

AGENDA

NOTE: Members who wish to have items moved from the Consent to the Regular Agenda should contact the University Secretariat before the Senate meeting. Members may also request to have items moved when the Agenda is presented for approval.

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A. OPEN SESSION

OPENING REMARKS

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CONSENT

2. MINUTES OF PREVIOUS MEETING – JANUARY 15, 2020 (OPEN SESSION)

REGULAR

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11. OTHER BUSINESS

**REPORT TO SENATE
from the
UNDERGRADUATE COUNCIL**

FOR APPROVAL

- I** Curriculum Revisions for Inclusion in the 2020-2021 Undergraduate Calendar
At its December 10, 2019 and January 28, 2020 meetings, Undergraduate Council approved, for recommendation to Senate, the following major curriculum revisions for inclusion in the *2020-2021 Undergraduate Calendar*. Details of the following are contained in Attachments I – IV of the circulated report.

- a. Faculty of Engineering (Attachment I)
- b. Faculty of Science (Attachment II)
- c. Faculty of Social Sciences (Attachment III)
- d. Office of the Registrar (Attachment (IV))

It is now recommended,

that Senate approve major revisions to the *Honours Bachelor of Applied Science in Computer Science* program, for inclusion in the *2020-2021 Undergraduate Calendar*, as recommended by the Faculty of Engineering, and set out in the attached.

It is now recommended,

that Senate approve the establishment of the *Honours Bachelor of Applied Science in Sustainable Chemistry* and *Honours Bachelor of Applied Science in Sustainable Chemistry Co-op* programs for inclusion in the *2020-2021 Undergraduate Calendar*, as recommended by the Faculty of Science, and set out in the attached.

It is now recommended,

that Senate approve the establishment of the *Honours Bachelor of Science in Biodiversity and Environmental Sciences* program and corresponding name change, as a modification of the *Honours Bachelor of Science in Biology and Environmental Sciences* program, for inclusion in the *2020-2021 Undergraduate Calendar*, as recommended by the Faculty of Science, and set out in the attached.

It is now recommended,

that Senate approve the establishment of the *Combined Honours Bachelor of Arts in Environment & Society and Another Subject*, *Honours Bachelor of Arts in Environment & Society*, and *Bachelor of Arts in Environment & Society* programs

and corresponding name changes, as modifications of the *Combined Honours Bachelor of Arts in Geography and Another Subject, Honours Bachelor of Arts in Geography, and Bachelor of Arts in Geography* programs for inclusion in the 2020-2021 Undergraduate Calendar, as recommended by the Faculty of Social Sciences, and set out in the attached.

It is now recommended,

that Senate approve revisions to Admission Requirements, General Academic Regulations and Student Financial Aid & Scholarships, for inclusion in the 2020-2021 Undergraduate Calendar, as recommended by the Office of the Registrar, and set out in the attached.

II Establishment of New Certificate Programs

At its January 28, 2020 meeting, the Undergraduate Council approved the establishment of the following Certificate Programs. Details of the proposed Certificates are contained within Attachments V and VI of the circulated report.

- a. Concurrent Certificate in Geographic Information Science (GIS) (Attachment V)
- b. Concurrent Certificate in Urban Studies & Planning (USP) (Attachment VI)

It is now recommended,

that Senate approve the establishment of the Concurrent Certificate in Geographic Information Science (GIS), as set out in the attached.

It is now recommended,

that Senate approve the establishment of the Concurrent Certificate in Urban Studies & Planning (USP), as set out in the attached.

FOR INFORMATION

III Terms of Award

At the same meeting, the Undergraduate Council approved: a) one new awards, b) changes to one award terms, c) six new bursaries, and d) one award removed from the *Undergraduate Calendar*.

- a) New Awards
The Shahram Shirani & Mehrnoosh Faghih Scholarship
- b) Changes to Award Terms
The Jim Waddington Prize in Physics & Astronomy
- c) New Bursaries
The Irma Bursary

The Joan Royle Nursing Bursary
 The Howard Rowe Vardy Memorial Bursary
 The Mary and Harold Waterman Undergraduate Science Bursary
 The Campbell Family Bursary
 Dr. Ian Wilson Bursary

- d) Awards Removed from the Undergraduate Calendar
 The Birch Island Physician Assistant Bursary

IV Revisions to Certificate and Diploma Programs

At the same meeting, the Undergraduate Council approved minor revisions to the following Certificate and Diploma Programs:

- a. Concurrent Certificate in Professional French
- b. Concurrent Certificate in the Language of Medicine and Health
- c. Concurrent Ethics and Policy for Technological Innovation Certificate (EPTIC)

V Revisions to Certificate of Completion Programs

At the same meeting, the Undergraduate Council received, for information, a proposal to revise the Certificate of Completion in Project Management.

- a. Certificate of Completion in Enhanced Geriatrics Competencies & Education
- b. Certificate of Completion in Entrepreneurship
- c. Certificate of Completion in Engaging Teachers in STEM Education

VI Program Closures

At the same meeting, the Undergraduate Council approved, for recommendation to the University Planning Committee, the following program closures:

- a. Master of Divinity (MDiv)
- b. Master of Theological (MTS)

VII Research Plagiarism Checking Policy

At the same meeting, the Undergraduate Council approved, for recommendation to Senate, the establishment of the Research Plagiarism Checking Policy. The Policy was also approved by Graduate Council at its January 21, 2020 meeting.

Documents detailing items for information are available for review on the [Secretariat's website](#)

Senate: February 12, 2020

FACULTY OF ENGINEERING

UNDERGRADUATE CURRICULUM REPORT

TO UNDERGRADUATE COUNCIL

FOR THE 2020 – 21 CALENDAR

Faculty approved Nov. 26, 2019

**FACULTY OF ENGINEERING
REPORT TO SENATE
SUMMARY OF MAJOR CURRICULUM CHANGES FOR 2020-21**

This report highlights substantive changes being proposed. For a complete review of all changes, please refer to the Faculty of Engineering Curriculum Report for changes to 2020-21 Engineering Undergraduate Curriculum Report.docx on MacDrive:
<https://macdrive.mcmaster.ca/f/16e8e27fadcc4ffb3f8/>

NEW PROGRAMS

None

PROGRAM CLOSURES

None

MAJOR REVISIONS

1. COMPUTER SCIENCE

REVISION OF PROGRAMS:

RATIONALE: Changed level 1 computer science courses from 3 to 5. Includes a new experiential course. Some of the upper year courses have been redesigned to be experiential courses. Replacing Math 1ZC3 with Math 1B03. This allows Linear Algebra course to be moved from term 2 to term 1.

Department of Computing and Software

Faculty of the Department of Computing and Software as of January 1, 2020

CHAIR

~~Ridha Khedri~~ Mark S. Lawford

PROFESSORS

Antoine Deza/M.Eng. (Ecole Nationale des Ponts et Chaussées, Paris), Ph.D. (Tokyo Institute of Technology), P.Eng.

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Notes

1. All programs in the Department of Computing and Software have limited enrolment.
2. For the purpose of admission to Level II B.A.Sc. programs, the three courses MATH 1A03, MATH 1AA3 and MATH 1B03 together are considered equivalent to MATH 1ZA3, MATH 1ZB3 and MATH 1ZC3.

For the Arts & Science and Computer Science (B.Arts.Sc.) program, see *Arts & Science Program*

For the Honours Economics and Computer Science (B.A.) program, see *Faculty of Social Sciences, Department of Economics*

For the Honours Mathematics and Computer Science (B.Sc.) program, see *Faculty of Science, Department of Mathematics and Statistics*

Major Area of Study

~~Honours Business Informatics, Honours Business Informatics Co-op (B.A.Sc.)~~

~~Admission to Level II Computer Science Programs~~

~~Admission to Level II Honours Computer Science requires completion of all non-elective Computer Science I courses with a minimum Grade Point Average (GPA) of 4.0.~~

~~Notes~~

- ~~1. This program has limited enrolment.~~
- ~~2. For the purpose of admission to Level II B.A.Sc. programs, the three courses MATH 1A03, MATH 1AA3 and MATH 1B03 together are considered equivalent to MATH 1ZA3, MATH 1ZB3, and MATH 1ZC3.~~

~~Requirements~~

~~Business Informatics is the study of the design and application of information systems for use in business. It lies within the intersection of Computer Science and Business. Admission to Level II Honours Business Informatics was last offered in September 2016.~~

~~Level IV: 30 Units~~

~~6 units~~

- ~~• COMPSCI 4C03 Computer Networks and Security~~
- ~~• COMPSCI 4TB3 Syntax Based Tools and Compilers~~

~~3 units~~

- ~~• COMMERCE 2BC3 Human Resource Management and Labour Relations~~

~~6 units~~

from

- ~~COMMERCE 4KF3 – Project Management~~
- ~~COMMERCE 4KH3 – Strategies for Electronic and Mobile Business~~
- ~~COMMERCE 4FO3 – Small Business and Entrepreneurial Finance~~
- ~~COMMERCE 4OB3 – Analysis of Production/Operations Problems~~
- ~~COMMERCE 4OD3 – Purchasing and Supply Management~~
- ~~COMMERCE 4OI3 – Supply Chain Management~~

~~12 units~~

- ~~Levels III, IV Computer Science~~

~~3 units~~

- ~~Electives~~

Honours Computer Science as a Second Degree (B.A.Sc.)

Admission

Completion of a Bachelor's degree from a recognized university in a discipline other than Computer Science with a Grade Point Average of at least 7.0 ; and completion of MATH 1ZA3, MATH 1ZB3 and a grade of at least C+ in COMPSCI 1MD3 or equivalent. As Second Degree candidates, applicants must first apply for admission to the University through the Enrolment Services (Admissions) indicating they wish to apply for the Honours Computer Science B.A.Sc. as a Second Degree program. For the purpose of admission to this program, the two courses MATH 1A03 and MATH 1AA3 together are considered as equivalent to MATH 1ZA3 and MATH 1ZB3.

Note

If a student in the program has previously taken a required course (or its equivalent), it is not a requirement to repeat the course. However, if the credit from that course has been used toward completion of a previous degree, the student will be required to take another course with the required number of units. Admission to this program is at Level III.

Level III: 30 Units

27 units

- COMPSCI 2C03 - Data Structures and Algorithms
- COMPSCI 2DM3 - Discrete Mathematics with Applications I
- COMPSCI 2FA3 - Discrete Mathematics with Applications II
- COMPSCI 2GA3 - Computer Architecture
- COMPSCI 2ME3 - Introduction to Software Development
- COMPSCI 2S03 - Principles of Programming
- COMPSCI 2XA3 - Computer Science Practice and Experience: Software Development Skills
- COMPSCI 2XB3 - Computer Science Practice and Experience: Binding Theory to Practice
- COMPSCI 3I03 - Communication Skills

3 units

- Levels III, IV Computer Science, or other approved technical electives from List G (contact the Department of Computing and Software)

Level IV: 30 Units

27 units

- COMPSCI 3AC3 - Algorithms and Complexity
- COMPSCI 3DB3 - ~~Data Bases~~ Databases
- COMPSCI 3MI3 - Principles of Programming Languages
- COMPSCI 3SD3 - Concurrent Systems
- COMPSCI 3SH3 - Computer Science Practice and Experience: Operating Systems
- COMPSCI 4C03 - Computer Networks and Security
- COMPSCI 4TB3 - Syntax-Based Tools and Compilers
- COMPSCI 4ZP6 A/B - Capstone Project

3 units

- Levels III, IV Computer Science, or other approved technical electives from List G (contact the Department of Computing and Software)

Honours Computer Science, Honours Computer Science Co-op (B.A.Sc.)

Admission to Level II Computer Science Programs

Admission to Level II Honours Computer Science requires completion of all non-elective Computer Science I courses with a minimum Grade Point Average (GPA) of 4.0.

Notes

1. This program has limited enrolment.
2. For the purpose of admission to Level II B.A.Sc. programs, the three courses MATH 1A03, MATH 1AA3 and MATH 1B03 together are considered equivalent to MATH 1ZA3, MATH 1ZB3, and MATH 1ZC3.

REQUIREMENTS FOR STUDENTS WHO ENTER IN OR 2020-2021

Level II: 30 Units

24 units

- COMPSCI 2C03 - Data Structures and Algorithms
- COMPSCI 2DM3 - Discrete Mathematics with Applications I
- COMPSCI 2FA3 - Discrete Mathematics with Applications II
- COMPSCI 2GA3 - Computer Architecture
- COMPSCI 2ME3 - Introduction to Software Development
- COMPSCI 2S03 - Principles of Programming
- COMPSCI 2XA3 - Computer Science Practice and Experience: Software Development Skills
- COMPSCI 2XB3 - Computer Science Practice and Experience: Binding Theory to Practice

6 units

- Electives

Level III: 30 Units

18 units

- COMPSCI 3AC3 - Algorithms and Complexity
- COMPSCI 3DB3 - ~~Data Bases~~ Databases

- COMPSCI 3I03 - Communication Skills
- COMPSCI 3MI3 - Principles of Programming Languages
- COMPSCI 3SD3 - Concurrent Systems
- COMPSCI 3SH3 - Computer Science Practice and Experience: Operating Systems

6 units

from

- Levels III, IV Computer Science, or other approved technical electives from List G (contact the Department of Computing and Software)

6 units

- Electives

Level IV: 30 Units

12 units

- COMPSCI 4C03 - Computer Networks and Security
- COMPSCI 4TB3 - Syntax-Based Tools and Compilers
- COMPSCI 4ZP6 A/B - Capstone Project

12 units

from

- Levels III, IV Computer Science, or other approved technical electives from List G (contact the Department of Computing and Software)
- SEP 4EP3 - New Enterprise Capstone Project

6 units

- Electives

REQUIREMENTS EFFECTIVE SEPTEMBER 2021-2022

Level II: 30 Units

24 units

- COMPSCI 2AC3 - Automata and Computability
- COMPSCI 2C03 - Data Structures and Algorithms
- COMPSCI 2DB3 - Databases
- COMPSCI 2LC3 - Logical Reasoning for Computer Science
- COMPSCI 2GA3 - Computer Architecture
- COMPSCI 2ME3 - Introduction to Software Development
- COMPSCI 2SD3 - Concurrent Systems
- COMPSCI 2XC3 - Computer Science Practice and Experience: Algorithms and Software Design

6 units

- Electives

Level III: 30 Units

18 units

- COMPSCI 3AC3 - Algorithms and Complexity
- COMPSCI 3I03 - Communication Skills
- COMPSCI 3MI3 - Principles of Programming Languages
- COMPSCI 3N03 - Computer Networks and Security
- COMPSCI 3SH3 - Computer Science Practice and Experience: Operating Systems
- COMPSCI 3TB3 - Syntax-Based Tools and Compilers

6 units

- from
- Levels III, IV Computer Science, or other approved technical electives from List G (contact the Department of Computing and Software)

6 units

- Electives

Level IV: 30 Units

6 units

- COMPSCI 4ZP6 A/B - Capstone Project

12 units

from

- Levels III, IV Computer Science, or other approved technical electives from List G (contact the Department of Computing and Software)
- SEP 4EP3 - New Enterprise Capstone Project

12 units

- Electives

Computer Science I/Computer Science I Co-Op (B.A.Sc.)

