



**HOW TO CHANGE
THE WORLD**

Interdisciplinary Studies for Sustainability & Innovation

the collaborative multi-university
'How to Change the World' course

Version 2.2 (6 October 2022)

CONTENTS

Course Description	3
Course Framework	4
Course Context	4
Interdisciplinary Course	4
Multi-university Course → Virtual Delivery & Team Collaboration	5
Sustainability Broadly Defined & Globally Distributed Communities	5
Community Challenge and Team Assignments	6
Learning Outcomes	6
General Learning Outcomes	6
Disciplinary Learning Outcomes	7
Deliverables	7
Team Deliverables	7
Individual (Disciplinary) Deliverables	7
Final Teammate Evaluations (and supporting Team Self-Assessments)	8
Required Readings	8
Evaluation	8
Course Components & Schedule	9
Course Components & Schedule	9
Weekly Course Sessions – Workshops, Seminars & Check-ins	9
Asynchronous Multimedia Materials	9
Course Schedule	10
Appendix 1: Expanded General Learning Outcomes	11
Mindsets	11
Mental Models and Skills Development	13
Sustainability Awareness	14
Appendix 2: Disciplinary Learning Outcomes	15
Arts and Humanities	15
Business/Management Learning Outcomes	16
Engineering Learning Outcomes	16
Natural Science (including Medical Sciences) Learning Outcomes	17
Social Science Learning Outcomes	17

Course Description

This is an interdisciplinary and multi-university project-based course focused on positively impacting the complex sustainability challenges faced by real-world communities around the world.

Throughout this course, students work in small (*three to five person*) interdisciplinary and multi-university teams in order to (1) identify and understand a well-defined sustainability (*social and/or environmental*) problem faced by a real-world community, and then (2) devise, design and propose an implementable idea for positively impacting that problem.

During the course, teams are introduced to and guided through a variety of interdisciplinary methods for identifying and interrogating the diverse social, environment and technological dimensions of both their chosen sustainability problem and their proposed solution. Each student is also provided with guidance and support for understanding how the skills and knowledge of the discipline(s) they are studying can be applied to tackling complex sustainability challenges.

During the course, students are provided with multiple facilitated and structured opportunities to:

- engage directly with local stakeholders from the community their team is focused on;
- receive mentorship from a global network of experienced sustainability and innovation experts; *and*
- collaborate with a diverse array of students from other disciplines and institutions working on similar sustainability problems with other communities around the world.

The course is delivered primarily through:

- Synchronous course sessions (*three hours per week*) that are highly-interactive and team-based, and that include:
 - workshops that guide teams through the application of interdisciplinary methods and tools to their context;
 - direct engagement with community stakeholders, and with global sustainability and innovation experts and mentors;
 - check-in meetings with members of the teaching team; *and*
 - small-group seminar discussions led by teaching team members.

- Supporting asynchronous multimedia materials that provide preparation for workshops and seminars, as well as guidance and assistance for teams and individuals with their project work and deliverables.
- The course deliverables themselves, which include the following:
 - five individual deliverables (*four short assignments, and one short report*) incorporating disciplinary knowledge and reflections;
 - two major team deliverables, accompanied by regular team self-assessments covering project progress and learning; *and*
 - a final showcase, incorporating interviews with external judges and peer-to-peer assessment of final deliverables.

Students should expect to spend an average of between eight to ten (8-10) hours per week on this course across the term (*including synchronous course sessions*).

Course Framework

This course follows the experiential Learning Journey at the heart of all How to Change the World programs. The main stages of that Learning Journey are described briefly in [this short illustrated video](#) and represented by these simple icons:



Figure 1 The icons representing the main stages of our foundational Learning Journey

While the video primarily depicts the delivery of an in-person program, this virtually delivered course remains grounded in the same experiential learning pedagogy, follows the same overarching Learning Journey, and provides the same learning outcomes.

Course Context

Interdisciplinary Course

This is an interdisciplinary course. The general course framework and experience is the same for all students, regardless of discipline, degree of study, or university.

