Winter 2024 Course Outline

SEP 760 / Design Thinking

Course Goal

We face a rapidly changing world in which being adept and expert in an area of knowledge is no longer sufficient. Knowledge has become a commodity. The complexity of problems faced by practitioners lies beyond simple application of scientifically validated knowledge. Real-world problems are frequently unique, have many solutions or none, involve contradictions in requirements, are ill-defined, and involve significant levels of uncertainty. Understanding of how design thinkers approach wicked problems has evolved over the last two decades. Conventional notions of design focus on the thinking used in the creation of artifacts and technologies. Design thinking instead broadens design to a set of mindsets, skills, and strategies for addressing wicked problems. In design thinking, the design space is human experience.

The complexity of problems resides not in the technological solutions but in human systems, behaviours, organizations, values, beliefs, and cultures. These systems are highly complex and can be reduced to neither simple nor complex models. Whereas engineering approaches are about quantitative ways of modelling complicated engineering problems, design thinking approaches are about interacting with people in a highly creative, empathetic, and iterative manner.

The goal of this course is to develop students' creative competencies in addressing problems where the solution is anticipated to be a physical artifact or technology but where the complexity of the problem is not diminished by constraining the solution space in this way.

Instructors

Course Instructor: Andrea Hemmerich, PhD (Biomedical Engineering)

Adjunct Assistant Professor, Walter G. Booth School of Engineering Practice and Technology
McMaster University

Adjunct Assistant Professor, Queen's University

Email/Teams chat: hemmera@mcmaster.ca

Teaching Assistant: Jon Pusic, MEng Design (Product Design)

Walter G. Booth School of Engineering Practice and Technology
McMaster University

Email/Teams chat: jon.pusic@gmail.com

MEng Design Program Lead: Robert Fleisig, PhD, PEng, FCEEA

Associate Professor, Walter G. Booth School of Engineering Practice and Technology

McMaster University

Email/Teams chat: robert@mcmaster.ca

Office hours will take place by appointment and will be held virtually on MS Teams. Office hours are not mandatory.

Calendar Description

This course will explore the creative design process, tools and methods that will enable students to discover, identify, and analyze opportunities and develop those opportunities into innovative design solutions. Based on a series of self-contained exercises and small projects, students will work to research a well-conceived design concept by the end of term.

Prerequisite: Instructor permission

Relation to Other W Booth School Courses

SEP 760 is the prerequisite for SEP 761. SEP 761 is mandatory for MEng Design students and builds on the skills developed in SEP 760.

Class Location and Schedule

All classes will be held in ETB 539 unless specified in advance. Any changes to the class location or schedule will be announced on Avenue to Learn in advance. The course is not offered virtually. There will be 13 classes, as shown below.

Class	Dates (11:30 AM – 2:30 PM)
1	January 12th
2	January 19th
3	January 26th
4	February 2nd
5	February 9th
6	February 16th
7	February 23rd
8	March 1st
9	March 8th
10	March 15th
11	March 22nd

12	March 29th
13	April 5th

All classes are mandatory. Exceptions cannot be made. Since learning in the course is primarily hands-on, classroom attendance is critical. Missing a class may result in a failing grade in the course.

Note that changes to the schedule and location of classes may be made during the term.

Learning Outcomes

By the end of the course, you will be able to do the following at a novice level:

1. Human-centred mindset
   - Embrace ambiguity and empathize with your user through the entire design process.
   - Discover human insights and use them to reframe a design challenge.
   - Develop a concept or direction to design an experience.
2. Bias towards action and prototyping
   - Making a physical or sensory-based (e.g., visual) model to communicate ideas.
   - Being able to discard a prototype.
   - Prototyping early, often; many, many iterations.
   - Trying multiple ideas in parallel in some depth.
3. Learning mindset
   - Using prototype testing to learn rather than to validate or verify.
   - Use prototype testing to learn about the user and not just obtain feedback.
   - Learn from people, contexts, existing solutions.
   - Learn to challenge the status quo.

Teaching Approach

This course is designed to support Master of Engineering Design (MED) students working with a faculty lead on a product design or human-centred design project in SEP 700 Part I and SEP 700 Part II and students from non-MED programs who wish to build their creative competencies.

It is assumed that the student has little or no experience in design. The instructors will be mindful of the communication abilities of students.

Design thinking is best learned through experience. As such, students will work in small teams (i.e., usually two or three persons) on projects throughout the course. Each team will be expected to do work between classes but also work in class during studio time on creative tasks related to the design. At the end of each project students will present their work including one or more prototypes.

