IBEHS 2E06
Health Engineering Science Entrepreneurship 1
Human-Centred Design
Fall/Winter 2019/20
Course Outline

CALENDAR/COURSE DESCRIPTION

The course will explore the concepts of human-centred design, foresight, and systems design as central to discovering and defining health problems. Students will develop capabilities in creative confidence and collaboration through group projects using a design thinking process.

Lecture (three hours); both terms

PRE-REQUISITES AND ANTI-REQUISITES

Prerequisite(s): IBEHS 1P10 A/B and registration in the Health, Engineering Science and Entrepreneurship Specialization of the Integrated Biomedical Engineering and Health Sciences (IBEHS) program

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INSTRUCTOR OFFICE HOURS AND CONTACT INFORMATION

Dr. Sean Park   Office Hours: by appointment
MDCL 3522
spark@mcmaster.ca
ext. 20316

TEACHING ASSISTANT OFFICE HOURS AND CONTACT INFORMATION

Arjun Raghavan – raghavaa@mcmaster.ca

COURSE WEBSITE/ALTERNATE METHODS OF COMMUNICATION

SLACK: https://hese2e06c2.slack.com/
MURAL: https://bit.ly/2EGARFK

COURSE OVERVIEW

This course introduces conceptual and applied approaches to human-centered design, an essential component of ethical innovation, leadership, and entrepreneurship.
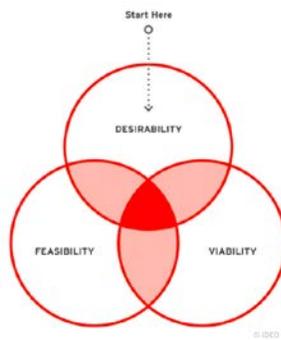
Human-centered design focuses on discovering what is important, desirable, and valuable to people and using this knowledge to create products, services, spaces, experiences and systems that address human needs, hopes, desires, and dreams. The goal of the specialization is not to help you become entrepreneurs per se, but to develop an entrepreneurial mindset that can used in any environment or role to create value in a number of contexts (e.g. social value, economic value). In the context of developing this entrepreneurial mindset, the goal of the course is to learn the **front end of design** where how to discover what is desirable to people, define opportunities for improving people's lives, and design products, services and experiences that can provide value. *Later courses* will focus on how make your designs feasible and viable in the long-run through business models, finance, regulation, etc.

We will use a design thinking methodology to explore and develop novel solutions for health topics in everyday and biomedical contexts. Design thinking is deeply embedded in the culture of the most innovative organizations in the world including Apple and IBM. The pinnacle outcome of design thinking is the development of **creative confidence**; the ability to come up with new ideas, take risks in trying out those ideas, and learn from failures. Design thinking and the development of creative confidence rests on a number of **mindsets** this course will seek to help you develop.

Mindsets

A mindset is an orientation, belief or attitude that guides how we act. It is not a set of discrete facts or content, but more about the process and overarching way of thinking that shapes our work. We will explore a few mindsets including:

- Focus on human values – Developing empathy for others and their experiences. Creating values requires understanding how others experience and perceive the world, rather than basing our actions on what we think others need
- Build great, diverse teams – Creating conditions for people to thrive in teams is essential for creating value that would not be possible working alone
- Bias-to-action and experimentation – Learning through experience and interaction enables us testing our assumptions, generating knowledge that cannot be gleamed through reading, and tapping into our ability to creatively improvise.
- Think about process – Planning our work, being reflective about what happened, and learning from what happened helps us use our time and resources efficiently, let go of designs that are not working, and be strategic
- Create clear and influential communication – Paying attention to how body language, text, verbal communication and design what is perceived enables us to influence ourselves and others
- Move between the abstract to concrete – Making our ideas tangible (visual, tactile, experiential) and using the tangible to inspire our ideas enables us to test and evolve our ideas

