SYDE660: Systems Design Graduate Workshop 1

Department of Systems Design Engineering, University of Waterloo.

Course Outline for Spring 2023.

Instructor. Jennifer Howcroft, PhD, Professional Engineer.
Email: jenny.howcroft@uwaterloo.ca.
Office: E7 6308.

Professor Howcroft's Office Hours. Mondays: 2:30 – 3:30 pm Eastern Time (E.T.)
Wednesdays: 9:00 – 10:00 am Eastern Time (E.T.)
For quick questions or concerns, post on Microsoft Teams or send me an email.

Guiding Principles.

I consider the classroom to be a place where we all will be treated with respect. I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Land Acknowledgement.

The University of Waterloo acknowledges that much of our work takes place on the traditional territory of the Neutral, Anishinaabeg and Haudenosaunee peoples. Our main campus is situated on the Haldimand Tract, the land granted to the Six Nations that includes six miles on each side of the Grand River. Our active work toward reconciliation takes place across our campuses through research, learning, teaching, and community building, and is centralized within the Office of Indigenous Relations.

Course Description.

Engineering Design Project course where students work in small groups or individually applying the principles of engineering problem solving, research methods, systems analysis including modelling, simulation, optimization, and design. There is a strong focus on a major design project with regular mentorship, project update reports and presentations, project reviews, and design embodiment demonstrations.

Students enrolled in a specialization version of the course must have a major focus of their design project in the specialization field as follows:

- 660A - Artificial Intelligence (AI) and Machine Learning.
- 660B - Biomedical Systems.
- 660C - Human Factors.
- 660D - Mechatronic & Physical Systems.
- 660E - Vision, Image & Signal Processing.

Course Objectives.

By the end of the course, students should be able to:

1. Apply the design process to develop solutions to open-ended, complex systems problems,
2. Demonstrate project management skills by appropriately scoping the selected problem space and completing project goals on-time,
3. Perform an in-depth needs assessment from a systems perspective,
4. Select and apply appropriate mathematical modelling, engineering analysis, or mathematical simulation and optimization in support of the design process,
5. Prototype a testable system,
6. Engage in appropriate testing procedures and competently evaluate test results,
7. Provide and respond to meaningful, constructive feedback on design work,
8. Develop and demonstrate functional team dynamics,
9. Communicate design work in a clear, technical manner through both oral and written communication.

Instruction.

This is a project-based course as opposed to a lecture-focused course or readings-focused course. As such, students will be working on a group design project where every individual makes a meaningful contribution that advances their design and technical skills. Students are expected to have already taken SYDE600 (course pre-requisite) and received instructions on the design process. Targeted, review-style lectures will be provided throughout the course paired with regular instructor meetings. The purpose of the instructor meetings is to provide project-specific advice and guidance throughout the term.

Class Time & Location.

Mondays 11:30 am – 12:50 pm Eastern Time (E.T.). E5 6004.
Wednesdays 11:30 am – 12:50 pm Eastern Time (E.T.). E5 6004.

Course Schedule.

The course schedule is posted on LEARN and details the following important information:

- Weekly high-level project goals,
- Supporting lectures, and
- Course deliverables.

Students are expected to review the course schedule, familiarize themselves with weekly expectations, and ask questions in advance of activities and associated deadlines to clear up any confusion. Changes to the course schedule will be announced as soon as possible and an updated course schedule will be posted on LEARN.

Religious Holidays.

Students have the right to practice the religion of their choice. If you need to miss class to observe a religious holiday, please submit the dates of absence to the instructor by the end of the second full week of classes. The instructor will work with you to develop a mutually agreeable plan to make-up for missed class time and course work.

LEARN.

Course slides and other course materials will be posted on LEARN. Students are allowed and encouraged to download materials for their own personal files but are not authorized to post SYDE660 materials on sites other than LEARN. Course deliverables will be available and submitted using LEARN except for presentations which will occur in-person.

Grade Breakdown.

Student Survey: 1%.
Team Contract: 4%.
Design Project: 65%.
    Preliminary Project Report & Presentation: 25%.
    Final Project Report, Prototype Demonstration, & Presentation: 40%.
Peer Review Activities: 20%.
Individual Contribution Activities: 10%.

Course Evaluation.

1. All evaluated course work (project work, individual contribution activities, peer review, etc.) must be solely the work of the student or students submitting it for credit.
2. Students are required to attend the project presentations in-person. This is necessary to complete the peer review activities. Presentations will occur during Week 6 and Week 12 during class time: Monday and Wednesday from 11:30 am to 12:50 pm.
3. It is expected that all team members will contribute to the project deliverables and to the overall success of their team project. See the section below on Design Project Work.
4. Late submissions will not be graded and will receive a grade of zero. Exception: grace days will be available. Use of grace days must be communicated before the submission deadline.

Design Project Work.