Classes will involve instruction, studio work (i.e., working on the project in a visual, sensory, or hands-on way), and critiques (i.e., being asked or asking questions to creatively explore a project).

Content Schedule

A preliminary schedule of topics and studio work is given in the table below. The list of topics and studio work is subject to change at the discretion of the instructors.

Note that this structure represents a plan and is subject to adjustment term by term.

The instructor and the University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.

Class	Activity/Content
1	Icebreaker Course Introduction Project 1 Kickoff
2	Empathetic Interviewing and Observation Design Studio (Project 1)
3	Empathy Maps and Storyboards Design Studio (Project 1)
4	PoV's, HMW's, Ideation Design Studio (Project 1)
5	Prototyping and Testing Design Studio (Project 1)
6	Project 1 Presentations Project 2 Kickoff
7	Project 2 Presentations Project 3 Kickoff
8	Design Research Deep Dive Design Studio (Project 3)
9	Creative Capacity Building Design Studio (Project 3) Project 4 Kickoff
10	Using Prototypes to Learn Design Studio (Projects 3 & 4)
11	Review Design Thinking Process & Mindsets Design Studio (Projects 3 & 4)
12	Project 3 Presentations
13	Project 4 Presentations Celebration

Note that this structure represents a plan and is subject to adjustment week by week.

Required Materials

- Computer laptop or desktop with a webcam, microphone, and speakers.
- Capability to run Avenue, Zoom, etc.
- Camera and ability to post photos during online meetings.

Assessment

Element	Weight
Project 1	10%
Project 2	25%
Project 3	20%
Project 4	35%
Participation	10%

Project 1

This project will be the subject of the first several classes. Students will work in small teams on this project and will be expected to keep all work performed in relation to the project. The project will be assessed in a presentation and students will be expected to show their work. Students may be expected to submit a written report and reflection. There will be weekly homework associated with this project.

Project 2 and Project 4

These projects will be performed individually although they will require students to collaborate and co-create on parts of the project. The projects will be presented in class and students will be expected to show all their work on the project.

Project 3

This project will be subject of the classes following Project 2. Students will work in small teams on this project and will be expected to keep all work performed in relation to the project. The project will be assessed in a presentation and students will be expected to show their work. Students may be expected to submit a written report and reflection. The Project 1 and Project 3 teams will be different. There will be weekly homework associated with this project.

Participation

Students are expected to contribute meaningfully to class. Contributions to the class will be tracked and used to assess participation.

Grade Conversion

Percentage grades will be converted to letter grades and grade points per the University calendar (see table below).

A minimum grade of B- is necessary to successfully pass a course in the Walter G. Booth School of Engineering Practice and Technology.

A grade of B-, B, or B+ indicates an expected level of learning. A grade of A-, A, or A+ indicates exceeding expectation.

Letter Grade	Points	Percentage
A+	12	90 – 100
A	11	85 – 89
A-	10	80 – 84
B+	9	77 – 79
B	8	73 – 76
B-	7	70 – 72

Instructors' Expectations of Students

1. Students are expected to behave, dress, and always deport themselves in the most professional manner, especially when interacting the members of the local community. Respect of local community members is paramount. Acts or behaviour that embarrasses the School may carry a significant grade penalty in the course.

2. Grades are not final until they are reviewed and approved by the School of Graduate Studies.

3. Attendance is required for all classes. Failure to attend may result in a failing grade.

4. On average students should expect a minimum of six to 12 hours per calendar week completing work outside class time.

5. All work will be shared with the class. Participants in the course, including mentors, TAs, instructors, and students, share in the ownership of the project work.

6. Students will always actively contribute to and maintain a sense of an open community in which sharing of ideas, research, and opinions is done so freely and without fear of censure. Furthermore, students will share their work, ideas, and research without reservation with faculty, staff, students, guests, and partners within the course. There will be no expectation of compensation. All students are expected to actively participate in critiques of course work.

References

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Policy and Advisory Statements

Departmental Policies

The use of cell phones, iPods, laptops, and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor makes an explicit exception.

Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.

Instructors have the right to submit work to software to identify plagiarism.

Anti-Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Associate Director, Graduate Studies, the Sexual Harassment Officer, or the Human Rights Consultant, as soon as possible.

http://www.mcmaster.ca/policy/General/HR/Discrimination_
Harassment_Sexual_Harassment-
Prevention&Response.pdf

Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g., the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at www.mcmaster.ca/academicintegrity.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g., the submission of work that is not one's own or for which other credit has been obtained.