That said, students studying different fields and disciplines are, by definition, learning distinct knowledge and skills from their studies. Each student therefore brings their own emerging disciplinary expertise to this course, and practices deploying it within the

context of a highly diverse interdisciplinary environment. Throughout the course, every student learns – by doing – how to communicate key concepts from their discipline(s) with a diverse range of non-specialist colleagues (*spanning teammates from other disciplines, to local stakeholders and experts with diverse real-world experience*), and how to identify the distinct contributions that their disciplinary expertise enables them to make to their team’s project work..

One goal of this course is to enable students from diverse disciplines to integrate experience and learning from this course with the broader learning journey of their own disciplinary degree program(s). In that context, the general course framework is also complemented by some field/discipline-specific content and guidance.

Multi-university Course → Virtual Delivery & Team Collaboration

This is a multi-university course, and **student teams are created to include students from across the participating universities.**

Because of the multi-university – and therefore geographically distributed – nature of the course, **all synchronous sessions will be delivered fully-virtually, and student teams will be set up with a customised suite of virtual collaboration tools to enable their collaborative project work.** All engagement with community stakeholders, sustainability/innovation mentors and the teaching team will take place virtually as well.

Whenever possible, opportunities for in-person interaction between students within each university will be provided during the course.

Students participating in the Winter 2023 version of the course come from the following institutions: **TBC.**

Sustainability Broadly Defined & Globally Distributed Communities

This course takes ‘sustainability’ to be defined broadly – encompassing social, environmental, economic and technological dimensions – as represented by the United Nations’ Sustainable Development Goals (UN SDGs).

Similarly, as these sustainability challenges are global in nature – meaning they are faced by communities and countries all around the world – the local communities at the centre of student team projects are distributed around the world. Engagement with local community stakeholders is thus facilitated virtually.

Community Challenge and Team Assignments

At the start of the second week of the course, students are assigned to both their teams (*which will be interdisciplinary and multi-university*) and to the real-world community their team will focus on. These assignments are made based on the preferences that students express during the first week of the course based on reviewing a range of materials provided at the start of the course.

After receiving their assignments, each team is then guided through a process to collaboratively identify the specific aspects of sustainability that they want to tackle within the context of the community they are focused on. That process involves direct engagement, consultation and co-design with local community stakeholders, along with consideration of the unique knowledge, skills and passions that each member of the student team brings to the table.

Learning Outcomes

General Learning Outcomes

By the end of the course, every student should be **inspired, empowered and equipped** to:

apply their pre-existing knowledge, skills and passions;

and

collaborate with highly diverse colleagues, stakeholders and experts;

in order to

collaboratively identify and investigate focused, tractable problems within complex societal challenges;

for which they can

iteratively co-design and effectively communicate implementable solutions;

that

positively impact real-world social and environmental sustainability challenges.

A comprehensive explanation of these general learning outcomes – including a breakdown of the mindsets, frameworks, mental models and skills the course aims to develop for students – is provided in Appendix 1 of this syllabus.

Disciplinary Learning Outcomes

In addition to the general learning outcomes applicable to all students within the course, there are additional focused learning outcomes for students from across a broad range of disciplinary areas provided in Appendix 2.

Deliverables

Team Deliverables

There are two major team deliverables during the course:

- A **multimedia Design Brief** that details – with appropriate qualitative and quantitative detail, and bibliographic referencing – the focused sustainability problem the team is focusing on. This design brief will be submitted approximately half-way through the course.
- A **multimedia Proposed Solution Portfolio** that presents – with appropriate qualitative and quantitative detail, and bibliographic referencing – the team’s proposed solution to the focused sustainability problem the team has focused on. This portfolio is submitted near the end of the course.
 - Following submission of their Proposed Solution Portfolio, student teams are required to attend an interview to answer questions about their project. This interview will be with a small panel composed of teaching team members, community stakeholders and sustainability/innovation mentors who have reviewed their submission in detail ahead of the interview.