30 units total
Requirements

15 units

- COMPSCI 1DM3 - Discrete Mathematics for Computer Science
- COMPSCI 1JC3 - Introduction to Computational Thinking
- COMPSCI 1MD3 - Introduction to Programming
- COMPSCI 1XA3 - Computer Science Practice and Experience: Basic Concepts
- COMPSCI 1XC3 - Computer Science Practice and Experience: Development Basics
- COMPSCI 1XD3 - Computer Science Practice and Experience: Introduction to Software Design Using Web Programming

9 units

- MATH 1B03 – Linear Algebra I
- MATH 1ZA3 - Engineering Mathematics I
- MATH 1ZB3 - Engineering Mathematics II-A
- MATH 1ZC3 – Engineering Mathematics II-B

~~12~~ 6 units

- ~~electives~~ Electives

1 course

- ENGINEER 1A00 or
- WHMIS 1A00 - Introduction to Health and Safety

COURSE DESCRIPTION CHANGES:

COMPSCI 1JC3 - Introduction to Computational Thinking

3 unit(s)

~~Inquiry into ideas and methods of computer science (CS), the science underlying our computational universe. Topics include what computers can and cannot do, the Internet and search engines, artificial intelligence, computer-controlled devices, and sustainability in computing.~~

Exploration of thinking that is inspired, supported, and enabled by computing. Survey of the salient ideas, methods, and technologies in the major areas of computing including basic data types, logic, operating systems, computer networking, web computing, information security, digital media, software development, and problem solving techniques. Introduction to the fundamentals of functional programming.

Three lectures, one tutorial (two hours), first term

Prerequisite(s): One of MATH 1K03, Grade 12 Advanced Functions and Introductory Calculus U, Grade 12 Calculus and Vectors, or registration in Computer Science 1

COMPSCI 1MD3 - Introduction to Programming

3 unit(s)

Introduction to fundamental programming concepts: values and types, expressions and evaluation, control flow constructs and exceptions, recursion, input/output and file processing.

Three lectures, one tutorial (one hour); ~~second~~ first term

Prerequisite(s): One of MATH 1K03, 1LS3, Grade 12 Advanced Functions and Introductory Calculus U, Grade 12 Calculus and Vectors

Antirequisite(s): ENGINEER 1D04, MATH 1MP3

COMPSCI 2C03 - Data Structures and Algorithms

3 unit(s)

Basic data structures: stacks, queues, hash tables, and binary trees; searching and sorting; graph representations and algorithms, including minimum spanning trees, traversals, shortest paths; introduction to algorithmic design strategies; correctness and performance analysis.

Three lectures, one tutorial (one hour); second term

Prerequisite(s): COMPSCI 1DM3 or 2DM3; and of COMPSCI 1MD3, 1XC3, 1XD3

Antirequisite(s): SFWRENG 2C03

Effective 2021-2022, this course will be offered in first term.

COMPSCI 2DM3 - Discrete Mathematics with Applications I

3 unit(s)

Functions, relations and sets; the language of predicate logic, propositional logic; proof techniques, counting principles; induction and recursion, discrete probabilities, graphs, and their application to computing.

Three lectures, one tutorial (one hour); first term

Prerequisite(s): MATH 1ZC3 or MATH 1B03 or registration in the Honours Computer Science as a Second Degree (B.A.Sc.)

Antirequisite(s): COMPSCI 1FC3, SFWRENG 2DM3, 2E03, 2F03

Last offered 2020-2021

COMPSCI 2FA3 - Discrete Mathematics with Applications II

3 unit(s)

Predicate logic and formal proofs, grammars and automata, modular arithmetic, and their applications to computing.

Three lectures, one tutorial (one hour); second term

Prerequisite(s): COMPSCI 1FC3 or 2DM3

Antirequisite(s): SFWRENG 2E03, 2F03, 2FA3

Last offered 2020-2021

COMPSCI 2GA3 - Computer Architecture

3 unit(s)

Introduction to logic gates, computer arithmetic, instruction-set architecture, assembly programming, translation of high-level languages into assembly. Computer system organization: datapath and control, pipelining, memory hierarchies, I/O systems; measures of performance.

~~Introduction to logic gates, number representation, computer arithmetic, instruction set architecture, datapath and control, pipelining, memory hierarchies, I/O systems, multiprocessor systems, measures of performance.~~

Three lectures, one tutorial, (one hour); first term

Prerequisite(s): COMPSCI 1MD3 or ENGINEER 1D04 or IBEHS 1P10

Prerequisite(s) effective 2021-2022: COMPSCI 1XC3 and 1DM3

Antirequisite(s): COMPENG 3DR4, 4DM4, SFWRENG 2GA3, 3GA3

COMPSCI 2ME3 - Introduction to Software Development

3 unit(s)

Classes and inheritance, class invariants, interface specifications; object-oriented design patterns; exception handling; tools for interface documentation, testing, program analysis; requirements documentation; quality attributes; development models. ~~Software life cycle, quality attributes, requirements documentation, specifying behavior, classes and objects, interface specification; creational, structural, and behavioral software design patterns; implementation in code, reviews, testing and verification.~~

Three lectures one tutorial (two hours); second term

Prerequisite(s): COMPSCI 2DM3, 2S03

Prerequisite(s) effective 2021-2022: COMPSCI 1XC3 and 1XD3

Co-requisite(s) effective 2021-2022: COMPSCI 2LC3

Antirequisite(s): SFWRENG 2AA4, SFWRENG 3K04, MECHTRON 3K04

Effective 2021-2022, this course will be offered in first term.

COMPSCI 2S03 - Principles of Programming

3 unit(s)

Fundamental concepts of programming: expressions, statements, procedures, control structures, iteration, recursion, exceptions; precise memory model of traditional imperative programming languages; basic data structures: records, arrays, dynamic structures; use of libraries.

Three lectures, one tutorial (one hour); first term

Prerequisite(s): COMPSCI 1MD3 or ENGINEER 1D04 or MATH 1MP3 or IBEHS 1P10

Antirequisite(s): COMPENG 2SH4, 2SC3, SFWRENG 2MP3, 2S03

Last offered 2020-2021

COMPSCI 2XA3 - Computer Science Practice and Experience: Software Development Skills

3 unit(s)

Unix and shell programming, makefiles, version control; assembly basics, translating high-level language into assembly, parameter passing, arrays, recursion; compiling, debugging, profiling, and software optimizations.

Two lectures, one lab (three hours per week), first term

Prerequisite(s): COMPSCI 1MD3 or ENGINEER 1D04 or IBEHS 1P10 A/B

Co-requisite(s): COMPSCI 2S03
Antirequisite(s): SFWRENG 2XA3
Last offered 2020-2021

COMPSCI 2XB3 - Computer Science Practice and Experience: Binding Theory to Practice

3 unit(s)

Open-ended design of computational solutions to practical problems that involve both theoretical (algorithmic) analysis and implementation; solving computational problems through an experiential approach.

~~One lecture, two labs (two hours each)~~ Two lectures, one lab (three hours), second term

Prerequisite(s): COMPSCI 2S03, 2XA3

Co-requisite(s): COMPSCI 2C03, 2ME3

Antirequisite(s): SFWRENG 2XB3

Last offered 2020-2021

COMPSCI 3AC3 - Algorithms and Complexity

3 unit(s)

Basic computability models; the Church-Turing thesis, complexity classes; P versus NP; NP-completeness, reduction techniques; algorithmic design strategies; flows, distributed algorithms, advanced techniques such as randomization.

Three lectures, one tutorial (one hour), second term

Prerequisite(s): COMPSCI 2C03 or SFWRENG 2C03, COMPSCI 2AC3 or 2FA3 or SFWRENG 2FA3

COMPSCI 3DB3 - ~~Data Bases~~ Databases

3 unit(s)

Data modelling, integrity constraints, principles and design of relational databases, relational algebra, SQL, query processing, transactions, concurrency control, recovery, security and data storage.

Three lectures, one tutorial (one hour); first term

Prerequisite(s): COMPSCI 1FC3 or COMPSCI 2DM3

Antirequisite(s): COMPSCI 4EB3, 4DB3, SFWRENG 3DB3, 3H03, 4M03, 4DB3

Last offered 2021-2022

COMPSCI 3EA3 - ~~Software Specifications and Correctness~~ Software and System Correctness

3 unit(s)

Formal specifications in software and system development; validation; verification; presentation of information; practical experience in formal specification and tool-supported verification. ~~Formal specifications in software development; logical formalisms; functional and relational specifications; completeness and consistency of specifications; verification; validation; presentation of information; tool-supported verification.~~

Three lectures; one tutorial (one hour); ~~second~~ first term

Prerequisite(s): COMPSCI 2LC3 or 2DM3, 2AC3 or 2FA3, 2ME3, 2SD3 or 3SD3

Offered on an irregular basis.

COMPSCI 3FP3 - Functional Programming

3 unit(s)

Functional programming; lists and algebraic data types, pattern matching, parametric polymorphism, higher-order functions, reasoning about programs; lazy and strict evaluation; programming with monads; domain-specific languages.

Three lectures, one tutorial; ~~first~~ first term

Prerequisite(s): COMPSCI 2DM3 or 2LC3, 2FA3 or 2AC3

Antirequisite(s): SFWRENG 3FP3

~~Cross-list(s):~~ SFWRENG 3FP3

Offered on an irregular basis.

COMPSCI 3GC3 - Computer Graphics

3 unit(s)

Mathematical foundations, the graphics pipeline, geometrical transformations, 3D visualization, clipping, illumination and shading models and the impact of graphics on society.

Three lectures, one tutorial (two hours every other week); ~~first~~ one term

Prerequisite(s): MATH 1B03 or 1ZC3, and COMPSCI 2C03 ~~Registration in Honours Computer Science or Honours Business Informatics, Honours Business Informatics Co-op (B.A.Sc.)~~

Antirequisite(s): SFWRENG 3GC3

Cross-list(s): SFWRENG 3GC3

Offered on an irregular basis.

COMPSCI 3IS3 - Information Security

3 unit(s)

Basic principles of information security; threats and defences; cryptography; introduction to network security and security management.

Three lectures; ~~first~~ one term

Prerequisite(s): ~~Credit or registration in~~ One of COMPSCI 2AC3, 2FA, ~~or~~ SFWRENG 2FA3; and COMPSCI 2C03 or SFWRENG 2C03

Offered on an irregular basis.

COMPSCI 3MI3 - Principles of Programming Languages

3 unit(s)

Principles of definition of and reasoning about programming languages and domain-specific languages; use of semantics for interpretation and in program analyses for correctness, security and efficiency.

~~Design space of programming languages; abstraction and modularization concepts and mechanisms; programming in non-procedural (functional and logic) paradigms; introduction to programming language semantics.~~

Three lectures; one tutorial (one hour); first term

Prerequisite(s): COMPSCI 2C03; and COMPSCI 2LC3 or 2DM3; and COMPSCI 2AC3 or 2FA3; and COMPSCI 2ME3

COMPSCI 3RA3 - Software Requirements and Security Considerations

3 unit(s)

Software requirements gathering. Critical systems requirements gathering. Security requirements. Traceability of requirements. Verification, validation, and documentation techniques. Software requirements quality attributes. Security policies. Measures for data confidentiality. Design principles that enhance security. Access control mechanisms.

Three lectures, one tutorial (one hour); first term

Prerequisite(s): COMPSCI 2AC3 or 2FA3; ; COMP SCI 2ME3

Antirequisite(s): ~~COMPSCI 3SR3, 4EF3, SFWRENG 3R03, 3RA3, 4EF3~~

Cross-list(s): SFWRENG 3RA3

COMPSCI 3SD3 - Concurrent Systems

3 unit(s)

Models of concurrency: process algebras, Petri nets, temporal logics and model checking; concurrency as software structuring principle: processes, threads, synchronization mechanisms, resource management and sharing; deadlock, safety and liveness; design, verification and testing of concurrent systems.

Three lectures, one tutorial (two hours); first term

Prerequisite(s): COMPSCI 2C03, 2FA3, 2ME3

Antirequisite(s): SFWRENG 3BB4

Last offered 2021-2022

COMPSCI 3SH3 - Computer Science Practice and Experience: Operating Systems

3 unit(s)

Processes and threads, synchronization and communication; scheduling, memory management; file systems; resource protection; structure of operating systems.

Two lectures, one tutorial, two labs (one hour each); second term

Prerequisite(s): COMPSCI 2SD3 or 3SD3; ; COMPSCI 2C03; ; and COMPSCI 2GA3

Antirequisite(s): ~~COMPSCI 3MH3, 4SH3, SFWRENG 3SH3~~

Effective 2021-2022, this course will be offered in first term.

COMPSCI 4AD3 - Advanced Databases

3 unit(s)

Advanced topics in database systems technology and design. Topics include: query processing; query optimization; data storage; indexing; crash recovery; physical database design; introductory data mining techniques.

Three lectures, one tutorial; ~~second~~ **one** term

Prerequisite(s): COMPSCI 3DB3

Antirequisite(s): SFWRENG 4AD3

Cross-list(s): SFWRENG 4AD3

Offered on an irregular basis.

COMPSCI 4AR3 - Software Architecture

3 unit(s)

Software architecture concepts; architectural styles; design patterns, components, libraries, configurations; modelling languages; software re-engineering.

Three lectures; ~~first~~ **one** term

Prerequisite(s): Credit or registration in COMPSCI 3RA3 or 3SR3

Offered on an irregular basis.

COMPSCI 4C03 - Computer Networks and Security

3 unit(s)

Physical networks, TCP/IP protocols, switching methods, network layering and components, network services. Information security, computer and network security threats, defence mechanisms, encryption.

