UNIVERSITY OF WATERLOO

NEW GRADUATE PROGRAM PROPOSAL

OF

MASTER OF FUTURE CITIES (MFC)

Submitted to the
Ontario Universities Council on Quality Assurance

VOLUME I - PROPOSED BRIEF

DECEMBER 2022

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1. INTRODUCTION

1.1 Brief Listing of the Program

The Master of Future Cities (MFC) is interdisciplinary in nature and will be housed in the Faculty of Environment. This course-based program includes nine courses in a mix of online, in-person block and hybrid delivery formats, including required courses in cities, sustainability, future studies, and a capstone course. The program can be completed either full-time (three terms) or part-time (six - eight terms). The program is regular only with no co-op, and no formal internship, although the applied capstone is required. Tuition is consistent with the per-course equivalent cost of this program's closest competitor program, the Master of Urban Innovation at the University of Toronto (Mississauga). Domestic per-course tuition is $1,986 and international per-course tuition is $4,538.

1.2 Method Used for Preparation of the Brief

This brief was prepared by Johanna Wandel, Associate Dean (Strategic Initiatives), Faculty of Environment, Clarence Woudsma, School of Planning and future Director of the Master of Future Cities program, and Jean Andrey, Dean of Environment with contributions from program faculty Helen Kerr, James Nugent, Cameron McCordic, Pierre Filion, Sarah Burch, Marta Berbes, Dawn Parker, Daniel Cockayne, and Nancy Worth. Section 3.1 (Library Resources) was written by Marian Davies (Resource Librarian for the School of Planning).

Date of Faculty of Environment Approval: March 31, 2022.

1.3 Objectives of the Program (QAF 2.1.1)

The 21st Century is the century of the city, with the United Nations estimating 75% of the global population will live in cities by 2050. The classic wicked problems that we associate with city building and urban life are epitomized in the critical need to address the climate crisis while at the same time tackling societal crises related to equity and justice across our communities. Concurrently, we are in the midst of an unprecedented digital revolution which is disrupting our world faster and across more domains than ever before, driving systems level changes in our economies, societies and governance.

The traditional approaches to studying, planning, managing, and visioning our cities are arguably struggling to address our challenges today and lack the capacity to critically explore and develop alternatives for a future city. There is need to move beyond the silos within cities and disciplinary boundaries to foster multidisciplinary and transdisciplinary thinking applied to urban challenges and futures.

The proposed Future Cities Master's program is designed to provide early- and mid-career professionals with competency in futures and systems thinking and foresight methods that can be used to better address the significant challenges of today while anticipating and generating innovative and sustainable options for uncertain and increasingly complex futures in the context of cities.

The University of Waterloo's Strategic Plan, *Connecting Imagination with Impact*, boldly declares "Waterloo is built for change" and that its 2020-2025 plan is for an era of rapid change. The proposed Future Cities program maps strongly onto the first theme of the strategic plan: "developing talent for a complex future".

- Under this theme, students learn to apply knowledge in contexts that we cannot even imagine today. The proposed program embeds foresight methods through systems and futures thinking throughout the program, and engages learners with alternative visions of future cities built from multiple perspectives. The program requires students to develop and demonstrate mastery of futures thinking and applications through a team-based capstone project course.
- University of Waterloo's strategic plan also calls for more interdisciplinarity and flexibility in graduate programs. The proposed program draws on disciplinary and inter-disciplinary knowledge and instructor expertise from the following fields: urban planning, geography, architecture, foresight, sustainability and systems science. Course sequencing within the program ensures that both full time and part-time students will be part of a cohort (all students complete required core courses FCIT 600 and FCIT 601 in the first five months of the program, and the part-time sequence recommends students complete most core courses in the same term as full time students) but also will have options in selecting elective courses. Further the program is designed such that it can be finished in one, two or three years; and it can be completed mostly online (with only two mandatory blocks on campus) but also can include more in-person instruction, if desired by students.
- The University's strategic plan also recognizes that accelerating climate change will magnify existing societal issues, with marginalized communities being among the most affected. The proposed program includes curriculum on climate transitions, climate resilience and climate justice; and several courses explicitly adopt an equity lens.
- The University of Waterloo strategic research plan focuses on eight themes. The proposed program is aligned with and draws on expertise from the theme, "supporting change: society, culture, and governance". More specifically, the program embeds curriculum related to complex systems and strategic decision-making techniques, advancing the understanding of urban systems through the lenses of governance, equity, sustainability, and resilience and an appreciation for how city building and visioning contribute to societal well-being. The program also draws on institutional strengths related to the digital revolution (e.g., smart cities,

digital media, autonomous vehicles, AI)) and environment and energy (e.g., climate resilience, energy futures).

The Master of Future Cities will address the University of Waterloo's Graduate Degree Level Expectations (GDLEs) as follows:

Table 1: Graduate Degree Level Expectations, Master of Future Cities

GDLE 1: Depth and Breadth of Knowledge.
Learning Objective 1: **Interdisciplinary knowledge of the concepts, information, and techniques relevant to futures studies, sustainability, and cities** • Develop a futures thinking lens incorporating systems thinking and sustainability • Understand and apply strategic decision-making methods that emphasize uncertainty and incorporate futures studies • Explain and examine city systems and their major challenges • Explain and apply sustainability, systems thinking and futures studies in the context of city challenges and urban futures
GDLE 2: Research and Scholarship
Learning Objective 2: **Demonstrate a conceptual understanding and methodological competence that enables the critical interpretation of current research findings and the application of research techniques specific to futures studies, sustainability, and cities** • Describe and consider the tools and methods used to collectively envision, imagine, and respond to urban futures • Analyze and interrogate current research on futures studies, sustainability, and selected city challenges • Explain, assess, and generate futures responses to complex city challenges
GDLE 3: Level and Application of Knowledge
Learning Objective 3: **Demonstrate competence in the application of an existing body of knowledge through research and critical analysis that addresses future cities challenges** • Explain, utilize, and critique data relevant to current and future city challenges • Design and conduct research applying futures, systems, and sustainability to real-world complex city challenges • Collaboratively develop pro-active interdisciplinary solutions to future city challenges

GDLE 4: Professional Capacity/Autonomy
Learning Objective 4: **Demonstrate professional capacity and autonomy, through ethical behavior consistent with academic integrity and research guidelines, personal initiative, responsibility, and sound decision-making in diverse academic and professional situations.** • Demonstrate professionalism through personal initiative and responsibility in all aspects of the classroom, laboratory, team projects, field school, and capstone work. • Demonstrate the ability to work effectively in interdisciplinary teams on problems relating to urban futures • Take a proactive and self-reflective approach to develop professional networks and relationships inside and outside the program.
GDLE 5: Level of Communications Skills
Learning Outcome 5**: Demonstrate effective communication of ideas, results and conclusions in visual, oral and written forms.** • Demonstrate competency to effectively communicate complex problems including technical challenges, social, environmental, sustainability, justice, equity and economic issues, in a variety of contexts and to diverse expert and non-expert audiences. • Be able to produce a range of written communication products for varied audiences. • Apply techniques to improve confidence and effectiveness in professional speaking and presentation skills in all communications within the program.
GDLE 6: Awareness of Limits of Knowledge
Learning Outcome 6: **Be cognizant of the complexity, uncertainty and limitations of knowledge related to futures studies, sustainability, and cities** • Have appreciation for the inherent complexities of cities, the uncertainties in applying futures studies, and the limits of program knowledge domains. • Develop an openness to alternative thinking, values, viewpoints and systems across the subject domains of the MFC

1.4 Admission Requirements (QAF 2.1.2)

- A four-year Honours Bachelor degree (or equivalent) in any humanities, social science, health, business, engineering or science discipline with an overall average of at least 75% in the last 20 courses (or last two years).
- Applicants whose first language is not English must demonstrate command of the English language with a minimum internet-based TOEFL score of 100 (writing 26; speaking 26) or the equivalent on a comparable test such as IELTS 7.5 (writing 7.0; speaking 7.0).
- Applications require two letters of reference (either professional or academic), a resume/CV, a personal statement, and transcripts of all previous attempted or completed university programs.

1.5 Structure (QAF 2.1.3)

1.5.1 Program Structure

The program requires completion of nine (0.5 unit weight) courses (five required, four electives from a prescribed list). Courses will be offered in all three of the University of Waterloo's academic terms. Enrolment may be full-time (three courses/term) or part-time (one or two courses/term). It is expected that courses will be offered as follows:

Required:
FCIT 600 Cities, Systems, Synergy and Collaboration
FCIT 601 Tools for Futures Thinking
FCIT 602 Future Thinking and Cities
FCIT 603 Sustainable Future Cities
FCIT 620 Future Cities Capstone

Recommended:
FCIT 610 International Field School (for students unwilling or unable to participate, any other FCIT elective or open elective from online offerings in the Faculty of Environment may be substituted)

Methods, one of:
FCIT 607 Data, Methods, and Models for Future Cities
INDEV 607 Methods for Sustainable Development Practice: A Systems Approach

Electives, two of:
FCIT 604 The Socially Just City
FCIT 605 The Future of Work
FCIT 606 Sustainability Transitions in Cities
ARCH 6XX Critical Engagements with Urban Technology (note: course has been taught as ARCH 684, Special Topics in Architecture, but will be assigned a permanent dedicated course code.)
PLAN 684 Physical Infrastructure and Planning
FCIT 609 Mobility Futures
PLAN 606 Modeling the City

1.5.2 Program length

It will be possible to complete all degree requirements in three terms; however, it is expected, given the mid-career professional focus, that the majority of candidates will complete one or two courses at a time, and thus complete the program in six to eight terms.