Both of these deliverables will be produced in structured multimedia formats within the virtual learning environment of the course.

Individual (Disciplinary) Deliverables

Alongside the major team deliverables, each student is required to:

- submit four short assignments (*approximately 1-2 pages each*) on the topics of;
 1. Systems Mapping
 2. Stakeholder Analysis
 3. Sustainability Pillars
 4. Disciplinary Reflection
- submit one State of the Art and Ideation report (*approximately 3-4 pages*); and

- attend and actively contribute to regular team check-ins, and multi-team seminar discussion sessions.

The assignments, report and seminar discussions all require each student to reflect on the disciplinary knowledge, concepts and skills they are bringing to bear throughout their team’s project work.

Final Teammate Evaluations (*and supporting Team Self-Assessments*)

At the end of the course, each student is required to submit an evaluation of their teammates’ performance and contributions throughout their collaborative project work. As noted in the Evaluation table below, these Final Teammate Evaluations do impact the individual grade received by each student on their two major team deliverables.

To ensure each student is aware of how their performance and contributions are being perceived by their teammates throughout the course, regular Team Self-Assessments are required throughout the course. While these self-assessments do not impact individual grades, they do provide teams and individuals with opportunities to identify and address perceived issues long before the final teammate evaluation takes place.

Required Readings

All required readings, including a range of multimedia materials, will be provided for students within the virtual learning environment provided for the course. No textbooks are required for this course.

Students can expect an average of thirty to sixty (30-60) minutes of readings and materials each week. Materials are drawn from a wide range of academic and professional sources to support and guide student teams’ progress on their projects.

Students will be expected to actively contribute to seminar group discussions (*described further below*) based on the provided readings and materials.

Evaluation

Team Design brief *	30%
Team Solution portfolio & interview *	40%

Individual Assignments (<i>four total</i>)	10%
Individual Report	10%
Individual Seminar Contributions	10%

✦ All members of the team receive the same preliminary mark for all collaboratively produced work; specifically the Design Brief and Solution Portfolio. Final teammate evaluations of each person's contributions to those team deliverables will then scale individual marks by up to $\pm 5\%$ while keeping the average team mark the same. The final peer evaluation process will be reviewed, and if necessary moderated, by the teaching team.

PLEASE NOTE: Each unexcused absence from a course session will result in a 1% overall grade penalty.

Course Components & Schedule

Course Components & Schedule

Weekly Course Sessions – Workshops, Seminars & Check-ins

Course sessions are highly interactive, with the majority of the time spent going through guided team-based exercises (Workshops), and/or in small group discussions (Seminars & Check-ins). Some sessions also include unique opportunities for synchronous team discussions with community stakeholders and global sustainability/innovation mentors.

Given the negative impact of non-attendance of the learning experience of *other* students (*not just oneself*), **full attendance at all course sessions – particularly Workshop, Seminar & Check-in components – is required for all students.** Attendance is taken at all course sessions, and **each unexcused absence will result in a 1% overall grade penalty.**

Asynchronous Multimedia Materials

Student teams will be provided with multimedia curricular materials on a weekly basis that provide preparation for workshops and seminars, as well as guidance and assistance for teams and individuals on their project work and deliverables.

Course Schedule

A section-specific course schedule will be provided with specific days and times for all course components (*Part 1 & Part 2 course sessions, as well as deliverables*). Please note that, in order to align with section scheduling, the sequence of Parts 1 & 2 might reverse for some weeks, and some deliverable due dates might shift to the next week.

