions) are provided under [copyright©](#) for personal (academic study) use only. Reproduction, distribution, or transmittal of course materials by any means, without explicit documentation expressing allowance from the copyright holder, violates copyright law. A student who publicly posts or sells an instructor's work, without the instructor's express consent, may be charged with misconduct under an academic offence under the [Academic Integrity Policy](#) of Carleton University and/or [Code of Conduct](#) (Category 2 Offence), and may also face adverse legal consequences for infringement of intellectual property rights. If you have questions about fair dealing and your other rights to use works for educational purposes, please contact copyright@carleton.ca.

Expectations of Student Engagement

As discussed in §7 Course Evaluation, although the course is centered around group activities, individuals will be accountable for their own performance, professionalism, attendance and active participation. Engage with your project team and we all have a responsibility to promote a positive environment through active listening, conflict mediation, consensus building, evidence based decision making, group integration, and open discussion and debate)

During the academic term, circumstances or events may arise that limit or prevent your engagement as a contributing member to your project team over an extended period of time. Provided you do not have to disclose a personal or confidential matter, (see §11 Academic Accommodations) then then it is your responsibility to:

- inform your Project Team Leader and Project Supervisor and
- either provide supporting documentation or submit a self-declaration form – the link to the [Covid-19 self-declaration form](#) is provided as an example.

In accordance with the [Academic Integrity](#) guidelines, the "...misrepresentation of facts for any academic purpose..." would be a violation of the [Carleton University Academic Integrity Policy](#).

If the situation involves a personal or confidential matter, please seek out an appropriate resource (see §11 Student Resources) or contact an individual that you feel comfortable with engaging

(e.g., [Engineering Academic Support Office](#), [Faculty of Engineering and Design](#), [Department of Civil and Environmental Engineering](#)).

In-Class and Online Behaviour

In the virtual environment of course offering and program delivery, Carleton University has provided some resources ([Carleton Online](#)) to support and guide your online study activities. Regardless of your setting, you must follow all Carleton University regulations and are expected to observe behavioural norms within the university environment and engineering profession.

For all virtual meetings in this course, the expectations are to be engaged in the meeting by enabling the live audio and video links, and to observe the “[Netiquette](#)” rules of expected behaviour. However, the audio or video stream shall never be recorded by any means and doing so will constitute a violation of the the [Carleton University Academic Integrity Policy](#). If there is a need for academic accommodations (see §11 Academic Accommodations),⁰ please seek out an appropriate resource (see §11 Student Resources) or contact an individual that you feel comfortable with engaging (e.g., [Engineering Academic Support Office](#), [Faculty of Engineering and Design](#), [Department of Civil and Environmental Engineering](#)).

11.Academic Accommodations

Carleton University is committed to providing access to the educational experience in order to promote academic accessibility for all individuals. Academic accommodation refers to educational practices, systems and support mechanisms designed to accommodate diversity and difference. The purpose of accommodation is to enable students to perform the essential requirements of their academic programs. At no time does academic accommodation undermine or compromise the learning objectives that are established by the academic authorities of the University. The accommodations include:

- pregnancy obligation
- religious obligation,
- academic accommodation for students with disabilities,
- survivors of sexual violence, and
- accommodation of student activities.

See the following link for further information on academic accommodations:

<https://students.carleton.ca/course-outline/>

12. Additional Student Resources

Carleton Online – Connect with resources to support online learning

<https://carleton.ca/online/>

Counselling Services – Counselling support for physical and mental health

<https://carleton.ca/health/counselling-services/>

Covid-19 – Information on Covid-19 policies, procedures and FAQs

<https://newsroom.carleton.ca/coronavirus-covid-19/>

From Intention to Action

[From Intention to Action - Carleton University](#)

International Students – Services and programs

<https://carleton.ca/isso/>

Paul Menton Centre – Integration of students with learning disabilities

<http://www.carleton.ca/pmc/>

Mental Health & Well-Being – Available tools and resources

<https://carleton.ca/wellness/>

Peer Assisted Study Sessions – Supportive learning environment

<https://carleton.ca/csas/pass/>

Research Help Desk – Library support services

<https://library.carleton.ca/contact/service-points/research-help-desk>

Student Experience Office – Resources to enhance university experience

<https://carleton.ca/seo/>

Undergraduate Academic Support – Engineering focused resources

<https://carleton.ca/engineering-design/current-students/undergrad-academic-support/>

Writing Service – Support to improve writing skills

<https://carleton.ca/csas/writing-services/>