Three lectures, one tutorial (one hour) ~~one lab (three hours every other week)~~; second term

Prerequisite(s): Credit or registration in COMP SCI 3MH3 or COMPSCI 3SH3

Antirequisite(s): COMP SCI 3CN3, 3C03, SFWRENG 4C03, COMPENG 4DN4

Cross-list(s): SFWRENG 4C03

Last offered 2022-2023

COMPSCI 4DC3 - Distributed Computing

3 unit(s)

Models of distributed computation, formal reasoning about distributed systems, time and message complexity, distributed agreement under adversarial attacks, distributed coordination and symmetry breaking, peer-to-peer computing, simulation as a tool for building more advanced functionality, actor-model programming.

Three lectures, one tutorial; ~~second~~ **one** term

Prerequisite(s): One of COMPSCI 2C03, ~~or~~ SFWRENG 2C03, ~~or~~ SFWRENG 2MD3; and one of COMPSCI 2SD3, 3SD3, ~~or~~ SFWRENG 3BB4 ~~or~~ SFWRENG 3SH3

Offered on an irregular basis.

COMPSCI 4EN3 A/B - Software Entrepreneurship

3 unit(s)

Issues in starting up a new software enterprise, with the focus on independent startups. This course will cover the technical, financial, legal and operational issues encountered by software startups. Small groups of students will take an idea and turn it into a prototype, a business plan, and a sales pitch. Lectures will cover issues from team formation to appropriate software development processes to patent protection to venture capital.

Three lectures; two terms

Prerequisite(s): Registration in Level III or IV of any Computer Science program

Offered on an irregular basis.

COMPSCI 4F03 - Parallel Computing

3 unit(s)

Parallel architectures, design and analysis of parallel algorithms; distributed-memory, shared-memory and GPU computing; communication cost, scalability; MPI, OpenMP and OpenACC; tuning parallel programs for performance.

Three lectures, one tutorial (one hour); ~~second one~~ term

Prerequisite(s): **COMPSCI 2SD3** or Credit or registration in COMPSCI 3SD3. Completion of COMPSCI 3N03 or 4C03 is recommended.

Antirequisite(s): SFWRENG 4F03

Cross-list(s): SFWRENG 4F03

Offered on an irregular basis.

COMPSCI 4HC3 - Human Computer Interaction Interfaces

3 unit(s)

Design of user interfaces. Principles of good interface design. Task-oriented design. User experience design. Inclusive design. Communicating with graphics. Modes and mode awareness problem. Human cognition (memory, perception, motor systems). Help systems. Interface design tools.

~~Design of user interfaces. Principles of good interface design. Human input. Displaying complex data using graphics and virtual reality. Modes and mode awareness problem. Health issues, information overload. Special purpose graphics hardware. Interface design tools; on line help systems.~~

Three lectures, one tutorial (one hour); first term

Prerequisite(s): COMPSCI 3MH3 or 3SH3 2C03

Antirequisite(s): SFWRENG 4D03, 4HC3

Cross-list(s): SFWRENG 4HC3

COMPSCI 4ML3 - Introduction to Machine Learning

3 unit(s)

Regression, Classification and Decision Theory, Bias-Variance Trade-off, Linear Models, Kernel Methods, Probabilistic Models, Neural Networks, Model Aggregation, Unsupervised Learning.

Three lectures, one tutorial; one term

Prerequisite(s): One of COMPSCI 2C03 or SFWRENG 2C03 or SFWRENG 2MD3. One of STATS 1L03, STATS 2D03, STATS 3Y03 is recommended. One of COMPSCI 4O03 or 4X03 or SFWRENG 3O03 or 4X03 is recommended.

~~Offered on an irregular basis.~~

Offered on an irregular basis.

COMPSCI 4TB3 - Syntax-Based Tools and Compilers

3 unit(s)

Lexical analysis, syntax analysis, type checking; syntax-directed translation, attribute grammars; compiler structure; implications of computer architecture; mapping of programming language concepts; code generation and optimization.

Two lectures, one tutorial, two labs (one hour each); second term

Prerequisite(s): COMPSCI 2C03 or SFWRENG 2C03, and COMPSCI 2GA3 or SFWRENG 2GA3 or 3GA3, and COMPSCI 2AC3 or 2FA3 or SFWRENG 2FA3, and COMPSCI 3MI3 or registration in Level IV or above of a Software Engineering program

Last offered 2022-2023

COMPSCI 4TE3 - Continuous Optimization

3 unit(s)

Fundamental algorithms and duality concepts of continuous optimization. Motivation, applicability, information requirements and computational cost of the algorithms is discussed. Practical problems will illustrate the power of continuous optimization techniques.

Three lectures, one tutorial (one hour); ~~first one~~ term

Prerequisite(s): One of MATH 2A03, 2M06 (or 2M03 and 2MM3), 2Q04, or 2ZZ3

Antirequisite(s): SFWRENG 4TE3

Cross-list(s): SFWRENG 4TE3

Offered on an irregular basis.

COMPSCI 4TH3 - Theory of Computation

3 unit(s)

Formal languages, models of computation, decidability, reduction techniques, time and space complexity classes.

Three lectures, one tutorial (one hour); one term

Prerequisite(s): COMPSCI 2AC3 or 2FA3, 2C03

Antirequisite(s): SFWRENG 4TH3

Cross-list(s): SFWRENG 4TH3

Offered on an irregular basis.

COMPSCI 4TI3 - Fundamentals of Image Processing

3 unit(s)

Discrete-time signals and systems, digital filter design, photons to pixels, linear filtering, edge-detection, non-linear filtering, multi-scale transforms, motion estimation.

Three lectures; ~~first~~ one term

Prerequisite(s): Registration in Level III or above of a program offered by the Department of Computing and Software

Offered on an irregular basis.

COMPSCI 4WW3 - Web Systems and Web Computing

3 unit(s)

Network protocols underlying the world wide web; client-side programming: markup, styles, scripts, design, mobile/desktop; server-side programming: databases, dynamic languages; web services; cloud technologies; security.

Three lectures; one term

Prerequisite(s): COMPSCI 2ME3 or SFWRENG 2AA4; completion of COMPSCI 2DB3 or 3DB3, 3IS3, or 3N03 or 4C03 is recommended.

Offered on an irregular basis.

COMPSCI 4X03 - Scientific Computation

3 unit(s)

Computer arithmetic, stability, sensitivity. Numerical methods for polynomial manipulation, interpolation, data fitting, integration, differentiation, solving linear and non-linear systems, ordinary differential equations and eigenvalue problems.

Three lectures, one tutorial (one hour); second term

Prerequisite(s): MATH 1ZZ5; or both MATH 1AA3 and MATH 1B03; or both MATH 1H03 and 1NN3; or both MATH 1ZB3 and MATH 1ZC3

Prerequisite(s): MATH 1AA3 or 1ZB3, and MATH 1B03 or 1ZC3

Antirequisite(s): COMPENG 3SK3, 3SK4, COMPSCI 3X03, 4MN3, SFWRENG 3X03, 4X03

Cross-list(s): SFWRENG 4X03

NEW COURSE(S):

COMPSCI 1DM3 - Discrete Mathematics for Computer Science

3 unit(s)

Sets, functions, relations, trees and graphs; counting principles, modular arithmetic, discrete probabilities; induction and recursion, recurrence relations.

Three lectures, one tutorial (two hours), second term

Prerequisite(s): MATH 1B03 or MATH 1ZC3 or registration in the Honours Computer Science as a Second Degree (B.A.Sc.)

Antirequisite(s): COMPSCI 1FC3, 2DM3, SFWRENG 2DM3, 2E03, 2F03

COMPSCI 1XC3 - Computer Science Practice and Experience: Development Basics

3 unit(s)

Acquiring familiarity with professional software development settings via practical experience with interaction with UNIX-like systems, programming in C, with documentation, testing, benchmarking, profiling and debugging; shell interaction and programming, pipes and filters; revision control.

Two lectures, two labs (two hours each); second term

Prerequisite(s): One of COMPSCI 1MD3 or ENGINEER 1D04

Antirequisite(s): COMPSCI 1XA3, 2XA3, 2S03, SFWRENG 2MP3, 2S03, 2XA3, COMPENG 2SH4

COMPSCI 1XD3 - Computer Science Practice and Experience: Introduction to Software Design Using Web Programming

3 unit(s)

Introduction to different aspects of design: Identifying user needs, goals and desires and translating them into software, and structuring and communicating the structure of software to improve reliability, readability and adaptability. Topics include web languages and protocols, types and design patterns.

Two lectures, two labs (two hours each); second term

Prerequisite(s): COMPSCI 1JC3 and 1MD3

Antirequisite(s): COMPSCI 1XA3

COMPSCI 2AC3 - Automata and Computability

3 unit(s)

Finite state machines, regular languages, regular expressions, applications of regular languages, grammars, context-free languages, models of computation, computability and decidability.

Three lectures, one tutorial (two hours); second term

Prerequisite(s): COMPSCI 2LC3, 2C03

Antirequisite(s): COMPSCI 2FA3, 2MJ3, SFWRENG 2FA3

First offered 2021-2022

COMPSCI 2DB3 - Databases

3 unit(s)

Data modelling, integrity constraints, principles and design of relational databases, relational algebra, SQL, query processing, transactions, concurrency control, recovery, security and data storage.

Three lectures, one tutorial (one hour); second term

Prerequisite(s): COMPSCI 2LC3 or COMPSCI 2DM3

Antirequisite(s): COMPSCI 3DB3, 4DB3, SFWRENG 3DB3, 3H03, 4M03, 4DB3

First offered 2021-2022

COMPSCI 2LC3 - Logical Reasoning for Computer Science

3 unit(s)

Introduction to logic and proof techniques for practical reasoning: propositional logic, predicate logic, structural induction; rigorous proofs in discrete mathematics and programming.

Three lectures, one tutorial (two hours); first term

Prerequisite(s): COMPSCI 1DM3, COMPSCI 1MD3 or 1XC3 or 1XD3

Antirequisite(s): COMPSCI 1FC3, 2DM3, SFWRENG 2DM3

First offered 2021-2022

COMPSCI 2SD3 - Concurrent Systems

3 unit(s)

Models of concurrency: process algebras, Petri nets, temporal logics and model checking; concurrency as software structuring principle: processes, threads, synchronization mechanisms, resource management and sharing; deadlock, safety and liveness; design, verification and testing of concurrent systems.

Three lectures, one tutorial (two hours); second term

Prerequisite(s): COMPSCI 2C03, 2LC3 or 2DM3, 2ME3

Co-requisite(s): COMPSCI 2AC3

Antirequisite(s): COMPSCI 3SD3, SFWRENG 3BB4

First offered 2021-2022

COMPSCI 2XC3 - Computer Science Practice and Experience: Algorithms and Software Design

3 unit(s)

Implementation of computational solutions to practical problems that combine algorithmic design and analysis with software design principles, through an experiential approach in simulated workplace environments. Communication skills: Technical documentation and presentation.

Two lectures, one lab (three hours), second term

Prerequisite(s): COMPSCI 1XC3, 1XD3, 2C03, 2ME3

Antirequisite(s): COMPSCI 2XB3, SFWRENG 2XB3

First offered 2021-2022

COMPSCI 3N03 - Computer Networks and Security

3 unit(s)

Physical networks, TCP/IP protocols, switching methods, network layering and components, network services. Information security, computer and network security threats, defence mechanisms, encryption.

Three lectures, one tutorial (one hour); second term

Prerequisite(s): COMP SCI 3MH3 or credit or registration in COMPSCI 3SH3

Antirequisite(s): COMP SCI 3CN3, 3C03, COMPSCI 4C03, SFWRENG 4C03, COMPENG 4DN4

First offered 2022-2023

COMPSCI 3TB3 - Syntax-Based Tools and Compilers

3 unit(s)

Lexical analysis, syntax analysis, type checking; syntax-directed translation, attribute grammars; compiler structure; implications of computer architecture; mapping of programming language concepts; code generation and optimization.

Two lectures, one tutorial, two labs (one hour each); second term

Prerequisite(s): COMPSCI 2C03 or SFWRENG 2C03, and COMPSCI 2GA3 or SFWRENG 2GA3 or 3GA3, and COMPSCI 2AC3 or 2FA3 or SFWRENG 2FA3, and COMPSCI 3MI3 or registration in Level IV or above of a Software Engineering program

First offered 2022-2023

COURSE DELETION(S):**COMPSCI 1XA3 - Computer Science Practice and Experience: Basic Concepts**

3 unit(s)

Practical experience with implementing basic CS concepts such as data representation, recursion, computer architecture, concurrency. Hands-on application of CS concepts to formulating, analyzing, and solving problems.

One lecture, two labs (two hours each); second term

Prerequisite(s): Registration in Computer Science or permission of the Instructor

Co-requisite(s): One of COMPSCI 1MD3 or ENGINEER 1D04

ENGINEER 2GB3 - Digital Media (Audio and Video) for Software Engineering

3 unit(s)

A study of digital media where students will create and critique digital audio and video. Readings will explore the evolution of digital media and the technical and social aspects of digital audio and video.

One lecture (two hours), one lab (two hours); first term

Prerequisite(s): Registration in Software Engineering - Game Design, Software Engineering - Game Design Co-op (B.Eng.) or permission of the department

Antirequisite(s): MMEDIA 2B03, 2BE3

ENGINEER 3GA3 - Introduction to Animation for Software Engineering

3 unit(s)

An introduction to the history and basic principles of animation. Students will create a significant work of computer animation displaying a variety of techniques. Readings and discussions will cover theatre, film studies and narrative.

One lecture (two hours), one lab (two hours); first term

Prerequisite(s): ENGINEER 2GB3 or MMEDIA 2BE3

Antirequisite(s): MMEDIA 2H03, 2HE3

ENGINEER 4GA3 - Interactive Digital Culture for Software Engineering

3 unit(s)

Covers works, forms, theories of digitally interactive culture. Works may include hypertext fiction, computer games, interactive digital art, video, music; theories may cover hypertext, interactivity, immersion, simulation, reception, participatory culture.