Week		Part 1	Part 2	Deliverables
1	January 9-13	Course Introduction & Overview <i>Interdisciplinarity</i>	Platform Walkthrough and Q&A <i>with time to complete material review and onboarding</i>	Course Onboarding Steps & Surveys
2	January 16-20	Workshop 1a <i>Team & Project Kickoff</i>	Workshop 1b <i>Guided Team Building Exercises</i>	System Map Individual Assignment
3	January 23-27	Seminar 1 <i>Design & Systems Thinking</i>	Teaching Team Check-ins <i>& team working time</i>	Stakeholder Analysis Individual Assignment <i>Team Self-Assessment</i>
4	January 30 - February 3	Workshop 2 <i>Expert Studio I</i>	Teaching Team Check-ins <i>& team working time</i>	Sustainability Pillar Individual Assignment
5	February 6-10	Seminar 2 <i>Sustainability</i>	Teaching Team Check-ins <i>& team working time</i>	Design Brief Draft <i>Team Self-Assessment</i>
6	February 13-17	Workshop 3 <i>Open Innovation I</i>	Teaching Team Check-ins <i>& team working time</i>	Design Brief Team Deliverable
7	February 20-24	Reading Week Break (some institutions) or Self-Work		State of the Art & Ideation Individual Report <i>due end of week a student is <u>not</u> on break</i>
8	February 27 - March 3	Reading Week Break (some institutions) or Self-Work		
9	March 6-10	Seminar 3 <i>Leadership, Innovation and Practical Humility</i>	Teaching Team Check-ins <i>& team working time</i>	OPTIONAL: Design Brief Resubmission <i>Team Self-Assessment</i>
10	March 13-17	Workshop 4 <i>Expert Studio II</i>	Teaching Team Check-ins <i>& team working time</i>	Solution Portfolio Draft
11	March 20-24	Workshop 5 <i>Open Innovation II</i>	Teaching Team Check-ins <i>& team working time</i>	Solution Portfolio Team Deliverable
12	March 27-31	Judging Panel Interviews		Final Teammate Evaluations
13	April 3-7	Showcase		Disciplinary Reflection Individual Assignment

Appendix 1: Expanded General Learning Outcomes

The general learning outcomes for the course are summarised by this statement:

By the end of the course, every student should be **inspired, empowered and equipped** to:

apply their pre-existing knowledge, skills and passions;

and

collaborate with highly diverse colleagues, stakeholders and experts;

in order to

collaboratively identify and investigate focused, tractable problems within complex societal challenges;

for which they can

iteratively co-design and effectively communicate implementable solutions;

that

effectively contribute to addressing real-world social and environmental sustainability challenges.

This statement intentionally packs in a lot of information. While it is useful as a quick reference for teaching team and students alike, the following sections provide further detail about the constituent components that are implicit within this overarching statement.

Mindsets

Although students enter this interdisciplinary and multi-university course with a diverse range of preexisting skills and knowledge, an overarching aim of the course is to provide every student with the same expanded mindsets. Specifically, there are four foundational mindsets that the course aims to cultivate for all students, regardless of discipline. These four foundational mindsets are also the basis of two broader mindsets described below.

- (1) **Every student should leave the course empowered with the confidence (*aka knowing, or believing*) that they are able and encouraged to deploy their knowledge, skills and passions to make a positive impact on communities and sustainability issues that they care about** – not least because they have experienced doing so throughout the program. (Empowered Mindset)

Several common barriers to this empowered mindset faced by students are: (i) a sense of self-doubt about their own ability to effectively contribute to such large and/or complex challenges; (ii) discomfort with tackling the open-ended nature of such complex challenges; and (iii) reinforced self-doubt when new information or learning reveals incorrect assumptions underlying previous work (*which are then perceived as mistakes*).

For these reasons, the course incorporates pedagogical elements designed to inspire and empower students throughout. These elements include: significant focus on self-directed teamwork and

learning (*balanced with appropriate guidance and coaching*); motivational aspects integrated within the overarching directive guidance; and provision of a wide variety of inspirational examples.

Another core pedagogical element that is integrated throughout the program relates to the second mindset the course aims to cultivate.