Candidates can only begin the Master of Future Cities in Fall terms. Typical three, six and eight term sequences are as follows:

Table 2: Typical course sequences

Courses in bold are required
Students choose two of courses marked with an asterisk (*)

Over three terms

	Spring	Fall	Winter
1		**FCIT 600[1]** **FCIT 601** **FCIT 602** Option to take a 4th course: FCIT 605* or FCIT 609* instead of one of the restricted electives in Winter or Spring	FCIT 607 or INDEV 607 **FCIT 603** CIVE 684* or FCIT 606* or ARCH 6XX* or PLAN 606*
2	FCIT 610 or open elective **FCIT 620** FCIT 604*		

Over six terms

	Spring	Fall	Winter
1		**FCIT 600[1]** **FCIT 601** **FCIT 602**	FCIT 607 or INDEV 607 **FCIT 603**
2	FCIT 610 or open elective FCIT 604*	FCIT 605* FCIT 609*	CIVE 684* FCIT 606* ARCH 6XX* PLAN 606*
3	**FCIT 620**		

Over eight terms

	Spring	Fall	Winter
1		**FCIT 600[1]** **FCIT 601**	FCIT 607 or INDEV 607
2	FCIT 610 or FCIT 604* or open elective	**FCIT 602**	**FCIT 603**
3	**FCIT 620**	FCIT 605* or FCIT 609*	FCIT 606* or CIVE 684* or ARCH 6XX or PLAN 606*

[1]FCIT 600 will require registration as a Fall term course, but will be delivered as a block in-person on-campus course before the beginning of the Fall term lecture period. During this time, space is available in Campus Housing, though students are welcome to make their own arrangements in Waterloo.

1.6 Program Content (QAF 2.1.4)

As the challenges of the climate crisis intensify alongside disruptions in all domains, cities are increasingly required to anticipate uncertain social and environmental conditions, to build resilience, and to integrate sustainable development goals into the policies, programs, and frameworks that will shape their future. The proposed curriculum is uniquely composed of a knowledge foundation in cities, future studies and sustainability complemented by a focused subject matter investigation (future of work, just cities, future mobilities) and skill development (foresight methods, systemic frameworks, data analytics). Collectively, the knowledge foundation and subject focus will be integrated through innovation application in the capstone project course.

The MFC consists of nine courses, only one of which can be chosen from beyond the list presented in Section 1.5.1. If the recommended International Field School (FCIT 610) is completed, all nine courses will be drawn from this list. All courses credited toward the degree, including the optional open elective, will be at the graduate level.

The required courses are structured to encourage cohort interaction to foster professional networking and collegial development of futures literacy in the urban realm over the longer term. Incoming cohorts will complete an intense, in-person block course (FCIT 600) and interact both virtually and in-person in FCIT 601 to build collaboration competency. FCIT 600 is planned as an intensive on-campus in person course spanning seven instructional days (plus a weekend for further cohort-building activities) in late August/early September. Once the program is in steady state, further networking will be encouraged via the final capstone presentations from FCIT 620 to be delivered to FCIT 600 students, either in person or virtually.

The balance of the required courses provide historical context of why and how the future is and has been considered in urban studies and urban planning (FCIT 602), the importance of sustainability for urban futures (FCIT 603). Additionally, students engage with one of two methods courses focused on big data (FCIT 607) or systems analysis (INDEV 607).

All students are strongly encouraged to complete the International Field School (FCIT 610) in the fourth term, further reinforcing the cohort feel. Through this course, students will be exposed first-hand to examples of emergent solutions to complex challenges internationally. Destination cities will change from year to year, with Singapore or Amsterdam as likely locations in the initial years. FCIT 610 is strongly recommended but not required because of both cost and potential travel restriction related issues.

Electives are framed within some of the greatest expected future challenges for urban systems, including transport (FCIT 609), infrastructure (PLAN 684), labour (FCIT 605), social justice (FCIT 604), urban technology (ARCH 6XX) and climate change and sustainability transitions (FCIT 606). One elective (PLAN 606) allows the development of modeling competence if students wish to pursue more quantitative tools.

Students who elect to complete the program in either six or eight terms will retain the same cohort for the applied capstone course (FCIT 620). As already noted, students will present their applied capstone projects to the new, incoming cohort completing FCIT 600, thus allowing cross-cohort interaction.

1.7 Mode of Delivery (QAF 2.1.5)

The program will be delivered via a mix of in-person block courses, remote courses with concentrated in-person elements at the end of the term, fully online (developed asynchronously in collaboration with CEL, the University's Center for Extended Learning) and remote courses (delivered synchronously online). Approximately 75%-85% of all course content and interaction will be online, 15% in-person on campus and 10-15% in person off-site (depending on optional participation in the field course, locations will vary). Specifically, the courses will be delivered as follows:

Table 3 Courses by term of offer and mode

Course	Term of offer	Mode
Required		
FCIT 600	Fall	In-person block, August-September
FCIT 601	Fall	Hybrid; remote teaching during lecture period, with in-person element in December.
FCIT 602	Fall	Online (CEL developed)
FCIT 603	Winter	Online (CEL developed)
FCIT 620	Spring	Hybrid; remote capstone work with in-person or remote presentations in August.
Recommended		
FCIT 610	Spring	In person block at international location (varies from offer to offer)
Methods (choose 1)		
FCIT 607	Winter	Remote
INDEV 607	Winter	TBD, likely in-person and remote offerings
Electives (choose 2)		
FCIT 604	Spring	Online (CEL developed)
FCIT 605	Fall	Remote
FCIT 606	Winter	Online (CEL developed)
ARCH 6XX	Winter	Remote
PLAN 684	Winter	Hybrid; both remote and in-person participation possible
PLAN 606	Winter	In person
FCIT 609	Fall	TBD, remote or online.

For students opting to complete an open elective, the Faculty of Environment offers multiple CEL-developed online courses focused on various Planning, Sustainability and Climate Change topics every term. Participation in in-person offerings is also possible during Fall and Winter terms.

1.8 Assessment of Teaching and Learning (QAF 2.1.6)

The program and its courses have been designed to meet Masters Graduate Degree Level Expectations (GDLEs) to ensure a) that these courses deliver content appropriate to post-undergraduate training; and b) that some of these courses can be used as electives in related programs to ensure sustainability of resourcing of the degree.

Each course has its own specific learning outcomes, consistent with the learning outcomes listed in Table 1. Each course will use unique evaluation tools, but in all cases, assessment of learning and feedback will be more frequent than in traditional face-to-face courses given the high share of courses delivered remotely/online. The elective courses will all include the preparation of an independent, professional report or paper plus multiple smaller assignments and quizzes. Specific evaluation tools are at the discretion of the instructor; however, evaluation in all courses will be examined by the Curriculum Committee. Table A1 in Appendix A outlines detailed assessment methods for each of the core courses listed in Section 1.5.1.

Learners will be assessed on skill and knowledge development through individual and collaborative group projects focused on subject matter specialization as outlined in curriculum. Students must maintain a minimum 75% cumulative GPA over the course of the program and in order to graduate.

Capstone projects may include external sponsors who will assess competency, effort, and alignment of skills to given challenges. In many cases, students will already be working in sectors such as urban planning, urban infrastructure or sustainability management, and the program builds skills in explicit, structured consideration of possible and plausible futures to enhance existing careers. Alumni will be highly qualified to launch careers related to their studies as policy makers in the public sector, strategic innovators in the private sector, and as social advocates in the nonprofit sector. Students may also be encouraged to participate in international competitions such as the Association of Professional Futurists Student Awards or the extra-curricular Positive Futures Cities competition. Student capstone projects may be presented at conferences and symposia such as the RSD (Relating Systems Thinking and Design) annual international symposium (https://rsdsymposium.org) or the Future Cities Canada Summit.

Overall program success will be assessed via an exit and 5-year post-graduation survey conducted by the Senior Alumni Advancement Officer, Faculty of Environment. The survey will focus on the extent to which graduates feel the program's learning objectives have been accomplished (exit survey) and applied in various employment contexts (5 year survey), the ways in which the degree program provides career opportunities and progression (both surveys) and graduates perception of how the degree training had

substantive impact on cities' programming and policy (5 year survey). Additionally, a closed LinkedIn Group will be established for students and alumni, and the Director will periodically seed advice on program outcomes via this group as well as monitoring graduates' career trajectories. Efforts will be made to maintain links to graduates via invitations to the Faculty of Environment Future Cities lecture series, which had its inaugural session in February 2022.

2. **HUMAN RESOURCES (QAF 2.1.7)Resources for Graduate Programs Only (QAF 2.1.8)**

As highlighted in Table 3 and Volume 2 of this submission, the MFC draws on a number of leading faculty members in the Faculty of Environment, with contribution from the School of Architecture. Contributing faculty are trained in a number of fields including Planning, Geography, Industrial Ecology, Economics and Interdisciplinary Studies. While all of participating faculty members implicitly address urban futures in their own work, they will be complemented by a part-time Lecturer who is also professional futurist, Helen Kerr, and a new, full-time hire, the Caivan Future Cities Professor (see Appendix B for job posting, filled by Marta Berbes as of January 1, 2022.) A second hire, in Smart Cities, is expected to be posted in 2022.

1.10 List of Faculty by Field

The MFC will be offered at the Faculty Level, with contributions from the School of Planning, the Department of Geography and Environmental Management (GEM), the School of Environment, Enterprise and Development (SEED), the Department of Knowledge Integration (KI) and the School of Environment, Resources and Sustainability (SERS). Core courses in Futures and Systems Thinking, Cities and Sustainability will be offered by leading thinkers in those fields (e.g., Vanessa Schweizer, Associate Professor in Knowledge Integration and the current Director of the Waterloo Institute for Complexity and Innovation [WICI] will contribute to FCIT 600; Pierre Filion, Professor Emeritus in the School of Planning is a long-established authority on Canadian and International Cities; Helen Kerr, a newly appointed Lecturer at the Faculty Level, is a practicing futurist who is co-principal of a design firm and has taught Futures Thinking courses at OCADU).

Core courses are supported by a required methods course, taught by experts in their fields. Thematic electives are taught by faculty whose primary appointment is in one of the units of the Faculty of Environment and whose research expertise includes subject matter relevant to urban futures (e.g., Sarah Burch, Associate Professor and Canada Research Chair in Sustainability Governance and Innovation, will teach the course on Sustainability Transitions in Cities [FCIT 606], a core thrust of her research program).