It is expected that all group members will contribute to the design project deliverables and to the overall success of their group project. Any group issues related to non-participating group members should be brought to the attention of Professor Jennifer Howcroft or a teaching assistant as soon as possible. Individual group members' project grades may be adjusted at the instructor's discretion based on lack of participation. In extreme circumstances, a non-participating group member may be removed from the group and tasked with completing design deliverables individually.

Required Textbook.

J. Knapp, J. Zeratsky, and B. Kowitz. Sprint: How to solve big problems and test new ideas in just five days. Simon & Schuster: New York, NY. 2016.

Recommended Textbooks.

There are lots of great books on design, engineering analysis, testing strategies, and more! Professor Zelek shared a lot of textbooks with you in SYDE600. In this course, I'm providing a list of specialization-specific textbooks you may find useful.

660A - Artificial Intelligence (AI) and Machine Learning.

S. Russell, P. Norvig. Artificial Intelligence: A Modern Approach, 4th edition. Pearson Education: New York, NY. 2021.

C.M. Bishop. Pattern Recognition and Machine Learning. Springer Science+Business Media: Singapore. 2006.

660B - Biomedical Systems.

P.H. King, R.C. Fries, A.T. Johnson. Design of Biomedical Devices and Systems, 4th edition. CRC Press: Taylor & Francis Group: Boca Raton, FL. 2019.

P.G. Yock, S. Zenios, J. Makower, T.J. Brinton, U.N. Kumar, F.T. Jay Watkins, L. Denend. Biodesign: The Process of Innovating Medical Technologies, 2nd edition. Cambridge University Press: Cambridge, UK. 2015.

660C - Human Factors.

J.D. Lee, C.D. Wickens, Y. Liu, L.N. Boyle. Designing for People: An Introduction to Human Factors Engineering, 3rd edition. Charleston, SC: CreateSpace. 2017

R.W. Proctor, T. Van Zandt. Human Factors in Simple and Complex Systems, 3rd edition. CRC Press: Taylor & Francis Group: Boca Raton, FL. 2018.

660D - Mechatronic & Physical Systems.

R.G. Budynas, K.J. Nisbett. Shigley's Mechanical Engineering Design, 11th edition. McGraw Hill Education: New York, NY. 2020.

W.L. Cleghorn, N. Dechev. Mechanics of Machines, 2nd edition. Oxford University Press: Oxford, UK. 2015.

660E - Vision, Image & Signal Processing.

R.C. Gonzalez, R.E. Woods. Digital Image Processing, 4th edition. Pearson Education: New York, NY. 2018.

Email Policy.

Microsoft Teams or email is the best way to get in touch with the instructor. When sending an email, remember the following:

1. Emails should be sent from your official University of Waterloo email account.
2. Put SYDE660 in the email subject line followed by a brief description of the email subject. For example, "SYDE660: Question concerning Peer Review".
3. Sign your email with your first and last name and your student number.
4. Emails should contain professional and respectful language.
5. While we will do our best to respond to your emails as soon as possible, allow 24 to 48 hours (excluding weekends) for a response to your email.
6. If your question or concern requires a complex answer or warrants a discussion, the instructor may suggest a video meeting through Microsoft Teams.

COVID-19 Considerations.

There could be a need to make alternate arrangements for in-person course activities. This alternate arrangement could be for a short period of time (e.g., one week) or a more sustained disruption to in-person course activities. In the event of a disruption, all in-person lectures will revert to synchronous, online lectures.

If presentations are impacted, the most likely scenario is that these presentations will still occur but in a virtual format using MS Team meetings.

If you are unable to attend an in-person course activity due to emergency self-isolation, please let Professor Howcroft know as soon as possible (see COIVD-19-Related and Short-Term Absences below). If this will impact more than one course, you are encouraged to inform the Associate Chair Graduate Studies. They will review your case and coordinate a reasonable and fair plan in consultation with appropriate others.

Please also see 'Fair Contingencies for Remote Teaching' below and 'Instructional Contingencies for Covid-19' in the next section.

COVID-19-Related Absences and Short-Term Absences.

If you declare a COVID-19-related two-day absence or short-term two (2) day absence and you will miss a graded component in SYDE660, you need to reach out to Professor Jennifer Howcroft as soon as possible. It is expected that only individual deliverables will be eligible for accommodation unless there are extenuating circumstances like the vast majority of a team being on an absence at the same time. The most likely accommodation will be a two (2) day extension to a deadline. If a presentation is missed, the most likely accommodation will be for the individual component of the presentation to occur at a later date or the weighting shifting to the next presentation.

Fair Contingencies for Remote Teaching.

We are facing unusual and challenging times. The course outline presents the instructor's intentions for course assessments, their weights, and due dates in Spring 2023. **As best as possible, we will keep to the specified assessments, weights, and dates**. To provide contingency for unforeseen circumstances, the instructor reserves the right to modify course topics and/or assessments and/or weight and/or deadlines with **due and fair notice to students**. In the event of such challenges, **the instructor will work with the Department/Faculty to find reasonable and fair solutions that respect rights and workloads of students, staff, and faculty**.

Turnitin.com.