- (2) **Every student should leave the course appreciating the importance of – and having experienced practical approaches for – iterative continuous learning when tackling (socially, technologically, economically and/or environmentally) complex societal challenges.** (Continuous Learning Mindset)

*NOTE: An important practical approach for the Continuous Learning Mindset is the **Scientific Mindset** of iteratively formulating and testing hypotheses based on continuous evidence gathering and evaluation. In this context, Continuous Learning is presented as a broader framing, because it encompasses the Scientific Mindset while also accounting for other areas of learning, such as: (a) development of personal capabilities (for example, ability to collaborate with colleagues from other disciplines or cultures); and (b) non-scientific forms of analytic inquiry (for example, ethical or philosophical analysis).*

This focus on the importance of – and methods for – iterative continuous learning provides a model of foundational behaviour patterns for successfully tackling complex societal challenges. The same is true for the third mindset the course aims to cultivate for students through the inherently collaborative and team-based nature of the program.

- (3) **Every student should leave the course appreciating the value of – and having experienced practical approaches for – collaborating with highly diverse colleagues and stakeholders when tackling complex challenges.** (Collaborative Mindset)

NOTE: Underlying this mindset is the pedagogical approach of intentionally cultivating interdisciplinary, intercultural, international and intergenerational diversity within the collaborative interactions that students experience.

Invariably, attempting to tackle complex ('wicked') societal challenges in highly diverse and collaborative environments involves confusing and frustrating moments. The fourth foundational mindset we aim to cultivate addresses these aspects directly.

- (4) **Every student should leave the course with greater mental and emotional resilience to perceived setbacks** – particularly setbacks in the form of (i) new evidence that alters their understanding of a (*complex*) problem and/or proposed solution, and/or (ii) difficult moments when collaborating within diverse teams (*for example miscommunications within diverse interdisciplinary teams*). (Resilience Mindset)

This resilience mindset is cultivated through discussion of, and encouraged self-reflection on, the emotions each student experiences throughout the intensive and iterative learning journey. Discussion of and reflection on the moments of 'peak frustration' (*that are intentionally designed into*

the program) enable students to consciously evaluate, discuss and cultivate their mental and emotional resilience.

Taken together, these four mindsets comprise the basis of the broader **Entrepreneurial and Design Thinking Mindsets**. Specifically, having the confidence and resilience to deploy one's knowledge, skills and passions – in collaboration with a diversity of others – to tackle complex challenges; to view setbacks as collaborative learning opportunities; and, through that, to embrace and practice iterative and collaborative continual learning throughout all stages of their work; covers the foundational aspects of both entrepreneurial and design thinking mindsets.

In addition to the mindsets discussed above, the program also aims to cultivate a **Global Mindset**.

Every student should leave the course with an appreciation for the value of engaging and learning from contexts outside of one's own local environment when tackling complex challenges. (Global Mindset)

While not necessarily foundational to entrepreneurship or design thinking, awareness of, appreciation for and willingness to learn from contexts outside of one's local environment is invaluable for anyone who aspires to make a positive impact. This mindset underpins: (i) the use of the UN Sustainable Development Goals as a guiding framework; (ii) the selection of globally (*ie. culturally and nationally*) diverse local contexts for the Challenges; (iii) the pedagogical pairing of teams working on local contexts from different parts of the world during open innovation sessions; (iii) the engagement of globally diverse stakeholders and mentors (*and, where possible, teaching team*); and (iv) the creation of as much diversity within students teams as is feasible given the student demographics of course.

Embedded across these mindsets are also the foundational values that underpin both this course and the How to Change the World social enterprise delivering the course. Those are:

- **Humility** ⇒ Accepting that we do not have all the answers (*especially in the context of complex societal challenges*), and therefore remaining continuously open to learning from diverse perspectives, insights and evidence.
- **Intentionality** ⇒ Remaining focused on the collaborative goal of making a positive impact, while being willing to push boundaries with innovative ideas.
- **Diversity** ⇒ Intentionally seeking perspectives, insights and ideas from the broadest possible range of colleagues and stakeholders, and engaging in ways that empower the unique knowledge, strengths and passions each person brings.