Table 4 Faculty Complement

Faculty Name	Rank (Professor, Assistant, etc.)	Gender (M/F/U)	Home Unit [1]	Supervisory Privileges [2]
Jean Andrey	Professor	F	GEM	Full
Marta Berbes	Assistant Professor	F	Planning/Faculty Level	Masters
Jeff Casello	Professor	M	Planning/CEE	Full
Sarah Burch	Associate Professor	F	GEM	Full
Daniel Cockayne	Associate Professor	M	GEM	Full
Pierre Filion	Professor Emeritus	M	Planning	Full
Helen Kerr	Lecturer	F	Faculty Level (Environment)	Masters
Cameron McCordic	Assistant Professor	M	SEED	Masters
John McLevey	Associate Professor	M	Knowledge Integration	Full
Leia Minaker	Assistant Professor	F	Planning	Masters
Markus Moos	Associate Professor	M	Planning	Full
James Nugent	Continuing Lecturer	M	SERS/Faculty level	Masters
Dawn Parker	Professor	F	Planning	Full
Maya Przybylski	Associate Professor	F	Architecture	Full
Vanessa Schweizer	Associate Professor	F	Knowledge Integration	Full
Simron Singh	Professor	M	SEED	Full
Nancy Worth	Associate Professor	F	GEM	Full

Notes:

1. This is the home department of the faculty member associated with the program under review.
2. The level of supervisory privileges held by each faculty member, e.g., full, masters only, co-supervision only, etc.

1.11 Commitment of Faculty from Other Graduate Programs/Other Institutions

With the exception of new hires, all of the faculty who will contribute to the MFC will also contribute to graduate programs in their home units. Future Cities core courses are developed exclusively for Master of Future Cities students. Elective courses will, where appropriate, also contribute to existing graduate programs in the faculty member's home unit (i.e. FCIT 605 will be available to MA and MES students in Geography; FCIT 605 will be available to Master of Climate Change students.)

1.12 Quality of Faculty (QAF 2.1.10)

The MFC will be delivered by an experienced complement of faculty with extensive teaching, research and administrative records. All of the faculty, including new appointment Helen Kerr, have taught well-received courses in their areas of expertise for five or more years. A number of faculty (Jean Andrey, Markus Moos, Daniel Cockayne, James Nugent) have been explicitly recognized via teaching awards.

Although faculty members contributing to this initiative have extensive research and teaching experiences in thematic areas which implicitly address urban futures, future studies is a relatively new field for the University of Waterloo. To this end, the faculty has added two new positions. Helen Kerr, who joined Waterloo as a part-time Lecturer on July 1, 2021, has more than 25 years' experience in applied design and futures work as co-principal of KerrSmith Design. Over the past several years, she has been a sought-after speaker on foresight and urban design. From 2009 to 2020, she taught in OCADU's Strategic Foresight graduate program. Ms. Kerr will anchor the tools and techniques for futures studies components of the curriculum (FCIT 601, with contributions to FCIT 600, FCIT 610 and FCIT 620). She will work with the new Caivan Communities Future Cities Professor, Marta Berbes.

A number of faculty have research programs of direct relevance to future studies and systems thinking. Vanessa Schweizer has published work on climate change assessment scenarios and energy futures, and has an extensive track record in socio-technical scenarios for climate change research. Sarah Burch has worked with communities in British Columbia on responding to visual scenarios of sea level rise management under various climate scenarios. Simron Singh, Vanessa Schweizer, Dawn Parker, Cameron McCordic, and Jeff Casello are experts in systems approaches, with applications to sustainability (Singh, McCordic), climate scenarios (Schweizer), urban infrastructure (Casello) and modelling (Parker).

Program faculty bring a wealth of methodological expertise, ranging from ethnography and qualitative research (Worth, Cockayne) to quantitative and modelling approaches (Casello, Parker) and future studies (Kerr, Berbes).

Both core courses and thematic electives in the MFC will be designed and delivered by experts in their field. Pierre Filion will develop a course focused on the history and context of urban planning's approach to the future city (FCIT 602), based on a long research and teaching career in urban planning and planning theory. Cameron McCordic's FCIT 603 builds on a research and teaching track record focused on sustainable development goals and urban food systems with particular emphasis on the Global South. Nancy Worth and Daniel Cockayne are economic geographers who have done extensive research on labour, particularly changing demographics (Worth) and precarious employment (Cockayne), and will build on this and their undergraduate Labour Geography course to develop FCIT 605. James Nugent's research focuses on justice and equity in urban systems, and he will develop FCIT 604 along with a to-be-identified co-instructor with lived experiences as a member of an equity-seeking group. Sarah Burch is Canada Research Chair in Sustainability Governance and Innovation, and is well-positioned to develop FCIT 606. Jeff Casello already teaches a graduate course on urban infrastructure and Planning, PLAN 684. Maya Przbylbski has already taught ARCH 6XX, Critical Engagements with Urban Infrastructure, as a special topics Architecture course. Jean Andrey's research program includes extensive work on transportation and mobilities, and she will contribute to FCIT 609.

One of the required methods courses already exists, INDEV 607, taught by Simron Singh, prioritizes systems analysis. John McLevey has been teaching graduate-level courses in computational data analysis, and will develop FCIT 607. The two instructors have agreed to work toward parallel methods competencies.

The faculty listed in this program brief bring an extraordinary degree of university administrative experience, ranging from Associate Vice-President, Graduate Studies and Postdoctoral Affairs (Casello) and Dean (Andrey), through Associate Dean (Singh), School Director (Moos, Woudsma), Research Centre Executive Director (Burch, Interdisciplinary Centre on Climate Change to Associate Chair (Schweizer).

The Master of Future Cities will draw on interdisciplinary expertise and approaches, and the program faculty reflect this with degrees in traditional disciplines including geography, planning, economics, engineering, sociology, and public health, as well as interdisciplinary degrees including Engineering and Public Policy, Environmental Studies and Human Ecology.

2. PHYSICAL AND FINANCIAL RESOURCES (QAF 2.1.7)

2.1 Library Resources

3.1.1 Level of support summary

The Library provides a high level of support for the existing programs and courses offered through the Faculty of Environment and anticipates that this high level of support will extend to the proposed Master of Future Cities. Students and faculty members in the proposed program will be encouraged to make use of the learning, teaching and research support services and expertise the Library offers. Current collection strengths would support the new program. No new collections are needed at this time. Should new subject areas emerge or if research intensity develops in subject areas currently outside of collection priorities, the Library is committed to engaging in discussions to articulate collection needs and assess funding implications.

3.1.2 Strengths of support provided and opportunities

Collections

The Library purchases and subscribes to a high number of resources relevant to the areas of focus. Key subscriptions to databases and data set collections include Avery Index to Architectural Periodicals, Building Green Suite, Building Types Online, MCEER, Scopus, TRID: the TRIS and ITRD database, ODESI, and the Social Science Research Network (SSRN). Access to journals, books, news sources, handbooks, and encyclopedias is through Waterloo subscriptions and consortial purchases through partnerships with Canadian universities such as the Ontario Council of University Libraries (OCUL) and the Canadian Research Knowledge Network (CRKN). The liaison librarian encourages purchase recommendations from faculty and students to ensure the collection meets the current research and teaching interests.

Research and instruction support

The liaison librarian is available to advise faculty and students on library resources and services including coursework, theses and major research project work, and publications. Discussions focus on identifying relevant resources and developing research strategies and techniques. The liaison librarian is a part of orientation activities and class sessions (in person and virtually) that introduce students to library resources and services. Customized library research guides and online modules created and maintained by the liaison librarian, facilitate the self-guided navigation and understanding of the Library's system.

Library and department interaction

The liaison librarian periodically surveys faculty to ensure library-related research and teaching needs are being met. Instructional support includes development of online modules and research guides as well as in-class sessions. The liaison librarian also offers in-person and online research consultations to support coursework, research publications, research data management, meeting open access requirements, and copyright. She would welcome further discussions on how the Library can improve users' research skills including emerging ones relating to measuring research impact and managing research data.

2.2 Computer Facilities

All faculty and graduate students are provided with an account on the University computing system. This account provides access to email, internet, and Microsoft Office 365. As students will be primarily working remote and online, no other facilities are needed.

2.3 Space

No new space needs beyond office space for new hires is anticipated. The Faculty of Environment is located in Environment Buildings 1, 2 and 3. Although course delivery will primarily be online/remote, when students are on campus for a block course or an optional in-person course, study space is available in flex office spaces in Environment 1 as well as a graduate lunchroom and extensive common space including the Environment 1 and 3 courtyard spaces and both a student-run and commercial coffee shop in the Environment buildings. Furthermore, during block courses on campus or in person elements at the end of remote courses (e.g., FCIT 602, FCIT 620), which are held outside the normal lecture period, dedicated rooms will be booked in Environment 3 for the duration of the course element.

All current faculty members associated with the program already have dedicated office space.

2.4 Financial Support

The University of Waterloo has a number of awards, bursaries and scholarships that all full-time graduate students can apply for. The level of support will be consistent with other existing coursework based Masters programs within the Faculty of Environment, i.e., students are eligible for scholarship support but have no minimum funding guarantees.

The University has been successful in generating external, philanthropic funds for entrance scholarship for students who will be admitted to the Future Cities Master's

program for the first four years (32 awards, each valued at $5,000, for a total value of $160,000). Considering the emerging salience of urban decision-making under uncertain futures, it is believed that there is strong potential to attract additional scholarship support for the program.

3. CURRICULUM

3.1 The Intellectual Development and the Educational Experience of the Student

3.1.1 Orientation and Opportunities for Cohort Building

Despite the fact that the program will be primarily delivered in an online/remote format, the Master of Future Cities is designed to facilitate strong professional networking and connections within a cohort of students. The first required course, FCIT 600, serves multiple roles: it introduces students to the degree program learning outcomes and objectives; establishes the foundational context for the program related to cities, systems thinking, sustainability, technology, futures studies and collaboration methods; its intensive in-person block format on campus in August ensures that students within each cohort establish a working relationship, and it will temporally overlap with final capstone presentations in FCIT 620, the applied capstone course students complete at or near the end of their degree and thus present opportunities for cross-cohort networking. Orientation activities, designed to establish cohorts and familiarize students with program sequencing, expectations and delivery modes will be built into the delivery of FCIT 600.

3.1.2 Relationship of Curriculum to Graduate Degree Level Expectations

The required course sequence and thematic electives will provide ***the broad interdisciplinary knowledge, information and techniques relevant to futures studies, sustainability, and cities*** (GDLE 1) through the development and application of a future thinking lens (core to FCIT 600, FCIT 601) to understand and apply strategic decision-making methods that emphasize uncertainty and incorporate future studies (FCIT 601, FCIT 620), with a focus on major challenges including sustainability (FCIT 603). Elective offerings will further support this GDLE through focus on explaining and applying sustainability, systems thinking and future studies in the context of city challenges and urban futures related to climate change (FCIT 606), work (FCIT 605), infrastructure (PLAN 684), transportation (FCIT 609) and justice and equity (FCIT 604).