Three lectures; first term

Prerequisite(s): ENGINEER 3GA3 or MMEDIA 2HE3

Antirequisite(s): MMEDIA 3E03, 3EE3

None

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SCIENCE

Report to Undergraduate Council for the 2020-2021 Undergraduate Calendar

Approved by the
General Faculty of the Faculty of Science

November 21, 2019

FACULTY OF SCIENCE

REPORT TO SENATE

SUMMARY OF MAJOR CURRICULUM CHANGES FOR 2020-2021

Following, is the summary of substantive curriculum changes being proposed by the Faculty of Science. For a complete review of all changes, refer to the November, 2019, Report of the Academic Planning and Policy Committee for changes to the 2019-2020 Undergraduate Calendar, found at:

<https://macdrive.mcmaster.ca/f/1a385ffc308e4ed0b457/?dl=1>

1.0 NEW PROGRAMS:

1.1 Honours Sustainable Chemistry (B.A.Sc.)

(The availability of this program is subject to completion of McMaster University's Quality Assurance approval process.)

Admission Note:

Students intending to complete CHEM 3PA3 are required to complete one of PHYSICS 1A03 or 1C03 in Level I. Completion of PHYSICS 1AA3 or 1CC3 are recommended.

ADMISSION

Completion of any level I program with a Grade Point Average of at least 5.0 including:

6 units from the following courses, where an average of at least 6.0 (between courses) is required

- CHEM 1A03 – Introductory Chemistry I
- CHEM 1AA3 – Introductory Chemistry II
- CHEM 1E03 – General Chemistry for Engineering I

3 units from

- MATH 1A03 – Calculus for Science I
- MATH 1LS3 – Calculus for the Life Sciences I
- MATH 1M03 – Calculus for Business, Humanities and the Social Sciences
- MATH 1X03 – Calculus for Math and Stats I
- MATH 1ZA3 – Engineering Mathematics I

6 units from

- Science I Course List (See *Admission Note* above.)

Program Notes:

1. In some cases there are Level II and III prerequisites for Level III and IV courses. The prerequisites should be considered when choosing your Level II and III courses.
2. Students are encouraged to seek academic advising from the Departmental Undergraduate Advisor (email: advisor@chemistry.mcmaster.ca).
3. Certain Level IV courses are offered in alternate years. Students are advised to consider course offerings carefully in planning their course selection for Levels III and IV.

Course List 1:

- CHEM 2A03 - Quantitative Chemical Analysis
- CHEM 2II3 - Introductory Inorganic Chemistry: Structure and Bonding

- CHEM 2LB3 - Tools for Chemical Discovery
- CHEM 2OD3 - Synthesis and Function of Organic Molecules
- CHEM 2OG3 - Structure and Reactivity of Organic Molecules
- CHEM 2P03 - Applications of Physical Chemistry
- CHEM 2Q03 - Inquiry for Chemistry
- CHEM 3AA3 - Instrumental Analysis
- CHEM 3BC3 – Bad Chemistry
- CHEM 3EP3- Advanced Chemistry Placement
- CHEM 3II3 - Introduction to Transition Metal Chemistry
- CHEM 3LA3 - Strategies for Chemical Discovery
- CHEM 3I03 - Industrial Chemistry
- CHEM 3OA3 - Organic Synthesis
- CHEM 3PA3 - Quantum Mechanics and Spectroscopy
- CHEM 3PC3 - Mathematical Tools for Chemical Problems
- CHEM 3RC3 - Radioisotopes in Medicine
- CHEM 3RP3 - Research Practicum in Chemistry
- CHEM 4AA3 - Recent Advances in Analytical Chemistry
- CHEM 4D03 - Organic Structure and Synthesis
- CHEM 4G12 - Senior Thesis
- CHEM 4IA3 - Physical Methods of Inorganic Structure Determination
- CHEM 4IB3 -Bio-Inorganic Chemistry
- CHEM 4IC3 - Solid State Inorganic Materials: Structures, Properties, Characterization and Applications
- CHEM 4II3 - Transition Metal Organometallic Chemistry and Catalysis
- CHEM 4OA3 - Natural Products
- CHEM 4OB3 - Polymers and Organic Materials
- CHEM 4PB3 - Computational Models for Electronic Structure and Chemical Bonding
- CHEM 4RP6 - Research Project in Chemistry
- CHEM 4W03 - Natural and Synthetic Materials
- CHEMBIO 3BM3 - Implanted Biomaterials
- CHEMBIO 3OA3 - Organic Mechanistic Tools for Chemical Biology
- CHEMBIO 3OB3 - Structural Elucidation of Natural Products and Small Molecules
- CHEMBIO 3P03 - Biomolecular Interactions and Kinetics
- CHEMBIO 4Q03 - Peer Tutoring in Chemical Biology or Chemistry
- CHEMBIO 4A03 - Bio-Analytical Chemistry and Assay Development
- CHEMBIO 4OA3 - Natural Products
- CHEMBIO 4OB3 - Medicinal Chemistry: Drug Design and Development

Course List 2:

- BIOLOGY 3ET3 - Ecotoxicology
- EARTHSCI 2GG3 - Natural Disasters
- EARTHSC 3CC3 - Earth's changing climate
- EARTHSC 4CC3 - Stable Isotopes in Earth and Environmental Systems
- ENVIRSC 2B03 - Soils and the Environment
- ENVIRSC 2C03 - Environment and Surface Climate Processes
- ENVIRSC 2Q03 - Introduction to Environmental Geochemistry
- ENVIRSC 2WW3 - Water and the Environment
- ENVIRSC 3O03 - Contaminants, Fate and Transport
- ENVIRSC 4EA3 – Environmental Assessment
- ENVIRSC 4N03 - Global Biogeochemical Cycles
- ENVSOCTY 2EI3 - Environmental Issues
- ENVSOCTY 3EC3 - Environmental Catastrophes
- ENVSOCTY 3ER3 - Sustainability and the Economy

- ENVSOCY 3EE3 - Energy and Society
- ENVSOCY 4HH3 - Environment and Health
- HTHSCI 4MS3 - Toxic Tales: The Social Lives of Molecules
- LIFESCI 2X03 – Environmental Change and Human Health
- POLSCI 3GC3 - Global Climate Change
- STATS 2B03 - Statistical Methods for Science
- SUSTAIN 2S03 - Evaluating Problems & Sustainable Solutions
- SUSTAIN 3S03 - Implementing Sustainable Change

REQUIREMENTS

120 units total (Levels I-IV), of which no more than 48 units may be level I

Level I: 30 Units

30 Units

(See Admission above)

Level II: 30 Units

3 units

- CHEM 2SC3 - Sustainable Chemistry - Green Chemistry

12 units from

- CHEM 2A03 - Quantitative Chemical Analysis
- CHEM 2II3 - Introductory Inorganic Chemistry: Structure and Bonding
- CHEM 2LB3 - Tools for Chemical Discovery
- CHEM 2OD3 - Synthesis and Function of Organic Molecules
- CHEM 2OG3 - Structure and Reactivity of Organic Molecules
- CHEM 2P03 - Applications of Physical Chemistry
- CHEM 2Q03 - Inquiry for Chemistry

6 units from

- Course List 2

9 units

- Electives

Level III: 30 units

3 units from

- CHEM 3SC3 - Sustainable Chemistry – Natural Resources and Energy
- CHEM 4SC3 - Sustainable Chemistry – Analysis and Regulation

12 units from

- Course List 1

6 units from

- Course List 2

9 units

- Electives

Level IV: 30 units

3 units from

- CHEM 3SC3 - Sustainable Chemistry – Natural Resources and Energy
- CHEM 4SC3 - Sustainable Chemistry – Analysis and Regulation

12 units from

- Course List 1

6 units from

- Course list 2

9 units

- Electives

1.2 Honours Sustainable Chemistry Co-op (B.A.Sc.)

(The availability of this program is subject to completion of McMaster University's Quality Assurance approval process.)

ADMISSION

Enrolment in this program is limited. Selection is based on academic achievement and an interview but requires, as a minimum, submission of the on-line application by the stated deadline, and completion of Level II Honours Sustainable Chemistry with a Grade Point Average of at least 5.0 including:

Level II: 30 units

- CHEM 2SC3 - Sustainable Chemistry - Green Chemistry

12 units from

- CHEM 2A03 - Quantitative Chemical Analysis
- CHEM 2II3 - Introductory Inorganic Chemistry: Structure and Bonding
- CHEM 2LB3 - Tools for Chemical Discovery
- CHEM 2OD3 - Synthesis and Function of Organic Molecules
- CHEM 2OG3 - Structure and Reactivity of Organic Molecules
- CHEM 2P03 - Applications of Physical Chemistry
- CHEM 2Q03 - Inquiry for Chemistry

6 units from

- Course List 2

9 units

- Electives

Information about the program and the selection procedure may be obtained from Science Career and Cooperative Education.

Program Notes

1. This is a five-level (year) co-op program which includes two eight-month work terms that must be spent in appropriate chemistry-related placements.
2. Students must be registered full-time and take a full academic workload as prescribed by Level and by Term.
3. Students are required to complete SCIENCE 2C00 and SCIENCE 3C00 before the first work placement and are strongly recommended to complete SCIENCE 2C00 in Level II.
4. There are Level II and III prerequisites for many Level III and IV courses. The prerequisites should be considered when choosing your Level II and III courses.
5. Students considering postgraduate studies in Chemistry should note that 18 units of Level IV Chemistry or related subjects are required for consideration for admission at McMaster and most graduate schools in Canada.
6. CHEM 4RP6 A/B, 4G09 A/B or 4G12 A/B cannot be taken concurrently with CHEM 3LA3 or 3RP3.

Course List 1:

- CHEM 2A03 - Quantitative Chemical Analysis
- CHEM 2II3 - Introductory Inorganic Chemistry: Structure and Bonding
- CHEM 2LB3 - Tools for Chemical Discovery
- CHEM 2OD3 - Synthesis and Function of Organic Molecules
- CHEM 2OG3 - Structure and Reactivity of Organic Molecules
- CHEM 2P03 - Applications of Physical Chemistry
- CHEM 2Q03 - Inquiry for Chemistry
- CHEM 3AA3 - Instrumental Analysis
- CHEM 3BC3 - Bad Chemistry
- CHEM 3EP3 - Advanced Chemistry Placement
- CHEM 3II3 - Introduction to Transition Metal Chemistry
- CHEM 3LA3 - Strategies for Chemical Discovery
- CHEM 3I03 - Industrial Chemistry
- CHEM 3OA3 - Organic Synthesis
- CHEM 3PA3 - Quantum Mechanics and Spectroscopy
- CHEM 3PC3 - Mathematical Tools for Chemical Problems
- CHEM 3RC3 - Radioisotopes in Medicine

- CHEM 3RP3 - Research Practicum in Chemistry
- CHEM 4AA3 - Recent Advances in Analytical Chemistry
- CHEM 4D03 - Organic Structure and Synthesis
- CHEM 4G12 - Senior Thesis
- CHEM 4IA3 - Physical Methods of Inorganic Structure Determination
- CHEM 4IB3 - Bio-Inorganic Chemistry
- CHEM 4IC3 - Solid State Inorganic Materials: Structures, Properties, Characterization and Applications
- CHEM 4II3 - Transition Metal Organometallic Chemistry and Catalysis
- CHEM 4OA3 - Natural Products
- CHEM 4OB3 - Polymers and Organic Materials
- CHEM 4PB3 - Computational Models for Electronic Structure and Chemical Bonding
- CHEM 4RP6- Research Project in Chemistry
- CHEM 4W03 - Natural and Synthetic Materials
- CHEMBIO 3BM3 - Implanted Biomaterials
- CHEMBIO 3OA3 - Organic Mechanistic Tools for Chemical Biology
- CHEMBIO 3OB3 - Structural Elucidation of Natural Products and Small Molecules
- CHEMBIO 3P03 - Biomolecular Interactions and Kinetics
- CHEMBIO 4Q03 - Peer Tutoring in Chemical Biology or Chemistry
- CHEMBIO 4A03 - Bio-Analytical Chemistry and Assay Development
- CHEMBIO 4OA3 - Natural Products
- CHEMBIO 4OB3 - Medicinal Chemistry: Drug Design and Development

Course List 2:

- BIOLOGY 3ET3 - Ecotoxicology
- EARTHSCI 2GG3 - Natural Disasters
- EARTHSC 3CC3 - Earth's changing climate
- EARTHSC 4CC3 - Stable Isotopes in Earth and Environmental Systems
- ENVIRSC 2B03 - Soils and the Environment
- ENVIRSC 2C03 - Environment and Surface Climate Processes
- ENVIRSC 2Q03 - Introduction to Environmental Geochemistry
- ENVIRSC 2WW3 - Water and the Environment
- ENVIRSC 3O03 - Contaminants, Fate and Transport
- ENVIRSC 4EA3 - Environmental Assessment
- ENVIRSC 4N03 - Global Biogeochemical Cycles
- ENVSOCTY 2EI3 - Environmental Issues
- ENVSOCTY 3EC3 - Environmental Catastrophes
- ENVSOCTY 3ER3 - Sustainability and the Economy
- ENVSOCTY 3EE3 - Energy and Society
- ENVSOCTY 4HH3 - Environment and Health
- HTHSCI 4MS3 - Toxic Tales: The Social Lives of Molecules
- LIFESCI 2X03 - Environmental Change and Human Health
- POLSCI 3GC3 - Global Climate Change
- STATS 2B03 - Statistical Methods for Science
- SUSTAIN 2S03 - Evaluating Problems & Sustainable Solutions
- SUSTAIN 3S03 - Implementing Sustainable Change

REQUIREMENTS

120 units total (Levels I to IV), of which no more than 48 units may be Level I

Level I: 30 Units

Completed prior to admission to the program

Level II: 30 Units

- Completion of any Level II Honours Sustainable Chemistry program

1 course

- SCIENCE 2C00 - Skills for Career Success in Science

Level III:
Consists of academic studies (Fall Term), Co-op Work Term (Winter Term), and Co-op Work Term (Spring/Summer Term)

Fall Term: 15 units:

6 units from

- Course List 1

3 units from

- Course List 2

6 units

- Electives

2 courses

- SCIENCE 2C00 - Skills for Career Success in Science (if not already completed)
- SCIENCE 3C00 - Advanced Job Search Skills For Science Co-op Students

Winter Term:
Work Term

1 course

- SCIENCE 3WT0 - Science Co-op Work Term

Spring/Summer Term:
Work Term

1 course

- SCIENCE 3WT0 - Science Co-op Work Term

Level IV
Consists of academic studies (Fall and Winter Terms) and Co-op Work Term (Spring/Summer Term)

Fall and Winter Terms: 30 units:

3 units from

- CHEM 3SC3 - Sustainable Chemistry – Natural Resources and Energy
- CHEM 4SC3 - Sustainable Chemistry – Analysis and Regulation

12 units from

- Course List 1

6 units from

- Course list 2

9 units

- Electives

Spring/Summer Term:
Work Term

1 course

- SCIENCE 4WT0 - Science Co-op Work Term

Level V
Consists of Co-op Work Term (Fall Term) and academic studies (Winter Term)

Fall Term:
Work Term

1 course

- SCIENCE 5WT0 - Science Co-op Work Term

Winter Term: 15 units:

3 units from

- CHEM 3SC3 - Sustainable Chemistry – Natural Resources and Energy
- CHEM 4SC3 - Sustainable Chemistry – Analysis and Regulation

6 units from

- Course List 1

3 units from

- Course list 2

3 units

- Electives

Co-op Program Chart

	FALL TERM (September to December)	WINTER TERM (January to April)	SPRING/SUMMER TERM (May to August)
Level III	15 units from Academic Level III + SCIENCE 2C00 (if not completed) and SCIENCE 3C00	Work Term SCIENCE 3WT0	Work Term SCIENCE 3WT0
Level IV	15 units from Academic Level III	15 units from Academic Level IV	Work Term SCIENCE 4WT0
Level V	Work Term SCIENCE 5WT0	15 units from Academic Level IV	

Justification (1.1 & 1.2):

To complement the Honours B.Sc in Chemistry and Chemical Biology programs – both providing an intense, focused curriculum designed to prepare students for graduate or professional school - the Department is introducing the Honours B.A.Sc. in Sustainable Chemistry. The flexible curriculum and interdisciplinary nature of this program will allow students to explore areas of study in greater breadth and focus on key interactions of chemistry with other disciplines and relevant to the private sector. As well, a suite of Sustainable Chemistry courses CHEM 2SC3, 3SC3, and 4SC3 form a cohesive core to the program. These offerings focus on environmental, regulatory and safety issues, matters that have a clear relationship to, but transcend, chemistry, and that are in heavy demand in the employment sector (e.g. government employment). A Co-op option is available and will have an enrolment limit. It is believed that Sustainable Chemistry students, especially those in the co-op option, will bring a unique and valuable skill set to employers.