Processes and Skills

The above mindsets are developed through practice. The Stanford d.school design thinking process, skills and associated methods/tools will serve as a scaffold for the design projects.
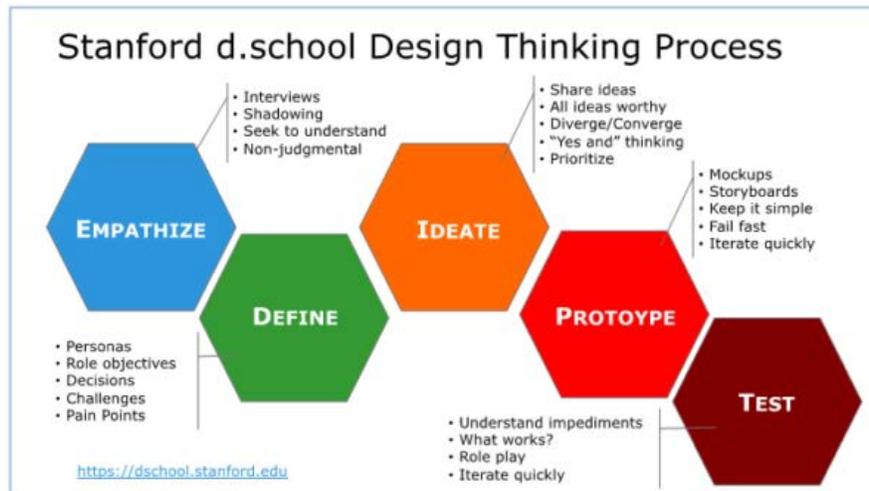
Within each mode of the d.school process you will develop skills in the following areas:

- Empathize - Develop an appreciative, humanistic perspective of others' lived experience. Build connection and understanding through conversation, interviews, ethnographic observation, and storytelling
- Define – Use qualitative evidence about people's experience and research literature to frame opportunities. Analyze and synthesize data to discover insights and translate these insights into personas and stories that illustrate where a design is required
- Ideate – Engage in radical creativity to generate new ideas for acting upon a defined opportunity. Play, absurdity, metaphorical thinking and disciplined creativity generate many ideas (divergent thinking) and prioritization of ideas (convergent thinking) helps in selecting one idea to turn into a prototype
- Prototype – Make an idea both tangible and grounded in lived experience through the use of storyboards, role plays, and lo-fidelity artifacts
- Test – Rather than validate, seek to quickly and rigorously test the assumptions about how people will respond to and experience the prototype. Use the feedback to gain more empathy, redefine the opportunity, or refine the prototype.

Design Projects

Project themes will vary year-to-year. A focus is placed on projects that examine health and wellness as (w)holistic phenomenon, not merely as the absence of disease. Past projects have included designing for behaviour change around nutrition, physical activity, digital distraction/technology addiction, and mental health issues stemming from a lack of social connection.

Milestones will include:

- Building Great Teams – a group-based assignment to explore values and needs around creating a collaborative, focused design team
- TCPS2 Core Module – the Tri-Council Policy Course on Research Ethics is an online tutorial covering basic research ethics and result in a certificate
- Design Brief – a document providing an overview of a challenge, evidence from field work, and opportunity/problem definition
- Prototype Report - description of ideation process, prototype, prototype testing plan, and results from testing prototype
- Peer and self assessments – Reflective activities that enable you and others to look at what happened and plan for what you would like to do going forward
- Presentations/Performances/Exhibits – formal presentations of learning process and project outcomes

Self-Development Project

A year-long self-development project will serve as a primary thread for each student's synthesis of learning. Beginning in the summer before the course starts with a reflective assignment and call with the instructor and another peer, students will start to craft opportunity statements related to creative confidence, collaboration, and design thinking mindsets. Weekly action-reflection assignments will enable students to apply design thinking mindsets to their personal opportunity statements inside and outside the classroom. Using tools provided, including feedback from peers, students will capture and assemble evidence of learning and communicate with peers and the instructor at various points in the course. A mid-year conversation (with instructor, student, and their design team) and end-of-year exit conversation (instructor and student) will enable students to reflect on growth and identify areas of further growth beyond the course.