Text matching software (Turnitin®) may be used to screen assignments in this course. This would be done to verify that use of all material and sources in assignments is documented. Students will be given an option if they do not want to have their assignment screened by Turnitin®. Students will be provided about arrangements and alternatives for the use of Turnitin® in this course.

Writing and Communication Centre.

The Writing and Communication Centre works with students in all Faculties to help you consider your audience, clarify your ideas, develop your voice, and write in the style appropriate to your discipline. We offer one-on-one support for writing papers, delivering presentations, integrating research, and revising for clarity and coherence. Group appointments for team-based projects, presentations, and papers are also available.

All of our services are available virtually: booked appointments, drop-ins, resources, and writing groups. Check out our website for other ways to interact with us, such as open online forums and online "Question and Answers". Visit us at www.uwaterloo.ca/wcc.

Please note that communication specialists guide you to see your work as readers would. We can teach you revising skills and strategies, but will not change or correct your work for you. Please bring your assignment instructions and any notes or drafts to your appointment.

[Link **Writing and Communication Centre**]

Course and Departmental Expectations

Guiding Principles for our SYDE-BME Community (faculty, staff, and students): 1) Be compassionate. 2) Be accountable. 3) Be patient. 4) Be safe and healthy.

Compassionate and respectful communication: Most online communication between the Department and students will be done through LEARN and/or email. Students are reminded that they should now use their email account name@uwaterloo.ca. Include an academic signature with your full name, program, student ID. We encourage you to include your preferred pronouns (he/him; she/her; they/them).

Student Absences: There are many reasons a student may miss class due to illness, quarantining, isolation, vaccination side effects – we have been advised to handle these as we would have for a 2-week absence in the pre-COVID times. Guidelines are available in the undergraduate calendar. [Link Academic Accommodations due to illness]

Instructional Contingencies for Covid-19: Should we be required to move away from full-occupancy in-person teaching, the instructors will work with the Department to ensure that students have a fair opportunity to meet course requirements and to be notified of any changes in a timely manner.

SYDE-BME Comment on Accommodation: We respect that our SYDE-BME students are independent adult decision-makers, with many opportunities to partake in activities that might be in time conflict with academic deadlines and deliverables. Along with the right to make adult decisions comes the responsibility and accountability for those decisions and any outcomes.
The University of Waterloo's policy on accommodation for missed deliverables pertains to verifiable health matters, and highly unfortunate events (for example: family tragedies). The Department of Systems Design Engineering follows University of Waterloo's general policy: students who self-elect to forgo a deliverable receive a "0" for that deliverable. It is preferred practice so that fairness is maintained for members of the same class/course by avoiding preferential treatment, and so that instructors are not burdened with having to create extra quizzes, deliverables, etc. It also reflects professional practice, as failing to show up to work and missing deadlines can be very costly to the company and individual (for example: not submitting a contract proposal, or design review on time). ***Please read the policy here:*** [Link Accommodation due to illness]

SYDE-BME Academic Priorities over Co-op Interviews: Academic deliverables are to take priority over co-op interviews. This is especially true for course midterms and final exams. Students who have been scheduled for an interview at the same time as a course test, midterm, or exam MUST follow the CECA procedure for rescheduling the interview: [Link CECA rescheduling co-op interviews]

Compassionate Accommodation: If you are facing challenges that are affecting more than one course contact the Associate Chair Graduate Studies (email: eihab@uwaterloo.ca). They will review your case and coordinate a reasonable and fair plan in consultation with appropriate others (for example: instructors, Department Undergraduate Studies Committee, Chair, AccessAbility Services, Engineering Counselling services, Registrar's Office).

FACULTY OF ENGINEERING – MORE FINE PRINT

Faculty of Engineering website: [Link Academic Support and Policies].

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect, and responsibility.
[Check Academic Integrity website for more information. Link Office of Academic Integrity].

Discipline: A student is expected to know what constitutes academic integrity (see link above) to avoid committing an academic offence, and to take responsibility for their actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (for example: plagiarism, cheating) or about expectations for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. Relevant documents include:

- University of Waterloo Policy 71 [Link Policy 71 Student Discipline].
- Academic Penalty Guidelines [Link Policy 71 Penalty Guidelines].
- Assessment of Unauthorized Collaboration: [Link Assessment of Unauthorized Collaboration].

Grievance: A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4. When in doubt please be certain to contact the **Associate Chair Undergraduate or Academic Advisor** who will provide further assistance.
[Link Policy 70 Petitions & Grievance.]

Appeals: A decision made, or penalty imposed under Policy 70 (Student Petitions and Grievances) (other than a petition) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to Policy 72 (Student Appeals)
[Link Policy 72 Student Appeals].

AccessAbility Services: AccessAbility Services (A.A.S.) is the University's centralized office for the provision of academic accommodations for students with a known or unknown disability, illness, or condition. Even if students are unsure of whether they qualify for A.A.S. support, an A.A.S. consultant can talk them through next steps, and refer them elsewhere if appropriate.
[Link AccessAbility Services].