Students will develop and ***demonstrate conceptual understanding and methodological competence that enables the critical interpretation of current research findings and the application of research techniques specific to futures studies, sustainability, and cities (GDLE 2)*** through training in systems thinking (FCIT 600, FCIT 601, INDEV 607) and tools for futures thinking (FCIT 601). Research skills will be further developed through the completion of one of two methods courses focusing on data analytics (FCIT 607) or systems approaches to sustainable development methods (INDEV 607). Methodological competence is reinforced through elective offerings including modelling (PLAN 606). Students will gain experience in analyzing and interrogating current research on future studies, sustainability, and selected city challenges though core and elective courses throughout the program. Research skills to explain, assess and generate future responses are applied to real world situations through the recommended international field school (FCIT 610) and the required applied capstone project (FCIT 620), achieving ***GDLE 3: Demonstrate competence in the application of an existing body of knowledge through research and critical analysis that addresses future cities challenges.*** Competence involves the ability to explain, utilize, and critique data relevant to current and future city challenges (FCIT 607, INDEV 607), and designing and conducting research applying futures, systems and sustainability to real-world complex system challenges (FCIT 610, FCIT 620). Collaboration to develop interdisciplinary solutions is first introduced in FCIT 600, and reinforced throughout, particularly through projects in FCIT 601, FCIT 610, and the applied capstone in FCIT 620.

Master of Future Cities students will, in many cases, already be practicing professionals, though some will enter directly from undergraduate programs. All students will learn to ***demonstrate professional capacity and autonomy, through ethical behaviour consistent with academic integrity and research guidelines, personal initiative, responsibility, and sound decision-making in diverse academic and professional situations (GDLE 4);*** and ***demonstrate effective communication of ideas, results and conclusions in visual, oral and written forms (GDLE 5).*** Continuous professional capacity development is achieved throughout all courses, which will require a mix of independent and interdisciplinary teamwork, online and in-person presentations (see Appendix A).

Master of Future Cities students will frame their work within uncertain urban futures throughout the program from the introductory block course (FCIT 600) to the capstone project (FCIT 620), directly addressing ***GDLE 6: Be cognizant of the complexity, uncertainty and limitations of knowledge related to futures studies, sustainability, and cities.*** While courses address not only ways of interpreting data (FCIT 607) and employ systems thinking (FCIT 600, FCIT 607) to consider future conditions, much of the work that students in this field will do will be within the context of multiple plausible futures. FCIT 601 is focused on tools and techniques for decision-making under uncertain futures.

3.1.3 Other opportunities and experiential learning

The Faculty of Environment is in the process of establishing a Future Cities lecture series, supported in part by an external gift. While lectures will occur on campus during normal working days, MFC students will be encouraged to attend in person (if possible) or via webcast. The program is designed as a primarily remote professional program, and thus it is unlikely that there will be high demand for the services of the Center for Career Action, Centre for Teaching Excellence and other Graduate Studies workshops. These opportunities are, however, available, and Future Cities students are encouraged to participate.

The Master of Future Cities does not have a required internship or co-op experience. Applied learning is, however, built into core courses throughout the program, including via the recommended international field school (FCIT 610) and the applied capstone project (FCIT 620). Furthermore, students will be strongly encouraged to attend conferences, including the Association of Professional Futurists, an international community of professional futurists dedicated to promoting professional excellence and demonstrating the value of futures thinking, annual meeting. The University of Waterloo provides financial support to graduate students to present their work, through its Graduate Studies Conference Assistantship. The Faculty of Environment commits to providing the necessary matching funds associated with this application.

3.2 Program Regulations

The program requires completion of nine (0.5 unit weight) courses (five required, four restricted electives). Candidates must pass all courses (minimum 60%). Additionally, in accordance with Faculty of Environment graduate-level coursework requirements, candidates must obtain a minimum average of 70% across all courses. There are no required progress reports or requirements beyond maintaining the minimum average.

Admission requirements are a four-year Honours Bachelor Degree (or equivalent) in any humanities, social science, business, health, engineering or science discipline with an overall average of at least 75% in the last 20 courses (or last two years), but given the interdisciplinary nature of the field, students are not required to demonstrate competence in any particular subject field as a pre-requisite for admission. Applicants whose first language is not English must demonstrate command of the English language with a minimum internet-based TOEFL score of 100 (writing 26; speaking 26) or the equivalent on a comparable test such as IELTS 7.5 (writing 7.0; speaking 7.0), and two letters of reference (either professional or academic).

3.3 Part-time Studies

The program is primarily envisioned as part-time, though a full-time option exists for those wishing to complete it in an accelerated fashion. Courses will primarily be delivered remotely, with synchronous sessions in required courses (if required). Where in person components are planned, these will run during defined blocks, typically at the beginning/end of terms.

3.4 Curriculum

The Master of Future Cities consists of nine courses. This includes five required courses (no choice), one methods course (choice of two), two thematic electives (choice of six), and one recommended elective, an International Field School. For students unwilling or unable to complete the International Field School, the ninth course may be a third thematic elective or, with instructor and program director permission, any other graduate course offered by the Faculty of Environment.

Short course descriptions for the required, methods, elective and field school courses are included here. Course activation forms for the eleven new FCIT courses are included in Appendix C. FCIT 600 and FCIT 610 are designed as intensive block courses. In the case of FCIT 600, students will spend nine days in Waterloo (seven instructional days plus one weekend for group work and cohort networking) in late August-early September. This time will include the FCIT 600 course content as well as a program orientation and cohort building social activities. FCIT 610 will be an approximately 10 day long in-person international field experience taught at various locations (one per year) outside Canada.

Required Courses:

FCIT 600 Systems, Synergy, Collaboration (in person, block, end of Spring term – beginning of Fall term)
This intensive block course sets the groundwork for students to understand the systemic nature of urban challenges, the complex reality of leading change in volatile circumstances and the power of collaborative engagement to build a sustainable future. Through practice-based learning, students will identify leverage points for change-making as they build their capacity for distributed knowledge and action. They will also develop professional skills required to lead collaborative teams in the context of designing and implementing urban sustainability initiatives. The course is delivered in modules focusing on systems analysis, problem identification in uncertain futures, team collaboration, as well as effective virtual and live engagement and participation processes. Students will build their knowledge of the characteristics of effective strategic decision making in multi-stakeholder contexts.

FCIT 601 Tools for Futures Thinking
Through theory and practice, this progressive project-based course will introduce foresight methods used in the development of strategic proposals related to urban sustainability. Working in teams, students will identify an issue in a specific predefined sector. Their exploration and research begins with a divergent process of signal discovery of emerging issues and trends through methods such as environmental scanning, new technology research, user research, field study, or stakeholder workshops. In a subsequent convergent process, students will then learn and apply methodologies, including medium-to long-range exploratory scenario planning, to develop insights and implications for action. A strategic innovation response will then be stress tested against scenarios to evaluate effectiveness and systemic fit for the defined urban context. Students will develop futures literacy skills to make sense of complex emergence and gain confidence in their ability to frame positive responses to change.

FCIT 602 Future Thinking and Cities
This course focuses on thinking about the future in ways that intersect with the urban phenomenon. It explores visions of the future, including the different objectives, impacts, potential, and limitations of these visions. This course looks at how visions of the future can inform human behaviour as people adapt to possible futures or, indeed, shape the future.

FCIT 603 Sustainable Future Cities
Cities have become the sites of significant sustainability challenges. At the same time, cities represent important assets for catalyzing sustainable development. This course will explore the theories, policies, and actions that have guided cities toward more sustainable futures. This discussion will be framed using the tools provided by systems thinking and futures thinking.

FCIT 620 Future Cities Capstone Project
Guided by faculty, students will work closely with an external partner to develop possible solutions to a specific urban sustainability problem in the form of a professional report. Partner organizations vary from not-for-profit, governmental, and private sector entities. Specifics may vary from year to year.

Recommended:
FCIT 610 International Field School
Building on their learning in Systems and Futures thinking, students will travel to one or more cities that showcase leading-edge sustainability solutions and provide innovative, resilient strategies to prepare for a changing world. The site for the international field school will vary from year to year, but will be outside of Canada. FCIT 610 will have co-instructors – one who is an expert in the futures space, the other may or may not have futures experience but will have lived experience in or familiarity with the destination city[1]. Programming will include site visits, conversations with sustainable city leaders in different sectors (for example transportation, waste management, climate mitigation, housing, public health, food systems) and case study specific learning modules. Supplemental preparatory reference materials will position how the adoption of forward leaning approaches was achieved within specific contextual circumstances. The course is run as an intensive block course.

Methods, one of:
FCIT 607 Data, Methods, and Models for Future Cities
This course is a hands-on introduction to the challenges and opportunities of "big data," computational power, and disruptive technologies (e.g., machine learning, artificial intelligence, and the internet of things) for future cities. It emphasizes contemporary debates about data ethics and politics, with an emphasis on privacy, surveillance, and security. Students will learn how to use Python to manage and analyze data; develop and interpret models; integrate domain experience and expertise from stakeholders; and effectively communicate evidence, risk, and uncertainty to decision-makers.

INDEV 607 Methods for Sustainable Development Practice: A Systems Approach
The course is aimed at enhancing skills useful for development practice. From a systems perspective, students will learn to conceptualize problems using real cases and to analyze them both at the level of structure and dynamics. Problem solving will rely on analytical, heuristic and normative categories and will include learning select methods focusing on sustainability coupled with socio-ecological systems.

[1] Early target cities include Singapore and Amsterdam, but this may change depending on co-instructor experience and destination suitability.

Electives, two of:

FCIT 604 The Socially Just City

This course explores efforts by urban planners, policy-makers and social movement organizations to envision and create socially just cities. Cities emerge through historical power relations, including contradictions between production (capital accumulation) and socio-ecological reproduction. They are places of hope, wealth accumulation, innovation and cultural vibrancy. But, as we will explore, cities are characterized by social struggles over: the uneven distribution of wealth and opportunities; a desire for deeper democratic participation; inequitable access to services and public space; unequal distribution of environmental benefits and harms; increasing state and corporate surveillance; philosophies and practices of security, policing and incarceration; and related discriminatory processes according to people's gender, sexuality, race and ethnicity, ability and (legal) status. We draw on case studies from cities around the world to critically assess progressive policies, programs and grassroots-led initiatives aimed at resolving these conflicts. This course focuses on solutions aimed at: increasing affordable housing and access to public transportation; redistributing wealth (e.g., through tax policy and public ownership); creating good jobs; planning for equity; and deepening participatory urban governance.