2.0 PROGRAM CLOSURES/MERGER:

2.1 Honours B.Sc. Geography & Environmental Sciences

See attached memorandum from Dr. Maureen MacDonald, Dean, Faculty of Science and Dr. Jeremiah Hurley, Dean, Faculty of Social Sciences

3.0 MAJOR REVISIONS:

3.1 Honours Biology and Environmental Sciences (B.Sc.)

Effective September 2021, this program will be renamed Honours Biodiversity and Environmental Sciences (B.Sc.) Students who enrolled prior to September 2021 will be given the choice to remain in Honours Biology and Environmental Sciences or transfer into Honours Biodiversity and Environmental Sciences (B.Sc.)

~~Honours Biology and Environmental Sciences is a flexible program that focuses on interdisciplinary studies among these two fields. Jointly offered by the Department of Biology and the School of~~

Geography and Earth Sciences, this program enables students to select courses according to their interests; to develop broad knowledge, and understanding of the linkages between biological and environmental processes; and to apply these to questions of biological, biomedical, or environmental interests. This program prepares students for graduate studies, careers in industry or academic research laboratories. Honours Biodiversity and Environmental Science is a flexible program that enables students to obtain an understanding of how a variety of organisms are able to adapt to their changing environments at the community and ecosystem levels. Offered jointly by the Department of Biology and School of Geography and Earth Sciences, this program enables students to select courses according to their interests; to develop broad knowledge, and understanding of the linkages between biodiversity and environmental processes; and to apply these to questions of biological, biomedical, or environmental interests. This program prepares students for graduate studies, careers in industry or academic research laboratories.

Admission Note

Students are strongly recommended to take CHEM 1A03 and 1AA3 in Level I.

Admission

Enrolment in this program is limited and possession of the published minimum requirements does not guarantee admission. Selection is based on academic achievement but requires, as a minimum, completion of any Level I program with a Grade Point Average of at least 5.0 including:

3 units from

- MATH 1A03 - Calculus For Science I
- MATH 1LS3 - Calculus for the Life Sciences I

6 units from the following courses, where an average of at least 6.0 (between the courses) is required

- BIOLOGY 1A03 - Cellular and Molecular Biology
- BIOLOGY 1M03 - Biodiversity, Evolution and Humanity

3 units from the following courses, with a grade of at least C+

- EARTHSC 1G03 - Earth and the Environment
- ENVIRSC 1C03 - Climate, Water And Environment
- ENVIRSC 1G03

12 units from

- ASTRON 1F03 - Introduction to Astronomy and Astrophysics
- BIOPHYS 1S03 - Biophysics of Movement and the Senses: From Microbes to Moose
- CHEM 1A03 - Introductory Chemistry I
- CHEM 1AA3 - Introductory Chemistry II
- COMPSCI 1JC3 - Introduction to Computational Thinking
- COMPSCI 1MD3 - Introduction to Programming
- COMPSCI 1XA3 - Computer Science Practice and Experience: Basic Concepts
- EARTHSC 1G03 - Earth and the Environment
- ENVIRSC 1C03 - Climate, Water And Environment
- ENVIRSC 1G03
- ENVSOCY 1HA3 - Society, Culture and Environment
- ENVSOCY 1HB3 - Population, Cities and Development
- GEOG 1HA3 - Society, Culture and Environment
- GEOG 1HB3 - Population, Cities and Development
- LIFESCI 1D03 - Medical Imaging Physics
- LIFESCI 1E03
- MATH 1AA3 - Calculus For Science II
- MATH 1B03 - Linear Algebra I
- MATH 1LT3 - Calculus for the Life Sciences II
- MEDPHYS 1E03
- PHYSICS 1A03 - Introductory Physics
- PHYSICS 1AA3 - Introduction To Modern Physics
- PHYSICS 1C03 - Physics for the Chemical and Physical Sciences

- PHYSICS 1CC3 - Modern Physics for the Chemical and Physical Sciences
 - PSYCH 1F03 - Survey of Psychology
 - PSYCH 1FF3 - Survey of Biological Basis of Psychology
 - PSYCH 1X03 - Introduction to Psychology, Neuroscience & Behaviour
 - PSYCH 1XX3 - Foundations of Psychology, Neuroscience & Behaviour
 - SCIENCE 1A03 - Investigating Science: Opportunities & Experiences
- (See *Admission Note* above.)

Program Notes

1. The Biology and Environmental Sciences program allows students (especially those focused on ecology and conservation) to choose Biology and Environmental Science courses that reflect their own interests. Students are strongly encouraged to discuss their course selections with an academic advisor in the Department of Biology or the School of Geography and Earth Sciences.
2. Prerequisites for upper year courses must be checked carefully when selecting courses in Level II. Biochemistry and Organic Chemistry prerequisites exist in many upper year biology courses. Students are encouraged to take six units from CHEM 2E03, 2OA3, 2OB3, 2OC3, 2OD3, 2OG3.
3. Students interested in completing a thesis may take one of BIOLOGY 4C12 A/B S, 4F06 A/B S or EARTHSC 4MT6 A/B in Level IV, subject to meeting the prerequisites. Students considering graduate studies are recommended to complete a thesis course.
4. Only one of BIOLOGY 4C12 A/B S, 4F06 A/B S or EARTHSC 4MT6 A/B may be completed as part of the program requirements. Completion of EARTHSC 3RD3 in Level III is required preparation for EARTHSC 4MT6 A/B.

Course List 1

- BIOCHEM 2EE3 - Metabolism and Physiological Chemistry
- BIOCHEM 3G03 - Proteins and Nucleic Acids
- BIOLOGY 2A03 - Integrative Physiology of Animals
- BIOLOGY 2B03 - Cell Biology
- BIOLOGY 2C03 - Genetics
- BIOLOGY 2D03 - Plant Biodiversity and Biotechnology
- BIOLOGY 2EE3 - Introduction to Microbiology and Biotechnology
- BIOLOGY 2F03 - Fundamental and Applied Ecology
- BIOLOGY 3ET3 - Ecotoxicology
- CHEM 2A03 - Quantitative Chemical Analysis
- CHEM 2AA3 - Quantitative Chemical Analysis
- CHEM 2OA3 - Organic Chemistry I
- CHEM 2OB3 - Organic Chemistry II
- CHEM 2OC3
- CHEM 2OD3 - Synthesis and Function of Organic Molecules
- CHEM 2OG3 - Structure and Reactivity of Organic Molecules
- CHEM 2P03 - Applications of Physical Chemistry
- ~~CHEM 2PD3~~
- CHEMBIO 2A03 - Introduction to Bio-Analytical Chemistry
- CHEMBIO 2P03 - Physical Chemistry Tools for Chemical Biology
- ~~LIFESCI 2H03~~
- LIFESCI 2X03 - Environmental Change and Human Health
- PSYCH 3T03 - Behavioural Ecology

Course List 2

- EARTHSC 2E03 - Earth History
- EARTHSC 2FE3 - Introduction to Field Methods in Earth Sciences
- EARTHSC 3CC3 - Earth's Changing Climate
- EARTHSC 3E03 - Clastic Sedimentary Environments
- EARTHSC 3RD3 - Research Design and Dissemination in Earth and Environmental Sciences
- EARTHSC 3W03 - Physical Hydrogeology

- EARTHSC 4CC3 - Stable Isotopes in Earth and Environmental Systems
- EARTHSC 4FF3 - Topics of Field Research
- EARTHSC 4G03 - Glacial Sediments and Environments
- EARTHSC 4MI3
- EARTHSC 4MT6 A/B - Senior Thesis
- EARTHSC 4P03 - Coral Reef Environments
- EARTHSC 4VV3 - Environmental Geophysics
- EARTHSC 4WB3 - Contaminant Hydrogeology
- ENVIRSC 2B03 - Soils and the Environment
- ENVIRSC 2C03 - Surface Climate Processes and Environmental Interactions
- ENVIRSC 2E03
- ENVIRSC 2EI3
- ENVIRSC 2GI3
- ENVIRSC 2L03
- ENVIRSC 2Q03 - Introduction to Environmental Geochemistry
- ENVIRSC 2W03 - Physical Hydrology
- ENVIRSC 3B03 - Ecosystems and Global Change
- ENVIRSC 3CC3
- ENVIRSC 3E03
- ENVIRSC 3EE3
- ENVIRSC 3MB3
- ENVIRSC 3ME3 - Environmental Field Camp
- ENVIRSC 3O03 - Contaminant Fate and Transport
- ENVIRSC 3SR3
- ENVIRSC 3U03 - Environmental Systems Modelling
- ENVIRSC 3W03
- ENVIRSC 4C03 - Advanced Physical Climatology
- ENVIRSC 4CC3
- ENVIRSC 4FF3
- ENVIRSC 4G03
- ENVIRSC 4GA3
- ENVIRSC 4HH3
- ENVIRSC 4MI3 - Independent Study in Earth and Environmental Sciences
- ENVIRSC 4N03 - Global Biogeochemical Cycles
- ENVIRSC 4W03 - Hydrologic Modelling
- ENVIRSC 4WB3
- ENVSOCTY 2EI3 - Environmental Issues
- ENVSOCTY 2GI3 - Geographic Information Systems
- ENVSOCTY 3EE3 - Energy and Society
- ENVSOCTY 3GI3 - Advanced Raster GIS
- ENVSOCTY 3GV3 - Advanced Vector GIS
- ENVSOCTY 3MB3 - Data Analysis
- ENVSOCTY 3SR3 - Remote Sensing
- ENVSOCTY 4GA3 - Applied Spatial Statistics
- ENVSOCTY 4HH3 - Environment and Health
- GEOG 2EI3 - Environmental Issues
- GEOG 2GI3 - Geographic Information Systems
- GEOG 3EE3 - Energy and Society
- GEOG 3GI3 - Advanced Raster GIS
- GEOG 3GV3 - Advanced Vector GIS
- GEOG 3MB3 - Data Analysis
- GEOG 3SR3 - Remote Sensing
- GEOG 4GA3 - Applied Spatial Statistics

- GEOG 4HH3 - ~~Environment and Health~~

Requirements

120 units total (Levels I to IV), of which no more than 48 units may be Level I

Level I: 30 Units

30 units

(See *Admission* above.)

Level II: 30 Units

9 units from

- BIOLOGY 2F03 - Fundamental and Applied Ecology
- ENVIRSC 2W03 - Physical Hydrology
- ENVSOCY 2GI3 - Geographic Information Systems
- GEOG 2GI3 - ~~Geographic Information Systems~~

3 units from

- BIOLOGY 2C03 - Genetics
- LIFESCI 2G03 - Genes, Genomes and Society

3 units from

- ENVSOCY 3MB3 - Data Analysis
- GEOG 3MB3 - ~~Data Analysis~~
- STATS 2B03 - Statistical Methods for Science

3 units from

- BIOLOGY 2B03 - Cell Biology
- BIOLOGY 2D03 - Plant Biodiversity and Biotechnology
- BIOLOGY 2EE3 - Introduction to Microbiology and Biotechnology
- LIFESCI 2X03 - Environmental Change and Human Health

3 units from

- EARTHSC 2E03 - Earth History
- ENVIRSC 2B03 - Soils and the Environment
- ENVIRSC 2C03 - Surface Climate Processes and Environmental Interactions
- ENVIRSC 2Q03 - Introduction to Environmental Geochemistry

9 units

- Electives

Level III: 30 Units

6 units from

- BIOLOGY 3EI3 - Ecological Indicators
- BIOLOGY 3ET3 - Ecotoxicology
- BIOLOGY 3JJ3 - Field Methods In Ecology
- ENVIRSC 3B03 - Ecosystems and Global Change
- ENVIRSC 3ME3 - Environmental Field Camp

6 units from

- BIOLOGY 3DD3 - Communities and Ecosystems
- BIOLOGY 3EI3 - Ecological Indicators
- BIOLOGY 3ET3 - Ecotoxicology
- BIOLOGY 3JJ3 - Field Methods In Ecology
- BIOLOGY 3R03 - Field Biology I
- BIOLOGY 3SS3 - Population Ecology
- ENVIRSC 3B03 - Ecosystems and Global Change

6 units from

- EARTHSC 3RD3 - Research Design and Dissemination in Earth and Environmental Sciences
- EARTHSC 3W03 - Physical Hydrogeology
- ENVIRSC 3O03 - Contaminant Fate and Transport
- ENVIRSC 3U03 - Environmental Systems Modelling
- ENVSOCY 3GI3 - Advanced Raster GIS

- ENVSOCY 3SR3 - Remote Sensing
- GEOG 3GI3 - ~~Advanced Raster GIS~~
- GEOG 3SR3 - ~~Remote Sensing~~

12 units

- Electives

Level IV: 30 Units

6 units from

- *Course List 1* or *Course List 2*

6 units

- Levels III, IV courses from *Course List 2*

6 units

- Levels III, IV Biology, Molecular Biology courses

3 units

- ENVIRSC 4EA3 - Environmental Assessment

9 units

- Electives

Requirements for Students Who Entered in September 2018

120 units total (Levels I to IV), of which no more than 48 units may be Level I

Level I: 30 Units

30 units

(See *Admission* above.)