Mental Models and Skills Development

To support students' mindset shifts, and to better enable students to act effectively based upon these mindsets following the course, **every student should also leave the course with mental models, methods and skills that equip them to engage and collaborate effectively with diverse colleagues and stakeholders in any context, and especially when seeking to make a positive societal and/or environmental impact.**

Specifically, by the end of the course, every student should be able to:

- appreciate why clear problem definition and stakeholder engagement are essential when attempting to tackle complex societal challenges;
- understand practical frameworks and methods for human-/community-centric problem identification and definition (*grounded in design and systems thinking approaches*) – and apply those frameworks and methods to develop and iteratively evaluate their own problem definition;
- understand practical frameworks and approaches for effective formation, communication and collaboration within highly diverse teams [i.e. interdisciplinary, and where possible, international and intercultural] – and apply those frameworks and approaches to develop and cultivate effective collaboration within their own highly diverse team;
- understand and apply practical approaches for effectively engaging with both local stakeholders and senior experts to develop deeper awareness and understanding of diverse knowledge bases and perspectives;
- understand and apply practical methods for researching, critically evaluating and synthesising evidence from a large and diverse range of sources within a collaborative interdisciplinary environment;
- understand practical methods for evaluating and balancing the social acceptability, technical feasibility, environmental sustainability and economic viability – and apply them both to guide and defend the selection of their own proposed solution, and to provide constructive feedback and critiques on others' proposed solutions; *and*
- understand and apply practical approaches for creating effective multimedia communications portfolios and delivering effective presentations.

Sustainability Awareness

The mindsets, mental models, methods and skills developed in this course are generally applicable to any complex real-world challenges students choose to tackle in the future. This course focuses specifically on how this learning can be applied to broadly defined sustainability challenges.

In this context, an additional aim is that **every student should leave the course with a broader understanding of global sustainability issues, and an appreciation for some of the differences and similarities regarding how those global issues play out locally across diverse geographic and cultural contexts**. As noted earlier in the syllabus, the course uses the UN Sustainable Development Goals as a framework for introducing students to global sustainability issues.

This is closely coupled to the Empowered Mindset described above, as that represents the further aim that **every student should leave the course motivated and equipped – and with a sense of responsibility – to deploy their knowledge and skills to collaboratively tackle sustainability issues they are passionate about, in communities that they care about**.

Appendix 2: Additional Learning Outcomes by Disciplinary Area

Each student is encouraged and expected to bring the distinct knowledge, concepts, skills and competencies from their discipline to bear throughout the course, and particularly in their project work within their interdisciplinary (and multi-university) team.

In order to facilitate and support this, discipline-specific content is incorporated throughout the course in the following ways:

- The multimedia preparatory materials for each seminar discussion, along with the initial introductory materials for the course as a whole, integrate a variety of discipline specific examples. Students are expected to review the materials for their own discipline(s), and encouraged to review the materials for the other disciplines represented by the colleagues on their team.
- Each individual Assignment and Report explicitly requires students to identify and reflect on the distinct contributions that their (emerging) disciplinary expertise enables them to make to their team's project work.
- During 'Open Innovation' workshop sessions, students from the same (or similar) disciplines are grouped together, facilitating peer-to-peer disciplinary learning within the broader interdisciplinary context of the course.
- Finally, the Teaching Team for each course iteration includes members from across the disciplinary areas represented within that iteration. That ensures that every student is able to access guidance and support from Teaching Team members with directly relevant disciplinary knowledge and experience.

Below the learning outcomes for each broad field of disciplines is presented.

Arts and Humanities Learning Outcomes

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

- critically discuss the potential for the arts and humanities broadly – and their arts and/or humanities discipline specifically – to positively impact complex (social, economic and environmental) sustainability challenges across diverse contexts;
- identify distinct concepts, knowledge, skills and competencies from the arts and humanities generally – and their arts and/or humanities discipline specifically – that could be mobilised to usefully contribute to tackling a complex sustainability challenge or problem;

- work with colleagues from other disciplines to devise, design and propose arts/humanities-grounded interdisciplinary ideas that could address a complex sustainability problem;
- identify and analyse the ethical and equity dimensions of a complex sustainability problem from the perspective of their arts and/or humanities discipline, and evaluate the likely ethical and equity implications of proposed solutions – particularly leveraging insights and understanding from the arts and humanities – to that problem; *and*
- communicate the results of comprehensive arts and/or humanities analyses and proposals clearly and effectively to diverse audiences.