FCIT 605 The Future of Work

This advanced graduate seminar examines the emergent possibilities associated with work in cities of the future. It theorizes the central role that work plays in everyday urban life, highlighting how work is spatially and socially unevenly distributed and how inequality continues to structure labor markets in cities. It engages with 'future of work' discourses to examine the complex role of technological change in urban labor market transition, as well as questioning the prominence of technological change in such transition. It focuses both on sectors privileged by mainstream theories of urban development (e.g., high technology and the creative industries) and sectors ignored by such theories but that nevertheless remain essential for the functioning of urban centers, including unpaid, informal, and care work. It questions the role of work in everyday life by highlighting dominant working norms and resistance to them, e.g., in calls for redistributive justice through unionization and collective action, anti-work discourses, and campaigns for a four-day work week.

FCIT 606 Sustainability Transitions in Cities

Sustainability is a multi-faceted and ever-changing collection of aspirations that weaves together environmental integrity, economic prosperity and social equity. The transition to more sustainable cities is both fraught with challenges, including the legacy of unsustainable infrastructure and deeply entrenched habits, but also exciting opportunities and potential for innovation. In this course, we explore the challenge of urban sustainability transitions through a systems lens, exploring the technologies, governance models, values, and behaviours that might trigger and accelerate the transition. We look around the world for compelling examples of sustainability

transitions in practice, from Malmö to Melbourne, and apply the lessons we learn to the Canadian context.

PLAN 684 Physical Infrastructure Planning
This course introduces students to the planning of physical infrastructure. The course covers governments' roles in regulating, financing and maintaining public infrastructure such as transportation or water systems. The impacts of infrastructure provision on land use, the environment, economic development and social equity are also addressed. Quantitative methods of predicting infrastructure demand and utilization are presented. The role of private sector in providing and maintaining infrastructure is discussed.

FCIT 609 Mobility Futures
Taking a systems approach, this course focuses on exploratory mobility futures with an emphasis on personal transportation in urban areas. Technological innovation and transport automation and their interactions with socio-demographics, the nature of work, land use planning, and energy systems are used to develop scenarios of different plausible futures and for identifying the challenges and opportunities that may emerge.

PLAN 606 Modelling the City
This course examines the use of computer modelling and simulation in the realm of urban analysis and forecasting, with the goal of understanding urban land-use change trajectories. Topics include an overview of the drivers and consequences in urban land-use change, the role of models, an overview of current methodological approaches, and an examination of urban simulation models as used in the development of urban policies and official plans. This course provides an applied learning environment in which students will gain experience in the use of spatial (GIS) modelling approaches.

ARCH 6XX Critical Engagements with Urban Technology
When we think about technologically mediated urban environments or projects, two narratives dominate: On the one hand, techno-utopian hype propels visions of optimized, sustainable, frictionless urbanisms, on the other hand, singularly pessimistic accounts of unjust algorithms and digital surveillance eclipse technology’s potential in supporting socially minded urban transformation. This course is situated in the territory between these opposing poles – embracing technology as a powerful tool with the capacity to address the needs of citizens while simultaneously recognizing technology’s incessant capacity to undermine efforts to creating a more just world.

3.5 Collateral and Supporting Departments

The MFC is a course-based program without a thesis or Masters Research Paper component. All supervision will be done as part of course experiences, e.g., the FCIT 620 Applied Capstone course will require students to work with the course instructor, alone or in groups.

Almost all faculty have their primary home in one of the units of the Faculty of Environment, and, in most cases, thematic electives and methods courses will also be available to students in the instructor's home graduate program. Core courses will only be available to Future Cities students, and the home units have agreed to make instructor time to deliver these courses available.

3.6 Organizational Structure

The MFC will be housed at the Faculty Level in Environment. The Program will have a Program Director, who will oversee recruitment, admissions and academic progression. The Program Director will be supported by a 0.5 FTE Graduate Program Administrator. The Program Director will normally be recruited from among the faculty members actively teaching in the program.

One of the thematic electives, ARCH 6XX, represents a contribution from the School of Architecture in the Faculty of Engineering. There are no other institutions involved in the development or delivery of the MFC.

4. PROJECTED ENROLMENT

It is hoped that the program can start in Fall 2023. Enough courses will be in place such that both part-time and full-time students entering in the first cohort can complete the program.

Enrolment in Year 1 is targeted at 12 new students (7 part-time and 5 full-time), increasing to an annual intake of 25-35 students (~70% part-time and 30% full-time), once steady-state is achieved in the 7th year of the program (class entering in 2029); 90% of enrolment is expected to be domestic.

Table 5 Projected Intake and Enrolment

Projected Student Intake and Enrolment								
Academic Year	FULL-TIME				PART-TIME (based on completion in 8 terms)			
	Year One Intake		Total FT Fiscal Year Enrolment[1]		Year One Intake		Total PT Fiscal Year Enrolment	
	Domestic	International fee-paying	Domestic	International fee-paying	Domestic	International fee-paying	Domestic	International fee-paying
2023-24	5	0	9.7	0	6	1	11.6	1.9
2024-25	6	0	16.1	0	9	2	32.1	6.3
2025-26	7	0	19.0	0	11	2	52.8	10.3
2026-27	8	0	21.8	0	13	2	66.4	11.9
2027-28	8	0	22.7	0	15	3	78.3	13.9
2028-29	8	0	22.7	0	17	3	90.2	16.3
2029-30	8	0	22.7	0	19	3	102.2	17.9

[1] Fiscal year enrolment is the total student enrolment over the three terms in the fiscal year (Spring + Fall + Winter). Note that student retention is estimated using existing transitions for the Master of Environment & Business and numbers are rounded to one decimal place. Full-time enrolment is based on program completion in 3 terms and part-time enrolment is based on completion in 8 terms.

5. FINANCIAL PLAN

A financial viability analysis (FVA) of the financial parameters and assumptions of the proposed program was conducted by Institutional Analysis and Planning (IAP) and discussed in detail with the Faculty Environment. IAP has not identified significant financial challenges to this proposal moving forward with the proposed enrolment, tuition rate, and costs outlined in the FVA. The financial viability analysis was approved by the Provost on February 13th, 2022.

Appendix A – Summary of Learning Outcomes Mapped to Courses and Assessment Methods

Specific GDLEs and Associated Learning Outcomes		Course													Assessment method							
	FCIT 600	FCIT 601	FCIT 602	FCIT 603	FCIT 620	FCIT 610	FCIT 607	INDEV 607	PLAN 606	FCIT 604	FCIT 605	FCIT 606	ARCH 6XX	PLAN 684	FCIT 609	Forum communication	Class discussions	Quizzes/Tests	Written assignments/ arguments/policy briefs	Data interpretation, synthesis, visualization	Technical reports/plans	Slide decks/presentations	Peer/article review
1. Depth and Breadth of Knowledge																							
Interdisciplinary knowledge of the concepts, information, and techniques relevant to futures studies, sustainability, and cities																							
Develop a futures thinking lens incorporating systems thinking and sustainability	✓	✓		✓			✓	✓	✓		✓						✓		✓	✓	✓	✓	
Understand and apply strategic decision-making methods that emphasize uncertainty and incorporate futures studies		✓		✓			✓								✓		✓			✓	✓	✓	✓
Explain and examine city systems and their major challenges			✓			✓				✓	✓	✓	✓	✓	✓	✓			✓			✓	✓
Explain and apply sustainability, systems thinking and futures studies in the context of city challenges and urban futures			✓	✓							✓				✓		✓		✓	✓	✓	✓	

Specific GDLEs and Associated Learning Outcomes	Course															Assessment method							
	FCIT 600	FCIT 601	FCIT 602	FCIT 603	FCIT 620	FCIT 610	FCIT 607	INDEV 607	PLAN 606	FCIT 604	FCIT 605	FCIT 606	ARCH 6XX	PLAN 684	FCIT 609	Forum communication/	Multi-part assignments	Quizzes/Tests	Written assignments/ arguments/policy briefs	Data interpretation, synthesis, visualization	Technical reports/plans	Slide decks/presentations	Peer/article review
2. Research & Scholarship																							
Demonstrate a conceptual understanding and methodological competence that enables the critical interpretation of current research findings and the application of research techniques specific to futures studies, sustainability, and cities																							
Describe and consider the tools and methods used to collectively envision, imagine, and respond to urban futures	✓	✓	✓	✓			✓	✓	✓			✓				✓	✓		✓	✓	✓	✓	
Analyze and interrogate current research on futures studies, sustainability, and selected city challenges		✓	✓	✓		✓	✓	✓	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓
Explain, assess, and generate futures responses to complex city challenges		✓	✓	✓							✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓

Specific GDLEs and Associated Learning Outcomes	Course															Assessment method							
	FCIT 600	FCIT 601	FCIT 602	FCIT 603	FCIT 620	FCIT 610	FCIT 607	INDEV 607	PLAN 606	FCIT 604	FCIT 605	FCIT 606	ARCH 6XX	PLAN 684	FCIT 609	Forum communication/ Class	Multi-part assignments	Quizzes/Tests	Written assignments/ arguments/policy briefs	Data interpretation, synthesis, visualization	Technical reports/plans	Slide decks/presentations	Peer/article review
3. Level and Application of Knowledge																							
Demonstrate competence in the application of an existing body of knowledge through research and critical analysis that addresses future cities challenges																							
Explain, utilize, and critique data relevant to current and future city challenges		✓		✓	✓	✓	✓						✓			✓			✓	✓	✓	✓	
Design and conduct research applying futures, systems, and sustainability to real-world complex city challenges			✓	✓	✓	✓	✓								✓	✓			✓	✓	✓	✓	
Collaboratively develop pro-active interdisciplinary solutions to future city challenges		✓		✓	✓	✓	✓			✓	✓	✓		✓	✓	✓			✓	✓	✓	✓	