Level II: 30 Units

9 units from

- BIOLOGY 2F03 - Fundamental and Applied Ecology
- ENVIRSC 2W03 - Physical Hydrology
- ENVSOCY 2GI3 - Geographic Information Systems
- GEOG 2GI3 - ~~Geographic Information Systems~~

3 units from

- BIOLOGY 2C03 - Genetics
- LIFESCI 2G03 - Genes, Genomes and Society

3 units from

- ENVSOCY 3MB3 - Data Analysis
- GEOG 3MB3 - ~~Data Analysis~~
- STATS 2B03 - Statistical Methods for Science

3 units from

- BIOLOGY 2B03 - Cell Biology
- BIOLOGY 2D03 - Plant Biodiversity and Biotechnology
- BIOLOGY 2EE3 - Introduction to Microbiology and Biotechnology
- LIFESCI 2X03 - Environmental Change and Human Health

3 units from

- EARTHSC 2E03 - Earth History
- ENVIRSC 2B03 - Soils and the Environment
- ENVIRSC 2C03 - Surface Climate Processes and Environmental Interactions
- ENVIRSC 2Q03 - Introduction to Environmental Geochemistry

9 units

- Electives

Levels III-IV: 60 Units

6 units from

- *Course List 1* or *Course List 2*

21 units

- Levels III, IV courses from *Course List 2*

18 units

- Levels III, IV Biology, Molecular Biology courses
3 units
- ENVIRSC 4EA3 - Environmental Assessment
12 units
- Electives

Students who entered the program prior to September 2018 should refer to the 2017-2018 Undergraduate Calendar or their personal Advisement Report for program requirements.

~~Requirements for Students Who Entered Prior to September 2018
120 units total (Levels I to IV), of which no more than 48 units may be Level I~~

~~Level I: 30 Units
30 units
(See Admission above.)~~

~~Levels II-IV: 90 Units
9 units from~~

- ~~• EARTHSC 2E03 – Earth History~~
- ~~• ENVIRSC 2B03 – Soils and the Environment~~
- ~~• ENVIRSC 2C03 – Surface Climate Processes and Environmental Interactions~~
- ~~• ENVIRSC 2E03~~
- ~~• ENVIRSC 2GI3~~
- ~~• ENVIRSC 2L03~~
- ~~• ENVIRSC 2Q03 – Introduction to Environmental Geochemistry~~
- ~~• ENVIRSC 2W03 – Physical Hydrology~~
- ~~• GEOG 2GI3 – Geographic Information Systems~~

~~9 units from~~

- ~~• BIOLOGY 2A03 – Integrative Physiology of Animals~~
- ~~• BIOLOGY 2B03 – Cell Biology~~
- ~~• BIOLOGY 2C03 – Genetics~~
- ~~• BIOLOGY 2D03 – Plant Biodiversity and Biotechnology~~
- ~~• BIOLOGY 2EE3 – Introduction to Microbiology and Biotechnology~~
- ~~• BIOLOGY 2F03 – Fundamental and Applied Ecology~~
- ~~• LIFESCI 2X03 – Environmental Change and Human Health~~

~~3 units from~~

- ~~• ENVIRSC 3MB3~~
- ~~• STATS 2B03 – Statistical Methods for Science~~

~~6 units from~~

- ~~• Course List 1 or Course List 2~~

~~21 units~~

- ~~• Levels III, IV courses from Course List 2~~

~~18 units~~

- ~~• Levels III, IV Biology, Molecular Biology courses~~

~~3 units~~

- ~~• ENVIRSC 4EA3 – Environmental Assessment~~

~~21 units~~

- ~~• Electives~~

Justification:

Program has been renamed to reflect the flavor of curriculum and the courses students are selecting with focus on biodiversity, soil, ecology, hydrology, and climate. In-course students will be contacted and given the choice to remain enrolled in Biology and Environmental Sciences or switch to the newly named Biodiversity and Environmental Sciences program label. Program enrolment limit has been removed as all qualified students can be accommodated.

November 12, 2019

TO: Associate Vice-President (Faculty)
Chair, Undergraduate Council

FROM: Dr. Maureen McDonald, Dean, Faculty of Science
Dr. Jeremiah Hurley, Dean, Faculty of Social Sciences

SUBJECT: Program Closure/Merger of Honours Geography & Environmental Science and Honours
Geography and Environmental Studies

During the 2018-19 academic year, the School of Geography and Earth Science (SGES) undertook a comprehensive review of its undergraduate programs. The SGES program review involved focus groups with program students, an online survey of Level III students asking about program choice, meetings with academic advisors in Science and Social Sciences, and an analysis of SGES program and course enrolment data.

The review found significant overlap between the Honours Environmental Sciences and Honours Geography and Environmental Sciences programs. For this reason, SGES recommended merging these programs into a single Honours Environmental Sciences program (also available as a Coop program).

The review also found significant overlap between the Honours Geography program and the Honours Geography & Environmental Studies program. For this reason, SGES recommended merging these programs into a renamed Honours Environment & Society program. The new name signals the program's central focus on the interrelationship between human societies and the built, social, economic and natural environments they inhabit; and the explicitly interdisciplinary nature of the program, which spans Environmental Studies, Human Geography, Geographic Information Science, and Urban Studies.

For details, see Major Modifications section below.

As per the proposed changes, the Faculty is proposing to do the following:

- Notify students that the existing Honours Geography & Environmental Science program is no longer available and direct Level I students who intended to register in this program to the merged Honours Environmental Science program. Admissions requirements to the merged program will be the same as those required for Honours Geography & Environmental Science. All currently enrolled students will be given the opportunity to complete their program requirements.

- Notify students that the Coop version of the Honours Geography & Environmental Science program will be phased out. Admission will be last available in September 2020. All currently enrolled students will be given the opportunity to complete their program requirements.
- Notify students that the existing Honours Geography & Environmental Studies program is no longer available and direct Level I students who intended to register in this program to the merged Honours Environment and Society program. Admissions requirements to the merged program will be the same as those required for Honours Geography & Environmental Studies. All currently enrolled students will be given the opportunity to complete their program requirements.
- Notify students that the existing Honours Geography program will be renamed Honours Environment and Society. All currently enrolled students will be given the opportunity to graduate with the existing program name, but they can also elect to graduate with the new name.

Students were consulted extensively during the program review process (in focus groups and surveys), and the broader student population has been made aware of these impending changes through email communications from the SGES Associate Director (Undergraduate):

SGES Program Changes

I want to update you on some exciting changes to our undergraduate programs. Before I outline what's changing (and what's not changing), let me be clear that these revisions will not impact to you as current program students, although there are some changes that you can choose to adopt if you wish (see 1.c and 2.a below). If you have specific questions, please feel free to contact Kara Salvador or myself for further information. We'll also be organizing information sessions in the winter term to provide additional guidance for students.

Let me offer some context for the changes. As some of you know, we undertook a review of our undergraduate BA and BSc programs last year. This involved focus groups with students in BA and BSc program, an online survey of Level III students asking about program choice, meetings with academic advisors in Science and Social Sciences, and an analysis of SGES program and course enrolment data. From the review, we learned a number of things:

- *On the BSc side, students and academic advisors felt we had too many programs and the differences between them were not clear. This was particularly the case for our Honours Environmental Sciences and Geography & Environmental Sciences programs.*
- *On the BA side, we noted significant overlaps between our Human Geography and Geography & Environmental Studies programs.*
- *Across all programs, many students in focus groups and online surveys were very interested in environmental issues, expressing both academic interest and personal concern with current environment challenges.*
- *Many students value flexible programs that offer multiple pathways to degree completion (e.g., some BA students take courses on climate science, while many BSc students take urban planning, environmental policy and sustainability courses)*

On the basis of the review, we are making a number of changes that we believe will better showcase the strengths of the school and ensure future growth in enrolments.

1. Science

- a. Our Honours Earth and Environmental Sciences program is not changing.*
- b. We are merging our Honours Environmental Sciences and Geography & Environmental Sciences programs to create a single, flexible program that will allow students to take course from across the school. This program will retain the Honours Environmental Sciences name. As of Fall 2020, there will be no new students admitted to Honours Geography & Environmental Sciences. However, if you're currently in Level II and thinking about the co-op option for Honours Geography and Environmental Science, you will still be able to enroll in co-op for the 2020-21 academic year.*
- c. We are changing the name of Honours Biology and Environmental Science to Biodiversity and Environmental Sciences as of Fall 2020. This reflects a growing focus in ecological and environmental research generally (and in this program specifically) on how diverse organisms are able to adapt to their changing environments at both the community and ecosystem levels. If you are currently in this program you will graduate with the existing name, but you can choose to graduate with the new name if you wish.*

2. Social Sciences

- a. The big change to our BA programs is that we are merging our Honours Geography and Geography & Environmental Studies programs into a single program that will be called Honours Environment and Society. We believe this name captures our central focus on the dynamic interrelationship between human societies and the environments (built, social, economic and natural) they inhabit; and the interdisciplinary nature of our courses, which span Environmental Studies, Human Geography, Geographic Information Science, and Urban Studies. This change will have no impact if you are currently enrolled in one of the existing programs unless you would like to graduate with the new program name. Please contact Kara if this is something you're interested in.*
- a. Reflecting the new program name, we are changing our GEOG course codes to ENVSOCTY. This means that when you go to register this summer all of our social science courses in the undergraduate calendar and on Mosaic will be listed under ENVSOCTY. For the most part, the course titles and descriptions will remain the same.*

As faculty members, we are really excited by these changes and firmly believe they will help us to welcome even more students into our programs and courses in the coming years. Again, please contact Kara or myself if you have further questions.

Faculty members within SGES have been made aware of these impending changes through review process and an associated SGES retreat. The revisions were given unanimous faculty support. More broadly, the

changes were discussed and voted on the Faculty of Science Academic Planning & Policy Committee, and General Faculty. The changes to the Honours Geography and Honours Geography & Environmental Studies BA programs were also discussed and approved by the Faculty of Social Sciences Undergraduate Curriculum Committee.

The above changes are being made in the best interests of students, faculty, and the Faculty of Science.



NEW PROGRAM PROPOSAL
Sustainable Chemistry
October 2019

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TRACKING THE APPROVALS PROCESS FOR NEW GRADUATE PROGRAMS..... 29

1 PROGRAM

1.1 PROGRAM DESCRIPTION

Chemistry is often called the “central science” because it interacts with disciplines from physics and engineering to biochemistry and biology, and drives applications that range from business to the environment. The Department of Chemistry & Chemical Biology currently offers two undergraduate programs in Chemistry and in Chemical Biology. Both offer an intense, focused curriculum with little room for electives, and both are designed to prepare students for graduate or professional schools. By contrast, there is less emphasis on preparation for employment directly upon graduation from these undergraduate degrees, or on interdisciplinary studies that broaden the student experience, allow students to explore options in greater width, and focus on the key interactions of chemistry with other disciplines. This is in spite of extensive evidence that there is much demand for these attributes within the modern student body.

The proposed offering in Sustainable Chemistry aims to address these concerns. We envision a program that allows students to explore chemistry while leaving room for both chemistry-related courses and electives. We foresee (but do not require) that students would focus on either preparative chemistry (organic and inorganic) or measurement subdisciplines (physical, analytical and theoretical). This approach releases twelve units during the first three semesters (prior to co-op) compared to the current chemistry program; in the new program, these units can be used for a range of interdisciplinary courses that are relevant to the private sector employment environment. As well, a suite of Sustainable Chemistry courses will be prepared, which focus on environmental, regulatory and safety issues, matters that have a clear relationship to, but transcend, chemistry, and that are in heavy demand in the employment sector (e.g. government employment). The B.A.Sc. designation aligns with these goals, illustrating the greater breadth and applicability of this program relative to the B.Sc. in Chemistry

We anticipate that this program will not have a limited enrolment. However, participation in the co-op version will as usual require success in the co-op admission process. We believe that co-op students from this program will bring a unique and valuable skill set to employers.

More extensive opportunities for experiential placement, research practicum, workplace integrated learning, and thesis work will also be built into the program, and we will endeavour to assist students wherever possible to seek summer employment within the Department or in the chemistry industry.

PROPOSAL PREPARATION AND CONSULTATION PROCESS

The new program was initially proposed in 2018. Several possible permutations, for example including a business add-on, were extensively discussed by the Department’s Undergraduate Curriculum Committee, along with consultations between the Department Chair and the Undergraduate Curriculum Committee Chair with stakeholders within Faculties of Science, Business, and Health Science. By the end of 2018, a final framework for the proposed program had been agreed. Below is timeline for events in 2019 that led from this conceptual framework to the current proposal:

Jan. 2, 2019: Discussions of a program with business separated from current proposed program

Jan. 3, 2019: Program name proposed: Sustainable Chemistry

Jan. 22, 2019: New program sub-committee meets with Associate Dean

Feb. 3-4, 2019: Level I survey developed to gauge interest in program

Feb. 11, 2019: Level I survey executed in CHEM 1AA3 classes

Feb. 21, 2019: Level I survey results show extensive interest in program

Mar. 5, 2019: Department meeting to discuss survey results and program in general

Mar. 7, 2019: Chemistry Chair (GG) meets Dean MacDonald for preliminary discussion
 Mar. 20, 2019: Final version of statement of intent ready
 Mar. 29 et seq.: Discussions with Kate Whalen re new program and Sustainability minor
 Apr. 3, 2019: Statement of Intent circulated to APPC (Academic Planning and Priorities Cttee.)
 Apr. 4, 2019: Statement of Intent circulated to Dean MacDonald
 Apr. 6, 2019: Statement of Intent signed by Dean MacDonald
 Apr. 17, 2019: Statement of Intent signed by Vice-Provost Faculty
 May 13, 2019: Preparation for Program Learning Outcome workshop
 May 13, 2019: Invitations for Focus Groups
 May 24, 2019: Consultation with M. Padden of SGES re impact of new program
 May 28, 2019: Program Learning Outcome workshop
 May 28, 2019: New course codes confirmed (xSC3)
 May 29, 2019: CHEM 2SC3 proposed on Dean's permission for 2019/20 year
 May 31-Jun. 1, 2019: Focus Groups meet
 June 3, 2019: CHEM 2SC3 approved on Dean's permission for 2019/20 year
 June 8, 2019: CHEM 2SC3 added to course list for Sustainability minor
 Aug. 8, 2019: Resources section draft completed and discussed
 Aug. 8, 2019: CHEM 3SC3 and 4SC3 outlines completed
 Sept. 9, 2019: Consultation with the Dean; request for revision was received
 Oct. 24, 2019: Revised document approved by APPC
 Oct. 29, 2019: Final approval (unanimous), Department of Chemistry and Chemical Biology
 Nov. 7, 2019: Revisions accepted at APPC

1.2 CONSISTENCY WITH MCMASTER'S MISSION AND ACADEMIC PLAN

This proposed program enhances Ontario's vision by providing stronger community engagement and skills development elements to add to the already strong creativity, innovation and knowledge drivers in our current offerings. Aspects such as sustainability, the environment, health and safety, chemical hygiene, regulatory affairs and green chemistry will now be addressed, all areas which are of community concern.