Business and Management Learning Outcomes

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

- critically discuss the potential for the field of business and management broadly – and their business and/or management discipline specifically – to positively impact complex (social, economic and environmental) sustainability challenges across diverse contexts;
- identify distinct concepts, knowledge, skills and competencies from business and management generally – and their business and/or management discipline specifically – that could be mobilised to usefully contribute to tackling a complex sustainability challenge or problem;
- work with colleagues from other disciplines to devise, design and propose interdisciplinary ideas grounded in good business and management plans that could addressing a complex sustainability problem;
- identify and analyse the ethical and equity dimensions of a complex sustainability problem from a business and management perspective, and evaluate the likely ethical and equity implications of proposed solutions – and particularly the business and management aspects of the proposed solutions – to that problem; *and*
- communicate the results of comprehensive business and management analyses and proposed plans clearly and effectively to diverse audiences.

Engineering Learning Outcomes

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

- critically discuss the potential for engineering broadly – and their engineering discipline specifically – to positively impact complex (social, economic and environmental) sustainability challenges across diverse contexts;
- identify distinct concepts, knowledge, skills and competencies from engineering generally – and their engineering discipline specifically – that could be mobilised to usefully contribute to tackling a complex sustainability challenge or problem;
- work with colleagues from other disciplines to devise, design and propose engineering-enabled interdisciplinary ideas that could address a complex sustainability problem;
- identify and analyse the ethical and equity dimensions of a complex sustainability problem from an engineering perspective, and evaluate the likely ethical and equity implications of proposed solutions – and particularly the engineering aspects of the proposed solutions – to that problem; *and*
- communicate the results of comprehensive engineering analyses and designs clearly and effectively to diverse audiences.

A detailed articulation of the general and engineering-specific learning outcomes in reference to the Canadian Engineering Accreditation Board (CEAB) and Canadian Engineering Grand Challenge (CEGC) Graduate Attributes is available upon request.

Natural Science (including Medical Sciences) Learning Outcomes

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

- critically discuss the potential for the natural sciences broadly – and their scientific discipline specifically – to positively impact complex (social, economic and environmental) sustainability challenges across diverse contexts;
- identify distinct concepts, knowledge, skills and competencies from natural sciences generally – and their scientific discipline specifically – that could be mobilised to usefully contribute to tackling a complex sustainability challenge or problem;
- work with colleagues from other disciplines to devise, design and propose scientifically-grounded interdisciplinary ideas that could address a complex sustainability problem;
- identify and analyse the ethical and equity dimensions of a complex sustainability problem from the perspective of their scientific discipline, and evaluate the likely ethical and equity implications of proposed solutions – and particularly the scientific aspects of the proposed solutions – to that problem; *and*

- communicate the results of comprehensive scientific analyses and proposals clearly and effectively to diverse audiences.

Social Science Learning Outcomes

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

- critically discuss the potential for the social sciences broadly – and their scientific discipline specifically – to positively impact complex (social, economic and environmental) sustainability challenges across diverse contexts;
- identify distinct concepts, knowledge, skills and competencies from the social sciences generally – and their social science discipline specifically – that could be mobilised to usefully contribute to tackling a complex sustainability challenge or problem;
- work with colleagues from other disciplines to devise, design and propose social-scientifically-grounded interdisciplinary ideas that could address a complex sustainability problem;
- identify and analyse the ethical and equity dimensions of a complex sustainability problem from the perspective of their social science discipline, and evaluate the likely ethical and equity implications of proposed solutions – and particularly the social science aspects, and social impacts, of the proposed solutions – to that problem; *and*
- communicate the results of comprehensive social science analyses and proposals clearly and effectively to diverse audiences.