Specific GDLEs and Associated Learning Outcomes		Course														Assessment Method							
	FCIT 600	FCIT 601	FCIT 602	FCIT 603	FCIT 620	FCIT 610	FCIT 607	INDEV 607	PLAN 606	FCIT 604	FCIT 605	FCIT 606	ARCH 6XX	PLAN 684	FCIT 609	Forum communication/ Class discussions	Multi-part assignments	Quizzes/Tests	Written assignments/ arguments/policy briefs	Data interpretation, synthesis, visualization	Technical reports/plans	Slide decks/presentations	Peer/article review
4. Professional Capacity/Autonomy																							
Demonstrate professional capacity and autonomy, through ethical behavior consistent with academic integrity and research guidelines, personal initiative, responsibility, and sound decision-making in diverse academic and professional situations.																							
Demonstrate professionalism through personal initiative and responsibility in all aspects of the classroom, laboratory, team projects, field school, and capstone work.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	
Demonstrate the ability to work effectively in interdisciplinary teams on problems relating to urban futures	✓	✓			✓	✓	✓	✓				✓			✓	✓			✓	✓	✓	✓	
Take a proactive and self-reflective approach to develop professional networks and relationships inside and outside the program.	✓			✓	✓	✓		✓				✓			✓	✓			✓		✓	✓	

Specific GDLEs and Associated Learning Outcomes		Course															Assessment Method							
	FCIT 600	FCIT 601	FCIT 602	FCIT 603	FCIT 620	FCIT 610	FCIT 607	INDEV 607	PLAN 606	FCIT 604	FCIT 605	FCIT 606	ARCH 6XX	PLAN 684	FCIT 609	Forum communication/ Class discussions	Multi-part assignments	Quizzes/Tests	Written assignments/ arguments/policy briefs	Data interpretation, synthesis, visualization	Technical reports/plans	Slide decks/presentations	Peer/article review
5. Level of Communications Skills																							
Demonstrate effective communication of ideas, results and conclusions in visual, oral and written forms.																							
Demonstrate competency to effectively communicate complex problems including technical challenges, social, environmental, sustainability, justice, equity and economic issues, in a variety of contexts and diverse expert and non-expert audiences.		✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓					✓			
Be able to produce a range of written communication products for varied audiences.		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓		
Apply techniques to improve confidence and effectiveness in professional speaking and presentation skills in all communications within the program.	✓	✓		✓	✓	✓					✓	✓				✓						✓	
6. Awareness of Limits of Knowledge																							
Be cognizant of the complexity, uncertainty and limitations of knowledge related to future urban systems																							
Have appreciation for the inherent uncertainties in projecting and predicting future urban systems.	✓	✓	✓	✓	✓	✓	✓					✓	✓		✓		✓	✓	✓	✓	✓	✓	
Develop an openness to alternative thinking, values, viewpoints and systems across the subject domains of the MFC.	✓	✓	✓	✓	✓	✓		✓							✓	✓			✓	✓	✓		

Course/Assessment Matrix

Course	Forum communication/ Class discussions	Multi-part assignments	Quizzes/Tests	Written assignments/ arguments/policy briefs	Data interpretation, synthesis, visualization	Technical reports/plans	Slide decks/presentations	Peer/article review
FCIT 600	✓			✓	✓		✓	
FCIT 601	✓	✓		✓	✓	✓	✓	
FCIT 602				✓		✓		✓
FCIT 603	✓	✓	✓	✓		✓		
FCIT 620	✓			✓	✓	✓	✓	
FCIT 610	✓			✓	✓	✓	✓	
FCIT 607	✓	✓		✓	✓	✓		
INDEV 607	✓			✓	✓	✓		✓
PLAN 606	✓		✓	✓		✓		✓
FCIT 604	✓			✓				✓
FCIT 605	✓	✓		✓			✓	✓
FCIT 606	✓	✓		✓		✓	✓	✓
ARCH 6XX	✓	✓			✓		✓	✓
PLAN 684			✓			✓	✓	
FCIT 609				✓	✓	✓	✓	

Appendix B
Job Posting – Caivan Communities Future Cities Professor

Assistant/Associate professor (tenure-track) in Future Studies with application to Cities

The Faculty of Environment, University of Waterloo, invites applications for a tenure-track faculty position at the rank of Assistant Professor or Associate Professor (salary range $90,000 to $150,000 per annum) with an anticipated start date of July 1, 2021, or shortly thereafter. The successful applicant will be jointly appointed to both the Faculty of Environment and the School of Planning as the inaugural "Caivan Communities Future Cities Professor."

We seek an energetic and dynamic scholar with demonstrated potential for leading academic programing and research related to future studies in the area of cities. Applicants should have an interest to study and critically evaluate plausible futures and their broader societal implications, and to contribute to scholarship and contemporary decision making in planning and/or broader public policy related to cities and their diverse inhabitants. We are particularly interested in applicants who employ interdisciplinary, futurist approaches to study the technology-human interface, society-environment interactions, and societal transitions as they apply to cities.

A demonstrated ability to forge and sustain fruitful partnerships with scholars from a variety of disciplines, as well as demonstrated excellence in teaching, are considered assets. We welcome individuals of all disciplinary backgrounds to apply.

Potential candidates should have a record of excellence in research and must be able to demonstrate a strong interest and ability to communicate to undergraduate and graduate students and to wider audiences, plus a keenness to mentor students effectively. Candidates are invited to submit an application including:

• an updated and complete curriculum vitae.
• a letter of interest (maximum 4 pages) outlining:

1. their qualifications for the position;
2. the fit of their profile and expertise with the advertised position;
3. their vision and future research program;
4. their potential to enhance the scholarship and capacity of the University and Faculty in strategic ways;
5. the names and contact information of three referees. [References will only be requested for applicants invited for an interview.]

The University of Waterloo is located in the Region of Waterloo: a mid-sized and rapidly growing area about an hour's drive west of Toronto's Pearson Airport. The University of Waterloo is a leader in the education of global citizens, with current efforts focusing on

promoting Indigenous scholarship, and creating opportunities with and for racialized campus community members. The University celebrates diversity through intersectionality informed initiatives for students, faculty and staff who identify as racialized, Indigenous, women, a person with a disability and/or LGBTQ2+. The University seeks candidates who embrace these goals of diversity and inclusion. The selection committee will be especially attentive to and respectful of the lived experiences of applicants.

All qualified candidates are encouraged to apply; however, Canadian citizens and permanent residents will be given priority.

The Faculty of Environment is a world leader in interdisciplinary research and teaching on the environment and sustainability. The Faculty is the home of five academic units: Department of Geography and Environmental Management; Department of Knowledge Integration; School of Environment, Enterprise and Development; School of Environment, Resources and Sustainability, and School of Planning. The Faculty is a dynamic and vibrant academic environment with ~ 100 faculty members, 50 staff, 2400 undergraduate students and 600 graduate students.

The School of Planning, housed in the Faculty of Environment, is at the forefront of planning research and teaching, characterized by a comprehensive, applied, critical, and interdisciplinary approach to planning with vibrant ties to the profession. Home to over 400 undergraduate students, 80 graduate students and 20 faculty members, the School offers undergraduate and Master's degrees accredited by the Professional Standards Board (PSB) for the profession, as well as an on-line professional Master's degree and a doctoral program.

If you have any questions regarding the position, the application process, assessment process, eligibility, or a request for accommodation during the hiring process, please contact Sheree Solomon at ssolomon@uwaterloo.ca.

Closing date for receipt of applications is February 28, 2021, and the application package should be addressed to:

Dean, Jean Andrey
Faculty of Environment
University of Waterloo
200 University Avenue West
Waterloo, ON, Canada, N2L 3G1

or may be submitted electronically to env-dean@uwaterloo.ca

Three reasons to apply: https://uwaterloo.ca/faculty-association/why-waterloo

UNIVERSITY OF WATERLOO

Program Response to External Reviewers' Report **Master of Future Cities (MFC) October 2022**

General Commentary

We would like to thank Drs. Shearmur and Gilliland for their feedback and suggestions. Below we describe how each of their suggestions will be addressed to strengthen the program and ensure its success.

Program Response to External Reviewers' Recommendations

The reviewers stated that they prefer to list suggestions as items for consideration rather than recommendations. Below are a set of high priority suggestions as well as other suggestions.

High Priority Suggestions:

1. Given that the program will not benefit from the administrative staff and procedures of a department, it is important to ensure that sufficient dedicated staff are available to deal with student affairs and with other aspects of program administration.

Response

Thank you for this feedback. You have correctly identified some of the challenges of a Faculty-level (rather than department-level) graduate program. While we are prepared to offer this program to incoming students in Fall 2023 at the Faculty level (as we have successfully done with other programs in the past), our Dean has begun discussions to explore the MFC's fit within the Faculty's Knowledge Integration (KI) department or School of Planning. We agree that situating the program within a department would provide the dedicated staff support and additional program administration support required for the program's long-term success. The School of Planning may be a good fit given the program's focus on cities, while the interdisciplinary and futures orientation of MFC fits well with the interdisciplinary, problem-based pedagogy in KI. We will continue to work collaboratively with the Directors/Chairs of Planning and KI, the Dean as we explore the options for a future unit for the program.

2. This is a new program, which will require constant monitoring and oversight for its first few years. Professor Minaker's course release, which we understand reduces her teaching load to 3 courses per year, is probably not sufficient. Additional teaching release is recommended in the first few years of this new program, so that the director can play a key role in the successful launch, monitoring, tweaking, marketing, and growth of the program.

Response

The Program Director's current course release is currently one course release every other year, bringing her course load to 3 each year. We agree with the recommendation to increase this and will therefore implement a full course release each year, resulting in a 2/3 teaching load over a two-year cycle.

3. It is important to market this program correctly. This probably entails market research before its launch, and certainly on-going market research to ensure that the university knows where to promote the program, and to ensure that potential students who may be interested in the program are made aware of it. We feel (but do not have the market research to back up this feeling!) that, given its essentially on-line structure, this program could be of interest to international as well as to domestic students.

Response

Thank you for this comment. An initial draft of the MFC graduate marketing recruitment plan was completed by the Faculty's Marketing and Recruitment Specialist in March 2022. The unique hybrid format and flexible completion timelines of the program were anticipated to be attractive to early- and mid-career professionals. The plan includes a series of actions to support recruitment over the first years of the program. Specific elements of the initial recruitment plan include: a Future Cities Video Series, a series of short, informative videos aimed at answering frequently asked questions about the program; a Future Cities Seminar Series (planning for which is currently underway); News stories posted on the Faculty's webpages as well as on the University's podcast and Daily Bulletin, and; the creation of a website, mailing list, and creating a MFC Google AdWords campaign. In the subsequent recruitment plan, we will: add additional web content to the website (after the program receives final approvals); create a digital brochure aligned with the Faculty's current graduate programs; host a graduate program open house, and; host an information webinar to extend our prospective student reach. We anticipate that future students and alumni of the program will be an important source of recruitment and thus have also created a student and alumni engagement plan, which will adapt to future circumstances and needs.