Likewise, this new and innovative emphasis on interdisciplinary studies aligns with McMaster's vision, mission and mandate to "serve the social, cultural and economic needs of our community and our society". We will emphasize job skills together with more practical knowledge of sustainable chemistry, which has developed over the last decades, and continues to evolve to positively impact the environment and contribute to remediation. Moreover, novel chemistry can be effectively translated into new economic growth within the local, provincial and national sectors.

The proposed program will offer enhanced opportunities for students to undertake a sustainable-chemistry focused degree, yet including interdisciplinary study, along with a problem- and inquiry-based approach to learning that aligns with McMaster's signature pedagogies. Emphasis on environmental and green chemistry, for example, aligns with McMaster's aspiration of "advancing human and societal health and wellbeing," while enhanced opportunities for experiential- and self-directed learning will be incorporated in accord with McMaster's approach to innovation in teaching and learning.

By emphasizing jobs and economic development to a greater extent than our traditional programs, the new offering will build graduates who are trained in sustainable chemistry with experience in regulatory affairs, and who will offer an exceptional skill set in this area to potential employers.

This new program offers a significant departure from the traditional approach to teaching chemistry, allowing expanded options and a flexible learning experience for students. This new program aligns with two strengths in areas identified in previous SMAs as areas for growth at McMaster. In particular, expanded opportunities will be provided in this program for experiential and work-integrated learning as well as research.

The proposed program will begin in level II, and will draw students primarily from level I Science. We expect to attract science-oriented students with interdisciplinary interests in areas such as sustainability, environmental science, public policy and governmental regulations, health and safety, and the industrial job market.

The expected outcomes will be focused towards the broad industrial job market where chemical knowledge can be applied to new sustainability challenges in many sectors.

1.3 PROGRAM LEARNING OUTCOMES

Degree Level Expectations for all Programs Offered by the Department

Graduates from the undergraduate programs of the Department of Chemistry and Chemical Biology will be able to:

- A.1. Apply chemical principles to the solution of multidisciplinary problems and, in this way, demonstrate that chemistry is a central science that is connected to disciplines as diverse as the life sciences, medicine, physics, geology, astronomy, mathematics, statistics and engineering.
- A.2. Combine and apply the principles of Analytical, Inorganic, Organic and Physical Chemistry, to understand contemporary chemical research and solve problems using a combination of methods and principles from various sub-disciplines.
- A.3. Predict the structure and properties (physical and chemical) of simple substances based on knowledge of their constituent elements and functional groups.
- A.4. Work in a safe manner by assessing the hazards associated with chemicals, reactions and laboratory equipment, and proposing and implementing safe work procedures that include the appropriate use of safety equipment; dispose of chemicals in a safe and environmentally responsible manner.
- A.5. Design and execute synthetic routes to target substances using known reagents and methods including solution phase, air-sensitive and solid-state techniques.
- A.6. Relate the outcome of a physical or chemical process to the factors that determine its natural direction as well as its speed and the extent to which such change can happen.
- A.7. Predict reactivity and mechanisms based on known reactions and a compound's functional groups; illustrate mechanisms using standard conventions such as curly arrows in organic chemistry and reaction co-ordinate diagrams; interpret experimental data, such as rate laws, in terms of these mechanisms; design experimental approaches to identify and quantify reaction products.
- A.8. Apply the principles and mechanisms of catalysis to design and execute novel reactions.
- A.9. Apply modern spectroscopic techniques such as Infrared, ultraviolet-visible absorption and luminescence, atomic absorption/emission, nuclear magnetic resonance and mass spectrometry for the characterization of substances, and integrate the results in order to establish the identity of unknown species and mixtures.
- A.10. Select and apply modern analytical methods such as gas chromatography, high-performance liquid chromatography, and capillary electrophoresis to quantitatively establish the composition of a substance or mixture.
- A.11. Interpret experimental data taking into account the limits on the type of information provided by different experimental techniques, as well as the limits of experimental

accuracy and precision; validate quantitative methods and assess the quality of data based on statistical criteria.

- A.12. Use databases and other library resources to retrieve chemical information. Assess the quality of information, distinguish primary from secondary sources and use them accordingly to discover and evaluate the current state of research in specific chemistry fields
- A.13. Use proper citations to acknowledge others' contributions and employ copyright protection rules.
- A.14. Plan and execute the steps necessary to reproduce results from the primary literature.
- A.15. Propose original solutions to chemical problems using literature sources and knowledge of experimental methods in chemistry; assess the relative merits and drawbacks of alternative approaches based on the material and labour requirements, effectiveness of the methods, anticipated quality of the data, and cost.
- A.16. Design an experimental solution to a problem that includes realistic objectives, critical milestones and an appropriate distribution of tasks within the members of a scientific team.
- A.17. Effectively communicate scientific ideas and results both orally and in writing to specialist and non-specialist audiences in records of laboratory work, written reports, posters and lectures.
- A.18. Recognize that most chemical theories and models are built from simplifying assumptions and can be subject to updates and revision.
- A.19. Recognize the limits of their own understanding, the knowledge frontiers of the discipline and the most significant topics of current research.
- A.20. Assess his/her own performance in the completion of an experimental project, appraise his/her own strengths and weaknesses.
- A.21. Demonstrate initiative, personal responsibility, accountability, integrity and social responsibility; work effectively with others.
- A.22. Conduct work in the chemical sciences in a manner that is ethical, responsible and respectful of the environment.

Degree Level Expectations Specific to Chemistry Programs

In addition, graduates of the Honours Chemistry program will be able to:

- B.1. Explain the physical principles that underlie chemical phenomena and apply the corresponding quantitative models to interpret and predict the outcome of chemical and chemistry-relevant physical processes.
- B.2. Apply the quantum mechanical model of atoms and molecules to explain the properties of matter.
- B.3. Relate the similarities and differences between chemical elements to their positions in families, periods and blocks of the periodic table; examine trends in their properties; assess the feasibility of proposed (not yet observed) forms and combinations of the elements.
- B.4. Interpret the results of advanced spectroscopic (e.g. Raman) and structural (e.g. X-ray diffraction) methods used in the characterization of simple substances.
- B.5. Contrast alternative models used to account for the reactivity, spectroscopic and magnetic properties of compounds of the transition elements

Degree Level Expectations Specific to Chemical Biology Programs

In addition, graduates of the Honours Chemical Biology program will be able to:

- C.1. Integrate their knowledge of chemistry, cell biology, molecular biology, biochemistry and evolution, to investigate and solve problems in Chemical Biology.

- C.2. Apply knowledge of the biological counterparts of conventional organic reactions and their common mechanisms to explain biological processes; predict molecules' most likely biosynthetic pathways based on their structure.
- C.3. Interpret experimental data in terms of the intermolecular forces that determine biomolecular interactions, particularly those involving macromolecules, and apply that understanding to problems in biology and medicine.
- C.4. Apply knowledge of biological catalysts (enzymes and catalytic nucleic acids) to explain catalytic mechanisms and design inhibitors, and apply those principles to design disease treatments and explain biological processes.
- C.5. Design and interpret experiments that apply modern analytical methods such as capillary electrophoresis to interactions between small molecules and macromolecules, and to molecular interactions with whole cells and whole organisms.

Degree Level Expectations Specific to the new Sustainable Chemistry Programs

- D.1. Assess the short and long term impact of chemical research and industrial activity on society, health, quality of life and the environment by drawing on interdisciplinary knowledge.
- D.2. In anticipating their professional activities, apply the principles of green chemistry.
- D.3. Design, implement and advocate for sustainable technological solutions to practical problems.
- D.4. Design, execute and evaluate processes compliant with applicable regulatory frameworks.

The lists of expectations shown above demonstrate that Sustainable Chemistry is distinct from the programs currently offered by the Department of Chemistry and Chemical Biology. The expectations specific to the proposed program were reviewed and approved by the focus groups described in section 3.1. The B.A.Sc. designation reflects these distinctive elements.

1.4 CONSISTENCY WITH DEGREE LEVEL EXPECTATIONS

McMaster University has adopted the Undergraduate University Degree Level Expectations (UUDLEs) that were developed by the Ontario Council of Academic Vice-Presidents and endorsed by the Council of Ontario Universities in December 2005. These degree-level expectations are classified within six distinct categories, the full descriptions of which are provided in the [Policy on Academic Program Development and Review](#). The following table summarizes the alignment of the Departmental expected learning outcomes with the University's.

Table 1. Alignment of departmental learning outcomes with the McMaster's

McMaster's and Ontario's expectations	Corresponding entries in the list of DLEs
Depth and breadth of knowledge	A.1, A.2, A.6-A.11, B.1-B.5, C.1-C.5, D1-D4
Knowledge of methodologies	A.3-A.5, A.12-A.14, B.2, B.4, C.1, C.4, C.5, D.2-D.4
Application of knowledge	A.1, A.3-A.12, A.14-A.16, B.1-B.5, C.1-C.5, D1-D4
Communication skills	A.17, D3, D4
Awareness of limits of knowledge	A.1, A.2, A.12, A.18-A.20, D.1-D.3
Autonomy and professional capacity	A.4, A.13, A.15, A.16, A.20-A.22, C.5, D.1-D.4

1.5 DEMAND FOR PROGRAM

1.6 EVIDENCE OF SOCIETAL/LABOUR MARKET NEED

Several informal discussions with professional chemists employed externally to the University early in the program development process both revealed unbridled enthusiasm for the proposed program, and helped guide content development. In order to further understand the factors that contributed to the perceived success of the program, two workshops were organized in late May, in which externals including graduates of McMaster's Honours Chemistry program as well as representatives from local industry participated. Several factors were identified as strengths of the proposed program, most notably including the ability to select (a) sub-discipline(s) of focus at an earlier stage, and the development of critical transferrable skills through the new experientially-focused courses in sustainable chemistry. Externals also noted that the proposed skill set would align well with talents that were highly sought in industrial settings such as co-op. There was also discussion about students undertaking shorter experiential placements in industrial settings, for example through single-semester courses such as CHEM 3EP3 (experiential placement), or even shorter components of sustainable chemistry courses. The B.A.Sc. designation emphasizes alignment with labour market need.

I. EVIDENCE OF STUDENT DEMAND

Student demand was quantitatively evaluated first through a survey of students in the level I chemistry course, CHEM 1AA3, in February 2019. Because of McMaster's gateway program structure in the Faculty of Science in level I, at this time students were preparing to select their programs for level II and beyond, so interest in their future careers was high, contributing to an good response to the survey. The survey received 271 responses from a possible total of 1200 students enrolled in this course; of those 271, 80 indicated they already plan to choose a program in Chemistry and Chemical Biology; 90 said NO, they would not choose one of our Department's existing programs; and 96 said they don't know. Next, we asked each of those groups if they would consider enrolling in a Sustainable Chemistry program, if it were available. Here, 70 % of those who chose a CCB program said "yes", and most impressive, 50% of the Not-Chemists said yes, plus 70% of the "I don't know" responders said yes. These results amount to 168 potential applicants from the 271 surveyed, indicating that over 60% of respondents considered the proposed program a contender.

A second indicator of interest among students comes from enrolment in CHEM 2SC3 during the 2019/20 academic year. As the program planning evolved, it became apparent that there was demand for a sustainable chemistry course within the current student body, even without the proposed program. Accordingly, CHEM 2SC3 was added to our offerings under Dean's permission, albeit too late to be included in the calendar process. Thus, we anticipated that not all students would identify this course as an option, potentially reducing enrolment to allow the instructor to have a manageable class size. In contrast, uptake has been substantial, with 27 students already enrolled (as of Aug. 27, 2019) for the offering in January 2020. We anticipate that this number will only go up as students become aware of the offering, and change their course selections over the Fall 2019 semester.

Both these pieces of evidence point to a strong interest in this area, and suggest that our enrolment estimates (25 in year 1, 50 students/year thereafter) are reasonably conservative.

II. JUSTIFIABLE DUPLICATION

Although several international institutions offer M.Sc. programs aligned with sustainable chemistry (e.g. Valencia, Venice), Bachelor's degrees are less common, although several have emerged in the UK (York has a B.Sc. (Hons.) in chemistry, green principles and sustainable processes; Dublin has Chemistry with Environmental and Sustainable Chemistry). We are not aware of similar programs in Ontario, although some institutions offer courses in sustainable chemistry (e.g. Queen's, McGill). Thus, our approach will offer a unique program in which students can focus on sustainable issues within chemistry, but also learn about sustainability in a broader context such as through taking sustainability courses that are not focused on chemistry, but which are already offered through the sustainability minor at McMaster.