2. Improper collaboration in-group work.

3. Copying or using unauthorized aids in tests and examinations.

Authenticity/Plagiarism Detection

Instructors may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g., A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

Use of Generative AI (e.g., ChatGPT)

Students may freely use generative AI in this course so long as the use of generative AI is referenced and cited following citation instructions given in the syllabus. Use of generative AI outside assessment guidelines or without citation will constitute academic dishonesty. It is the student's

responsibility to be clear on the expectations for citation and reference and to do so appropriately.

If you use ChatGPT or a similar tool in the process of conducting your assignments, it is important to be transparent about this. You must include a "ChatGPT statement" before the first page of your submitted work, stating that you used ChatGPT and what you used it for (e.g., correction of spelling and grammar). You must make clear how you adjusted/modified/corrected/enhanced any text that you used as a starting point. You must include the specific prompts that you used in your conversation with ChatGPT, attaching all of your relevant ChatGPT chats as an appendix to your assignment. There are no penalties for using ChatGPT appropriately, as long as the guidelines indicated in these assignment instructions and university policies are followed.

Course Management Systems

In this course we will be using Avenue to Learn. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, usernames for the McMaster email accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

Avenue (https://avenue.mcmaster.ca) will be used to communicate grades and collect student work.

Course Modification

The instructors reserve the right to change dates and/or deadlines etc. for any or all course elements in the case of an emergency situation or labour disruption or civil unrest/disobedience, etc.

Health and Safety

The Faculty of Engineering is committed to McMaster's University Workplace and Environmental Health and Safety Policy which states: "Students are required by University policy to comply with all University health, safety and environmental programs".

It is your responsibility to understand McMaster University Workplace and Environmental Health and Safety programs and policies. For information on these programs and policies please refer to McMaster University Environmental and Health Support Services Occupational Safety Risk Management Manual at: https://hr.mcmaster.ca/employees/health_safety_well-being/our-safety/risk-management-manuals-rmms/.

It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for some of the experiments and the laboratory equipment.

Ethics Protocol

The two principles underlying integrity in research in a university setting are these: a researcher must be honest in proposing, seeking support for, conducting, and reporting research; a researcher must respect the rights of others in these activities. The policy is included to ensure that students understand and uphold a high level of ethical practice when performing stakeholder research or any sort of information collection.

Research misconduct is defined to include the following in proposing, conducting, or reporting research:

1. misrepresentation, fabrication, or falsification of data;

2. plagiarism, including plagiarism of one's own work;

3. abuse of confidentiality with regard to information and ideas taken from manuscripts, grant applications, or discussions held in confidence;

4. other kinds of misconduct, such as: violation of the regulations of the granting bodies; improper use of funds, equipment, supplies, facilities, or other resources; failure to respect University policies on use of human subjects or animals; falsification or misrepresentation of credentials;

5. failure to reveal any material conflict of interest to the sponsors or to those who commission work or when asked to undertake reviews of research grant applications or manuscripts for publication, or to test products for sale or distribution to the public; or

6. failure to reveal to the University any material financial interest in a company that contracts with the University to undertake research, particularly research involving the company's products. Material financial interest includes ownership, substantial stock holding, a directorship, significant honoraria or consulting fees but does not include routine stock holding in a large publicly traded company.

The University demands integrity in the conduct of research. It expects ethical behaviour in respect to authorship and appropriate acknowledgement of research contributions. It is recognized that there are varying degrees of severity in violation of standards of research conduct. Further, there will be cases where disputes may arise which do not clearly involve misconduct but rather are differences of opinion as to what is considered ethical behaviour.

In cases where research misconduct is at issue, the University will take action as described in the document, "Procedures for Inquiries and Hearings Regarding Allegations of Misconduct in Research," unless the individual being accused is a student carrying out research as part of his or her academic programme. In that case, action will be taken as described in the document, "Senate Resolutions on Academic Dishonesty". The University will impose sanctions on those who have committed research misconduct.

Communications

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.

- Use the University provided e-mail address or maintain a valid forwarding e-mail address.

- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.

- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.

- Check the McMaster/Avenue email and course websites on a regular basis during the term.

Conduct Expectations

As a McMaster graduate student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the *Code of Student Rights & Responsibilities* (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in university activities. Student disruptions or behaviours that interfere with University functions on online platforms (e.g., use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's *Academic Accommodation of Students with Disabilities* policy.

Academic Accommodation for Religious, Indigenous or Spiritual Observances (RISO)

Students requiring academic accommodation based on religious, indigenous, or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make

alternative arrangements for classes, assignments, and tests.

Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.