Regarding international student recruitments, we expect that most applicants will be domestic students, but are certainly open to accepting international students.

4. The program is interdisciplinary and will be admitting mid-career professionals. Admissions will therefore need to be curated (to try to ensure a diversity of backgrounds and skills within each student cohort, as well as general EDI issues at Waterloo). Also, thought will need to be given as to how to assess candidates with good professional credentials and accomplishments but maybe weaker (and ancient) academic records.

Response

University of Waterloo has several non-standard admissions pathways for graduate students. In the ramp-up phase of the program, we expect to admit all qualified students until we hit our target number, and we will additionally consider non-standard admissions on the basis of professional and lived experiences on a case-by-case basis.

We anticipate that the balance of disciplines will vary from cohort to cohort, and so each cohort will have its own composition and resulting character. Because there are no specific undergraduate disciplinary pathways to this degree and because our marketing strategy (see Response to Suggestion 3) will aim to recruit students from diverse fields/disciplines, we expect to recruit cohorts with diverse disciplinary backgrounds. Even if we are unsuccessful in recruiting an evenly-balanced interdisciplinary cohort in the first several years, the program itself will add diverse perspectives through faculty teaching and other program experiences (such as the seminar series, for example).

Finally, as per our response to suggestion 8, we are considering implementing a “mirror course” strategy for several of the core and elective courses (depending on student interest), wherein two sections of the same course are taught by the same instructor, with one section being the MFC cohort and the other being open to non-MFC students. This will help to maintain the cohort feel of the program but still provides access to all who wish to take the course.

Other suggestions:

5. The program is located within the Faculty of the Environment. Whilst we understand that this has been done before with success, we wonder whether it would not benefit from the administrative services, as well as the advocacy of a department director, of a department (such as Planning or Knowledge Integration).

Response

Please see response to High Priority Suggestion #1 above. We have begun conversations with relevant stakeholders within the Faculty and working towards situating the MFC program within either the School of Planning or Knowledge Integration department.

6. Currently, most faculty teaching in the program come from departments within the Faculty of the Environment. Whilst agreements in principle exist that release them from some departmental duties in order to teach in the program, such agreements can be difficult to respect over the longer term as each department's needs and priorities change. It will be important to ensure that these agreements are respected, and to put in place a mechanism whereby due notice is given by a department and/or a professor who is expecting to withdraw from the program, so that replacements may be found in a timely fashion.

Response

Thank you for this excellent suggestion. Professor Minaker will approach each of the department heads to begin discussions about establishing a mechanism by which due notice will be given in the case a department/professor expects to withdraw from the program. This will be done in conjunction with the Associate Dean of Graduate Studies.

7. The library is well equipped to deal with remote students. A curated collection of material dealing with systems theory and future studies (especially as they relate to cities) would be useful as support for the program. The only question we have relates to international students having access to material that is only available in hard-copy (such as foundational literature; grey literature; printed reports) which cannot be accessed via the university library network nor using the Canada Post arrangement.

Response

I have followed up with Marian Davies (the Faculty's library liaison) to respond to this suggestion appropriately. As you know, the University of Waterloo has an effective interlibrary loan service. All students (including international students) have access to the university library network and are able to access the network as long as they have an internet connection. However, the library liaison has assured me that in the rare circumstance that student somehow does not have access to the library network, they would find whatever alternative means necessary to provide the students with the material for their studies even if they had to work through a third party.

8. A considerable number of elective courses have been developed for the program. Whilst the core courses, which are taken by the whole cohort, will understandably be dedicated to the program, it may be useful to open the electives to the wider Waterloo community. Indeed, all the electives are interesting, and students need to have access to them; however, some may attract fewer students than others from within the Future Cities program. Therefore, opening them up will (maybe with reserved places for Future Cities students) would ensure these courses can be given regularly.

Response

We agree that many of the program electives will likely garner interest from beyond the MFC student cohort (as might some of the core courses). As noted in the response to Suggestion 4, we are considering implementing a "mirror course" strategy for several of the core and elective courses (depending on student interest), wherein two sections of the same course are taught by the same instructor, with one section being the MFC cohort and the other being open to non-MFC students. The development of these "mirror courses" could be administered in a way that does not increase the overall workload of the instructors, especially given that the courses will be online and so materials would be equivalent between courses (e.g., lecture content would not have to be recorded twice). Please note, the ultimate decision to open elective courses (and a limited number of core courses) will depend on student interest as noted. Thank you for this suggestion.

Signature of Approval

November 4, 2022

Chair/Director Date

Dean's Response to External Reviewers' Report
Master of Future Cities (MFC)
October 2022

General Commentary

Dean can add commentary here (e.g., how recommendations fit with the program and faculty's future plans, if particular recommendations are the purview of the program etc.).

Dean's Response to External Reviewers' Recommendations

The reviewers stated that they prefer to list suggestions as items for consideration rather than recommendations. Below are a set of high priority suggestions as well as other suggestions.

High Priority Suggestions:

1. Given that the program will not benefit from the administrative staff and procedures of a department, it is important to ensure that sufficient dedicated staff are available to deal with student affairs and with other aspects of program administration.

> **Dean's Response**
> The Dean's Office has created some dedicated capacity within its existing administrative structure to ensure that support is provided to the program in the initial start-up phase (~2 years). This provides the time required to assess future administrative resource needs to ensure successful implementation.

2. This is a new program, which will require constant monitoring and oversight for its first few years. Professor Minaker's course release, which we understand reduces her teaching load to 3 courses per year, is probably not sufficient. Additional teaching release is recommended in the first few years of this new program, so that the director can play a key role in the successful launch, monitoring, tweaking, marketing, and growth of the program.

> **Dean's Response**
> Agreed and an additional course release will be provided to the Director.

3. It is important to market this program correctly. This probably entails market research before its launch, and certainly on-going market research to ensure that the university knows where to promote the program, and to ensure that potential students who may be interested in the External Reviewers' Report for Cyclical Program Reviews Page 10 of 12 program are made aware of it. We feel (but do not have the market research to back up this feeling!) that, given its essentially on-line structure, this program could be of interest to international as well as to domestic students.

Dean's Response
There is a workplan in place, flowing from the Faculty's Marketing and Recruitment Specialist (completed in March 2022) that addresses this recommendation (see Program Director's response for detail).

4. The program is interdisciplinary and will be admitting mid-career professionals. Admissions will therefore need to be curated (to try to ensure a diversity of backgrounds and skills within each student cohort, as well as general EDI issues at Waterloo). Also, thought will need to be given as to how to assess candidates with good professional credentials and accomplishments but maybe weaker (and ancient) academic records.

Dean's Response
This issue is important and UW has non-standard admissions pathways to assist in this regard. In addition, our professional Master of Environment and Business provides precedence on the question of evaluating experience and academic credentials of applicants, within the framework of EDI.

Other suggestions:

5. The program is located within the Faculty of the Environment. Whilst we understand that this has been done before with success, we wonder whether it would not benefit from the administrative services, as well as the advocacy of a department director, of a department (such as Planning or Knowledge Integration).

Dean's Response
After consultations with both Planning and KI, as well as other relevant stakeholders, on balance I have decided that the program should remain at the Faculty level for the initial start-up. This will provide time to evaluate the implementation challenges and opportunities of the program and allow a more fulsome exploration of the most suitable

departmental home unit for the program. I note that this does not exclude the program remaining at the Faculty level in the longer term.

6. Currently, most faculty teaching in the program come from departments within the Faculty of the Environment. Whilst agreements in principle exist that release them from some departmental duties in order to teach in the program, such agreements can be difficult to respect over the longer term as each department's needs and priorities change. It will be important to ensure that these agreements are respected, and to put in place a mechanism whereby due notice is given by a department and/or a professor who is expecting to withdraw from the program, so that replacements may be found in a timely fashion.

Dean's Response
Agreed and this falls under the responsibilities of the Director and Associate Dean Graduate Studies.

7. The library is well equipped to deal with remote students. A curated collection of material dealing with systems theory and future studies (especially as they relate to cities) would be useful as support for the program. The only question we have relates to international students having access to material that is only available in hard-copy (such as foundational literature; grey literature; printed reports) which cannot be accessed via the university library network nor using the Canada Post arrangement.

Dean's Response
The Director has followed up with the Faculty's library liaison, who is aware of the program and ready to provide assistance and resources as required by all students.

8. A considerable number of elective courses have been developed for the program. Whilst the core courses, which are taken by the whole cohort, will understandably be dedicated to the program, it may be useful to open the electives to the wider Waterloo community. Indeed, all the electives are interesting, and students need to have access to them; however, some may attract fewer students than others from within the Future Cities program. Therefore, opening them up will (maybe with reserved places for Future Cities students) would ensure these courses can be given regularly.

Dean's Response
One intention of the program is to draw interest from beyond only the Faculty of Environment; in this context, course delivery will be planned based on demand.

Recommendations Not Selected for Implementation

None, with the note that #5 will remain under consideration in the evolving context of the program's implementation.

Signature of Approval

4 November 2022

Faculty Dean Date

Note: AFIW programs fall under the Faculty of ARTS; however, the Dean does not have fiscal control nor authority over staffing and administration of the program.

AFIW Administrative Dean/Head (*For AFIW programs only*) Date

UNIVERSITY OF WATERLOO | Co-operative and Experiential Education
Co-operative Education

CO-OPERATIVE AND EXPERIENTIAL EDUCATION
Co-operative Education
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Co-operative & Experiential Education (CEE)

Preliminary review

Proposed Program: Master of Engineering, Chemical Engineering, Co-operative Education

Program Effective Date: Fall 2023

Requested by: Nassar Mohieddin Abukhdeir, Associate Chair, Chemical Engineering

Prepared by: Richard Wikkerink, Director, Student & Faculty Relations, Co-operative Education

Executive Summary

The Department of Chemical Engineering has expressed intent to add a program-level work integrated learning (WIL) experience (co-op) option to their master's program for fall 2023. The co-op components of the degree will be fully administered by Co-operative & Experiential Education (CEE) with the work integrated learning (WIL) component included as a milestone degree requirement.