Attendance and Participation

Students are expected to attend each class on time. Attendance will be recorded, be included a piece of evidence for students' self-development project, and be considered as part of the final grade evaluation. A self-sign in system using a QR-code will be used for each class. There are ways of scanning QR-codes using a mobile phone camera without an app - see Android and iPhone. There are also many free QR-code scanners for mobile phones. Failure over the duration of the course to show up in time or at all will result in reduction of your final grade as seen below:

Missed two classes = OK
Missed four **classes = grade drops by 1⁄2 letter** (e.g. A to A-)
Missed six classes = full letter drop (e.g. A to B)
3 times late (more than 15 minutes) = full absence

Students are also expected to evaluate themselves and their peers in context of their participation with their team and how their mindsets and skills are developing over the course. This feedback from peers will also be included in the final grade evaluation.

Please refer to the Assessment section and Notifications For Student Absences section for more information.

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COURSE OBJECTIVES

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

- Create a psychologically safe team with defined roles in order to understand why good design and effective teams require groups that know how to function well through challenges
- Skillfully give and receive feedback to team members and critique projects from a variety of viewpoints
- Identify and pursue personal opportunities for growth in context of developing a human-centred design mindset
- Appreciate how human-centred design is foundational to the ethical development of an entrepreneurial mindset
- Understand health as a lived experience
- Use foresight to identify potential opportunities and challenges in the future of health
- Conduct ethnographic fieldwork, including interviews and observations to gain empathy for people
- Find, evaluate and use a range of information and secondary research to answer a question
- Synthesize qualitative data to identify and articulate the needs, desires, values of people
- Define, frame, and redefine opportunities/problems for helping others and oneself
- Engage in play as a means to nurture collaboration and creativity
- Rapidly ideate a range of novel ideas and solutions
- Critically analyze a range of design options to converge on a decision
- Rapidly develop a range of low and medium fidelity prototypes
- Apply principles from behavioural design to understanding of user experiences, design of solutions, and effective, influential communication of ideas to others
- Utilize a range of user testing methods to elicit feedback for iteration and pivoting
- Reflect upon performance and identify ways to improve
- Articulate the human-centred design process as a way of thinking and learning

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MATERIALS AND FEES

Required Texts and Other Materials: As provided by instructor

ASSESSMENT

Evaluation in this course will take several forms; we evaluate you, you evaluate yourself, and you evaluate each other. We have started by describing a mindset and process for design thinking and value creation. This is the focus of the evaluation. You need to demonstrate to yourself and to us, objectively and with evidence, that you have changed (shift in mindset and skills) from the start to the end of the course. It is really that simple, in principle.

We will sit down with you and have several discussions (late summer, late December, early April). The mindsets and your level of effort, engagement, development, and growth will translate to a letter grade during the final exit interview in early April using the descriptors listed below. Any facilitator or peer should be able to review your evidence and arrive at a similar evaluation.

A range - Has attained a higher level of competency in all, or almost all, of the stated mindset and skill areas. Aware of areas requiring further development and has developed strategies for continued growth

B range - Has attained a higher level of competency in many (but not all) of the stated mindset and skill areas, or has attained moderate competency in all of the mindset and skill areas. Will have developed a plan of action for further development in those areas that need it.

C range - Has attained moderate level of competency in some of the stated mindset and skill areas or has attained a low level of competency in all of the mindset and skill areas. Cannot appropriately recognize the concerns and has difficulty discussing a plan of action.

LEARNING OUTCOMES

Outcomes	Indicators*
Identify and evaluate opportunities, needs and trends in the health and biomedical engineering sectors of the economy.	H1
Apply design thinking to health and biomedical problems.	H2
Understand markets, customer service and relationships and sales and marketing strategies.	H3
Identify, formulate, and solve problems at the interface of engineering and health sciences.	A5
Collaborate effectively with peers in multidisciplinary teams.	A7
Communicate in a professional manner to interdisciplinary audiences.	A8
Contribute to the assessment process through personal and peer evaluations.	A9
Demonstrate a strong sense of personal awareness.	A10
Demonstrate an understanding of societal, professional and ethical responsibility.	A11
Recognize the need for, and demonstrate an ability to engage in, life-long learning.	A12

*see Learning Outcomes section at the end of this document

INCLUSIVE ENVIRONMENT STATEMENT

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

We will gladly honour your request to address you by an alternate name or gender pronoun. Please advise us of this preference early in the semester so that we may make appropriate changes to our records.