CEE will utilize existing staff, resources, and co-op processes across the portfolio, to support this new program, as it does for other graduate co-op programs in Engineering. CEE will require sufficient time to complete a new program plan and will work with the program in the coming months to address system and records processing needs, WIL programming and job development opportunities.

An industry and jobs analysis is not included in this report as there was insufficient advanced notice. Analysis, completed by CEE, will follow in 2023 and encompass all existing, new, and anticipated graduate co-op plans in the Faculty of Engineering.

With the understanding of a cap of 5 students for fall 2023, CEE supports in principle the proposed new MEng Chemical Engineering Co-op program and will collaborate with the academic unit on the development and administration of co-op components of the degree.

CEE recommends the Department of Chemical Engineering (Graduate Studies) consider the following:

- Establish new co-op admission requirements for Fall 2023 so that students may be directly admitted to the program, reducing barriers for international students who are required to obtain a co-op work permit to work in Canada

- Include co-op degree requirements in graduate calendar
- Review the implications of involvement in co-op as related to items such as, but not limited to, student statuses, funding packages and scholarships.

CEE, with leadership from the designated Faculty Relations Manager, will:

- Complete a labor market and co-op job analysis for MEng programs, sharing this data with the grad job development working group to inform Account Management (AM) and Business Development (BD) activities and targets. The Senior Advisor working with Engineering and Mitacs is included in this group
- Collaborate with the Associate Chair Graduate Studies for Chemical Engineering and the Graduate Officer/Coordinator to work through the Co-op Program Plan

Work-Integrated Learning at UW

Co-operative Education is a form of work integrated learning (WIL), which allows students to apply classroom learning to the workplace and, likewise, connect workplace learning to their degree and areas of specialization. For those students who are seeking a stronger connection between their studies and industry, the University of Waterloo's co-op programs distinguish it amongst Canadian institutions. Furthermore, CEE provides a robust system of support for students (domestic and international visa) seeking work experiences in Canada or internationally.

Benefits go beyond the students. Industry partners benefit by gaining access to a wider range of grad students who bring varied experiences personally, professionally, and academically. All stakeholders will benefit from opportunities for idea exchange and strengthened connection between academic research and innovations in industry.

Introducing a new co-op plan aligns with the strategic focus on GradWIL at an institutional level and will continue to reinforce UW as a WIL leader for both undergraduate and graduate programs.

The key components of a quality WIL experience are pedagogy, experience, assessment and reflection, or P.E.A.R. Making sure all four elements are included in the development of program-level WIL are critical for creating a qualify WIL experience.

- Pedagogy – includes the academic course content and the WIL curriculum
- Experience – meaningful and aligned appropriately with the WIL model
- Assessment – including the learning outcomes for the program + Future Ready Talent Framework
- Reflection – on the WIL experience and in alignment with the idea of "purposeful work"

Co-op Program Structure

The MEng Chemical Engineering Co-op program, as with other graduate co-op programs, will follow the existing co-op model. All co-op students are responsible for following the procedures, roles and responsibilities of co-op students.

Co-op students are strongly encouraged to complete PD 601 prior to their first co-op work term (typically completed in their Winter term/second study term) prior to the co-op experience and while they apply to jobs concurrently. PD 601 provides information on navigating the co-op employment process, foundational career preparation and teaches students how to prepare professional job search documents. Some graduate programs have positioned PD 601 as a foundational requirement for co-op participation. Students who have already completed similar UW co-op preparation modules (e.g.: PD1 Career

Fundamentals) will not be required to take PD 601. Note: PD 601 is currently going through a major re-development of course content, with an expected launch of Winter 2024.

The Centre for Career Action (CCA) provides career and co-op preparation resources and services (e.g.: resume, cover letter, interview preparation, job search, etc.) for all graduate students. These services are accessed more readily when promoted by the academic program or incorporated into existing courses. Additional collaboration between Chemical Engineering, SFR and CCA may be required prior to Fall 2023 to establish how existing services and staff will be utilized.

Co-op work terms must meet standard work term requirements for all graduate students. Chemical Engineering students will have access to the co-op job board through WaterlooWorks or may arrange their own employment, externally, which must be approved by CEE. During the experience, graduate students will be supported by Co-op Advisors through site visits, e-check-ins, work term ratings. Employers will evaluate the work performance of students via the Student Performance Evaluation (SPE); a rating of 'satisfactory' or above will grant the student credit for the work term.

As a best practice, it is recommended students in Graduate Co-op plan return for a final study term following the co-op work experience. The program will facilitate a work report or reflection assignment post-experience, which will also be a co-op degree milestone.

To evaluate program effectiveness and WIL outcomes, the CEE Faculty Relations Manager, Engineering, will monitor key metrics annually to ensure program quality.

Co-op Sequence

Students in MEng Chemical Engineering will be required to complete one standard co-op work term; however, CEE strongly recommends that the program allow for two consecutive co-op work terms in their program structure. Strategically, this proposed sequence would provide a longer immersive work experience for students, which is particularly appealing to industry partners, and would be consistent with other UW graduate co-op plans.

The proposed program will have students scheduled for Fall and Winter work terms, differing slightly from other graduate co-op sequences. This plan has students available to work in Winter terms, which historically have had low numbers of graduate co-op students scheduled to work.

MEng Chemical Engineering Co-op Sequence:

Fall	Winter	Spring	Fall	Winter	Spring
Study Direct-entry co-op	Study	Study Co-op prep course	**Work Term**	**Work Term**	Final course Completion of Work Report

Co-op Admissions

Programs seeking to add co-op as an option for their students, must do so by creating a direct-entry co-op program. There are a range of benefits to this structure, including CEE's ability to forecast earlier the number of students expected to be scheduled for a work term from the program and adjust employer and student-facing resources as necessary. Most notably, CEE can assist visa students in their work permit applications upon program admission, ensuring work terms are not negatively impacted by processing times.

Beginning Fall 2023, students will apply and be directly admitted into the MEng Chemical Engineering Co-op plan. The academic unit will need to establish a specific process and criteria for admissions into this new program.

Where there is demand for co-op, consideration should be given to the value and intention of a WIL experience, as academic standing is not always an indicator of workplace success. Additionally, graduate students bring a range of personal, professional, and academic experiences and so while the more experienced students may ultimately be successful in finding co-op employment, they arguably may not be the students to benefit most from the WIL experience.

Degree Requirements

Graduate students completing the co-operative education degree requirements will receive a "Co-operative Education" degree designation. These requirements include the following:

- Complete a minimum of 1 standard co-op work term and receive a Student Performance Evaluation of "marginal" or better
- Complete a work report/reflection requirement administered by the academic department

Note: as part of the GradWIL project, and in alignment with quality WIL standards, work is underway to enhance the graduate student co-op experience over the next two years. This includes the re-development of the co-op preparation course (PD 601) and the creation of a major reflective report post-experience. Graduate co-op programs

should anticipate future calendar changes including additional co-op degree requirements for their students.

Graduate Student Support

The Centre for Career Action (CCA) is in the Tatham Centre at the Waterloo campus and provides support to undergrad and grad students (whether in co-op or not), alumni and staff with co-op and career planning and preparation. Existing services include 1:1 appointments for resumes, cover letters, interview skills, work search, career planning and others, 1:1 drop-ins, workshops, both on and offline resources and supports all offered through a dedicated team of existing co-op and career staff.

Chemical Engineering graduate co-op students will be assigned to a team of Career Advisors who provide answers to co-op related questions as well as support throughout the co-op recruitment process. Once students secure a work term, they are offered additional support via a dedicated co-op Student Advisor who is available throughout the term, and provides a work term consultation and reviews e-check-ins.

Job Development

A New Program Plan will be completed between the Faculty Relations Manager, Engineering and will review the labour market, job demands, and areas for business development. With the newly established graduate job development working group in CEE, there is additional focus on strategies to develop jobs that are meaningful for the learning of graduate co-op students.

Generally, there are two years of lead time needed to develop jobs ahead of the first work term. With strong connections into associated industries, CEE can provide a range of suitable opportunities for students. As a course-based program with many pathways, marketing these students to employers may be challenging given the more specialized and focused areas of expertise and knowledge graduate students bring. Best efforts will be made to support graduate students in their job search – for example, CEE has proactively been engaged with Mitacs and the funding they have access to for WIL at the graduate level. Existing services and expertise in CCA will be leveraged to support students in their job search, noting that the new program plan will examine the resources required to provide these supports.

Note: Given the evolving landscape of graduate co-op in the Faculty of Engineering, and in anticipation of more programs coming forward to include a co-op option, CEE will complete an industry and job analysis in 2023. This report will consider all existing and new Master of Engineering co-op programs and will inform job development strategies for the growing numbers of students in these plans.

Additional Considerations
Graduate WIL

CEE and the GSPA, along with the faculties are undergoing a multi-unit, multi-year project to expand WIL offerings at the graduate level and enhance CEE co-op programming, support, and processes for graduate students. Therefore, graduate co-op will undergo several changes over the coming years which will impact existing programming, support, and job development efforts for graduate students.

Student Status and Fees

Graduate co-op students have their term status changed to co-op and pay a co-op fee during employed co-op work terms. Participation in graduate co-op may have implications for student statuses, funding packages and scholarships. The program will need to investigate further and make students aware of this.

International Students and Work Experiences

The CEE international team will support work terms held outside of Canada, adhering to UW and Global Affairs Canada (GAC) travel polices and advisories.

Students studying on a visa must obtain a co-op work permit in order to find employment for a co-op work term. Applying for a co-op work permit in Canada can take several months, with recent processing times taking at least six months. Direct admissions to the co-op program, allowing CEE to identify co-op students as early as possible, allows students to apply earlier and avoid delaying co-op employment.

Equity

Equity is an important component to consider within a competitive admissions and co-op process. For example, international students may encounter additional barriers such as: varying levels and types of work experience of incoming students, potential for travel restrictions, as well as the complexities of obtaining funding and/or security clearance that may be required for some roles can often be a disadvantage to international students and can delay or impact work term opportunities.

Co-op Program Plan

Following all levels of academic program approval for this new program and before the first term of admission, a Co-op Program Plan will be required. The Co-op Program Plan is a checklist of information, records, system, communications, etc., that ensure CEE administered co-op plans are set-up appropriately and necessary decisions are made. This is a collaborative activity led by a designated Faculty Relations Manager and the academic unit.