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
http://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.

ACADEMIC ACCOMMODATIONS

Students who require academic accommodation must contact Student accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contact by phone at 905.525.9140 ext. 28652 or e-mail at sas@mcmaster.ca. For further information, consult McMaster University's Policy for Academic Accommodation of Students with Disabilities.

NOTIFICATION OF STUDENT ABSENCE AND SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK

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1. The McMaster Student Absence Form is a self-reporting tool for Undergraduate Students to report absences DUE TO MINOR MEDICAL SITUATIONS that last up to 3 days and provides the ability to request accommodation for any missed academic work. Please note this tool cannot be used during any final examination period.

2. You may submit a maximum of 1 Academic Work Missed request per term. It is YOUR responsibility to follow up with your Instructor immediately (NORMALLY WITHIN TWO WORKING DAYS) regarding the nature of the accommodation. Relief for missed academic work is not guaranteed.

3. If you are absent for reasons other than medical reasons, for more than 3 days, or exceed 1 request per term you MUST visit the Associate Dean's Office (JHE/A214). You may be required to provide supporting documentation.

4. This form must be submitted during the period of absence or the following day, and is only valid for academic work missed during this period of absence.

5. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in his/her course.

6. You should expect to have academic commitments Monday through Saturday but not on Sunday or statutory holidays. If you require an accommodation to meet a religious obligation or to celebrate an important religious holiday, you may submit the Academic Accommodation for Religious, Indigenous and Spiritual Observances (RISO) Form to the Associate Dean's Office. You can find all paperwork needed here: http://www.eng.mcmaster.ca/current/documents.html

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NOTICE REGARDING POSSIBLE COURSE MODIFICATION

The instructor and 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. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

ON-LINE STATEMENT FOR COURSES REQUIRING ONLINE ACCESS OR WORK

In this course, we will be using SLACK and MURAL. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail 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.

REFERENCE TO RESEARCH ETHICS

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. Any departure from these principles will diminish the integrity of the research enterprise. This policy applies to all those conducting research at or under the aegis of McMaster University. It is incumbent upon all members of the university community to practice and to promote ethical behaviour. To see the Policy on Research Ethics at McMaster University, please go to https://reo.mcmaster.ca/.

PEDAGOGICAL STUDY

For the study of health sciences and engineering education, you may be asked to provide information or feedback about course components. When possible, the instructor will share these results with participants.

IBIOMED PROGRAM LEARNING OUTCOMES

Learning Outcomes Common to the IBEHS program

Upon completion of the undergraduate program, all graduates of the Integrated Biomedical Engineering and Health Sciences program will be able to:

A1 Apply knowledge of mathematics (including differential equations and statistics), life and physical sciences, and engineering.

A2 Apply knowledge of health from biological, behavioural, and population-based perspectives.

A3 Demonstrate an understanding of the structure, function and behaviour of the human body, the environmental determinants of health and the ways that these factors interact to result in disease or illness.

A4 Exhibit a working knowledge of contemporary issues in biomedical engineering and health care.

A5 Identify, formulate, and solve problems at the interface of engineering and health sciences.

A6 Employ translational design and research practices to solve biomedical engineering problems of an interdisciplinary nature.

A7 Collaborate effectively with peers in multidisciplinary teams.

A8 Communicate in a professional manner to interdisciplinary audiences.

A9 Contribute to the assessment process through personal and peer evaluations.

A10 Demonstrate a strong sense of personal awareness.

A11 Demonstrate an understanding of societal, professional and ethical responsibility.

A12 Recognize the need for, and demonstrate an ability to engage in, life-long learning.

Learning Outcomes for the Health, Engineering Science and Entrepreneurship specialization

In addition to the learning outcomes common to all graduates in the IBEHS program, graduates in Health, Engineering Science and Entrepreneurship specialization will be able to:

H1 Identify and evaluate opportunities, needs and trends in the health and biomedical engineering sectors of the economy.

H2 Apply design thinking to health and biomedical problems.

H3 Understand markets, customer service and relationships and sales and marketing strategies.

H4 Understand finance and fundraising from discovery through product and service development.