1.7 DEGREE NOMENCLATURE

The program will lead to an B.A.Sc. (Hons.) degree in Sustainable Chemistry. This designation reflects the overall academic rigour and graduation expectations associated with the program, while reflecting the specialization that the graduands have undertaken within chemistry and the breadth of sustainability courses. The applied designation emphasizes the more practical degree level expectations (p.8) and alignment with employment (p.9) within this program

2 ADMISSION & ENROLMENT

2.1 ADMISSION REQUIREMENTS

Like most B.Sc. programs in the Faculty of Science, Sustainable Chemistry will begin in level-II. level-I Science instruction at McMaster is organized in four “gateway” programs: Chemical & Physical Sciences, Environmental & Earth Sciences, Mathematics & Statistics and Life Sciences. Each level I program has its own admission requirements (high school courses and cut-off grade average). This structure is not meant to restrict access to any Bachelor's programs; therefore, all students can apply to level II Sustainable Chemistry as long as they satisfy the admission requirements. Since the implementation of this structure, the Department has drawn students from the Life Sciences and Chemical & Physical Sciences gateways in approximately equal numbers. While it is expected that those will remain the main sources of students for the new program; it is expected that Sustainable Chemistry will be especially interesting to students in the Life Sciences gateway.

Specifically, admission to level II of the Sustainable Chemistry Program will require completion of any level I program (30 units of academic credit, i.e. ten 3-unit courses) with a Grade Point Average of at least 5.0 including:

6 units from

- CHEM 1A03 – Introductory Chemistry I
- CHEM 1AA3 – Introductory Chemistry II
- CHEM 1E03 – General Chemistry for Engineering I

3 units from

- MATH 1A03 – Calculus for Science I
- MATH 1LS3 – Calculus for the Life Sciences I

- MATH 1M03 – Calculus for Business, Humanities and the Social Sciences
- MATH 1X03 – Calculus for Math and Stats I
- MATH 1ZA3 – Engineering Mathematics I

6 units from

- The Science I Course List

Courses in level I will provide the foundation on which the Honours B.Sc. program is built; they also act as the bridge between high school and advanced university courses. As shown in Table 2, the level I courses required for admission to the program directly contribute to fulfilling the departmental learning expectations. Naturally, Chem 1A03 and 1AA3 introduce multiple concepts that will be expanded in later years. Both courses will be updated to introduce topics relevant to Sustainable Chemistry in order to raise awareness of the new program amongst students and contribute to recruitment. One Mathematics course provides the numerical skill sets that are highly desirable to fully understand the physical principles and quantitative models that underlie and explain chemical phenomena; as such the proposed program requires at least one of these courses from level I. Admission to Honours Sustainable Chemistry will require a minimum cumulative average (C.A.) of 5.0/12 but students with at least 4.5 could be admitted under probation and would be expected to attain 5.0 in the subsequent academic year. In any case, the combined average of CHEM 1A03 and CHEM 1AA3 must be at least 6.0.

Table 2. Specific admission requirements for level-II of the proposed program.

Admission Requirements for Honours Sustainable Chemistry	Alignment to Departmental Learning Objectives
CHEM 1A03(or 1E03)	A.1-A.4, A.6, A.19-A.22, D.1-D.3
CHEM 1AA3	A.1-A.4, A.6, A.7, A.19-A.22, D.1-D.3
MATH 1A03 (or 1LS3, or 1M03, or 1X03, or 1ZA3)	A.1, A.18, D.1-D.3
2 Courses from the Science I course list	A.1, variable
5 Elective Courses	

2.2 ENROLMENT PLANNING AND ALLOCATIONS

The following enrolment targets are based on a survey intended to assess interest of current Science students in the new program (see 1.2) as well as current and planned Departmental resources (see 6.1).

Table 3. Expected enrolment in Sustainable Chemistry.

Academic Year	Cohort Year 1	Cohort Year 2	Cohort Year 3	Total Enrolment	Maturity
20-21	25			25	
21-22	50	25		75	
22-23	50	50	25	125	
23-24	50	50	50	150	150

2.3 ALTERNATIVE REQUIREMENTS

Students already registered at McMaster and applicants who transfer to McMaster from other postsecondary institutions will be eligible for admission to level II of the Sustainable Chemistry Program if they have completed a set of courses equivalent to those in the list of Admission requirements. Course equivalencies will be determined by the Office of the Registrar and the Faculty of Science.

3 STRUCTURE

3.1 ADMINISTRATIVE, GOVERNANCE AND COMMUNICATION

The program will be administered by the Department of Chemistry and Chemical Biology and by the Faculty of Science. The Associate Chair (Undergraduate) will coordinate the program, oversee the curriculum, and provide student and faculty support. The Associate Chair (Undergraduate) will liaise and coordinate with outside experts, many of whom will provide guest lectures and serve as mentors on group projects. The Associate Chair (Undergraduate) will report to the Chair, who will in turn report to the Dean of the faculty. The Associate Chair (Undergraduate) will work in collaboration with the Associate Dean of Science (Academic) and provide information to APPC. Communications related to the program will originate from the Associate Chair or the Associate Dean (Academic).

The Undergraduate Curriculum Committee in Chemistry and Chemical Biology will develop curriculum recommendations for the program. Proposed changes to the Program and curriculum are presented for approval to APPC in the Faculty of Science.

As the program develops, an Industry Advisory Committee will be assembled, and chaired by an external member of industry. We have already taken steps to establish this committee by hosting two industry/government partner focus groups in June, 2019, with participants having agreed in principle to participate in the Advisory Committee. Members of the Industry Advisory Committee will include the Associate Chair (Undergraduate), and senior industry representatives from the chemical industry. The function of the Industry Advisory Committee will be to provide feedback on the Program's objectives and activities as they relate to current industry needs in the sustainable chemistry field and provide updates on technological advances as well as to secure connections to the chemical industry and government. An Industry Advisory Panel consisting of external stakeholders has existed for several years in the School of Biomedical Engineering.

The Department has already taken steps toward establishing the Advisory Committee by hosting two focus groups with potential industry/government partners in June 2019. The event gathered

input and perspectives on the development of the proposed program and invited participation in guest lectures of Sustainable Chemistry courses.

3.2 STRUCTURE AND REGULATION

The Associate Chair (Undergraduate) will be primarily responsible for overseeing the program in collaboration with the Associate Dean of Science (Academic). Each will meet with their respective Curriculum and Policy Committees to assess the program, courses and enrolments. The Associate Chair (Undergraduate) will be responsible for preparation of the documentation required for the cyclic IQAP reviews. Based on student feedback, the curriculum and/or the level of support and guidance will be routinely adjusted to meet the needs of the students, teaching assistants, faculty and the learning objectives of the program.

All students in the Program will take three courses in sustainable chemistry that highlight the sustainability component of the program. These courses ensure that all Program Learning Outcomes for the program, as outlined in Section 1.4, are met. Each course specific to the program is offered at a level that is appropriate to each students' expected knowledge base and provides the necessary content for each student to appropriately advance throughout the program. Regardless of the chosen discipline, enrolled students will have the necessary pre-requisites (from earlier core courses) to meet the learning outcomes for the SC3 core courses.

4 CURRICULUM AND TEACHING

4.1 PROGRAM CONTENT

Requirements

The program will start in level II and require 90 units to be completed over 3 years after level I. Program requirements by academic year will be as follows:

Level II: 30 Units

3 Units from CHEM 2SC3 - Sustainable Chemistry: Green Chemistry
12 Units from Level II Chemistry (Chem 2A03, 2II3, 2LB3, 2OD3, 2OG3, 2P03, 2Q03)
9 Units from elective courses
6 Units from course list 2

Level III, 30 units

3 Units from CHEM 3SC3 - Sustainable Chemistry: Natural Resources and Energy or 4SC3 – Sustainable: Chemistry Analysis and Regulation
12 Units from Level II-IV Chemistry or Chemical Biology (course list 1)
9 Units from elective courses
6 Units from course list 2

Level IV, 30 units

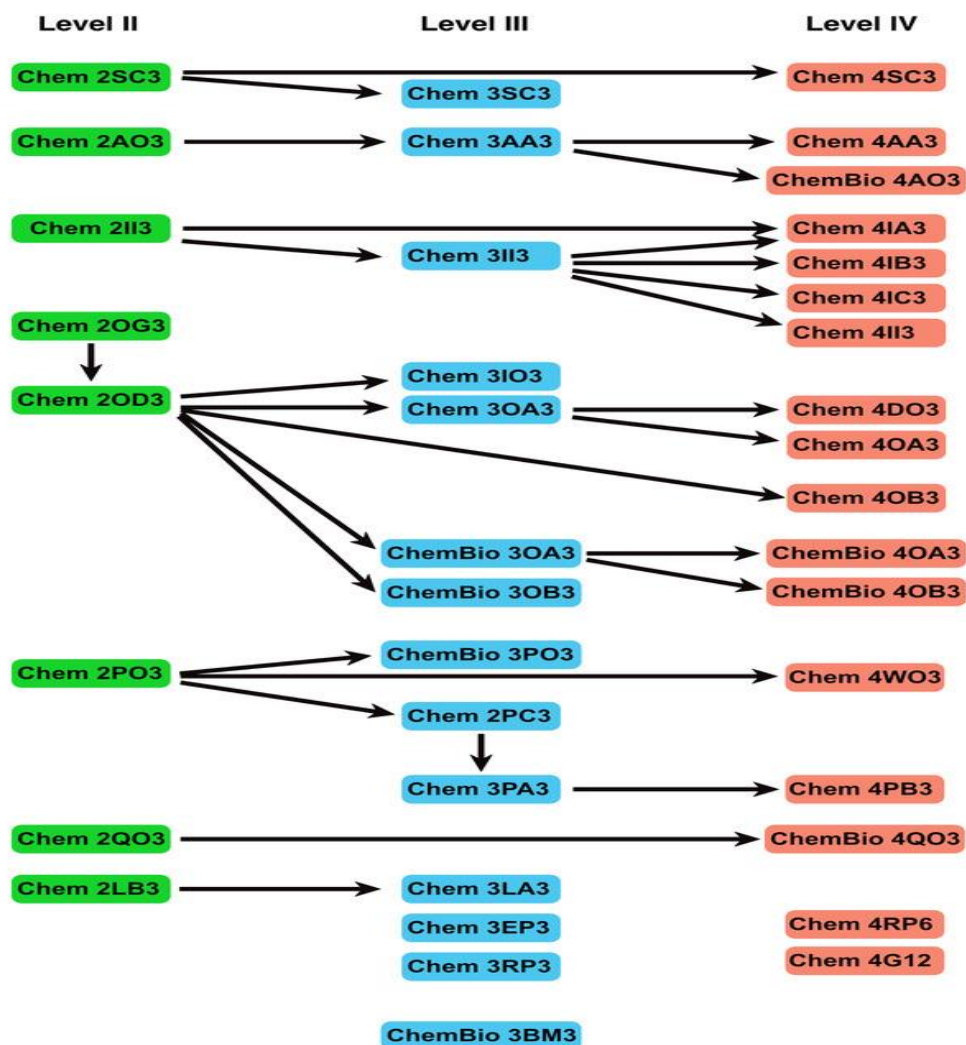
3 Units from CHEM 4SC3 - Sustainable Chemistry: Analysis and Regulation
12 Units from Level II-IV Chemistry or Chemical Biology (course list 1)
9 Units from elective courses
6 Units from course list 2

In order to fulfill the requirements of Level II, III and IV Chemistry and Chemical Biology, the following courses will be available to students registered in Sustainable Chemistry:

Course List 1:

- CHEM 2A03 - Quantitative Chemical Analysis
- CHEM 2II3 - Introductory Inorganic Chemistry: Structure and Bonding
- CHEM 2LB3 - Tools for Chemical Discovery
- CHEM 2OD3 - Synthesis and Function of Organic Molecules
- CHEM 2OG3 - Structure and Reactivity of Organic Molecules
- CHEM 2P03 - Applications of Physical Chemistry
- CHEM 2Q03 - Inquiry for Chemistry
- CHEM 3AA3 - Instrumental Analysis
- CHEM 3BC3 – Bad Chemistry
- CHEM 3EP3- Advanced Chemistry Placement
- CHEM 3II3 - Introduction to Transition Metal Chemistry
- CHEM 3LA3 - Strategies for Chemical Discovery
- CHEM 3I03 - Industrial Chemistry
- CHEM 3OA3 - Organic Synthesis
- CHEM 3PA3 - Quantum Mechanics and Spectroscopy
- CHEM 3PC3 - Mathematical Tools for Chemical Problems
- CHEM 3RC3 - Radioisotopes in Medicine
- CHEM 3RP3 - Research Practicum in Chemistry
- CHEM 4AA3 - Recent Advances in Analytical Chemistry
- CHEM 4D03 - Organic Structure and Synthesis
- CHEM 4G12 - Senior Thesis
- CHEM 4IA3 - Physical Methods of Inorganic Structure Determination
- CHEM 4IB3 -Bio-Inorganic Chemistry
- CHEM 4IC3 - Solid State Inorganic Materials: Structures, Properties, Characterization and Applications
- CHEM 4II3 - Transition Metal Organometallic Chemistry and Catalysis
- CHEM 4OA3 - Natural Products
- CHEM 4OB3 - Polymers and Organic Materials
- CHEM 4PB3 - Computational Models for Electronic Structure and Chemical Bonding
- CHEM 4RP6 - Research Project in Chemistry
- CHEM 4W03 - Natural and Synthetic Materials
- CHEMBIO 3BM3 - Implanted Biomaterials
- CHEMBIO 3OA3 - Organic Mechanistic Tools for Chemical Biology
- CHEMBIO 3OB3 - Structural Elucidation of Natural Products and Small Molecules
- CHEMBIO 3P03 - Biomolecular Interactions and Kinetics
- CHEMBIO 4Q03 - Peer Tutoring in Chemical Biology or Chemistry
- CHEMBIO 4A03 - Bio-Analytical Chemistry and Assay Development
- CHEMBIO 4OA3 - Natural Products
- CHEMBIO 4OB3 - Medicinal Chemistry: Drug Design and Development

Students will be able to select any of those courses as long as the corresponding pre-requisites are satisfied, as shown in the following map:



The Course List for Sustainable Chemistry includes:

- BIOLOGY 3ET3 - Ecotoxicology
- EARTHSCI 2GG3 - Natural Disasters
- EARTHSC 3CC3 - Earth's changing climate
- EARTHSC 4CC3 - Stable Isotopes in Earth and Environmental Systems
- ENVIRSC 2B03 - Soils and the Environment
- ENVIRSC 2C03 - Environment and Surface Climate Processes
- ENVIRSC 2Q03 - Introduction to Environmental Geochemistry
- ENVIRSC 2WW3 - Water and the Environment
- ENVIRSC 3O03 - Contaminants, Fate and Transport
- ENVIRSC 4EA3 – Environmental Assessment
- ENVIRSC 4N03 - Global Biogeochemical Cycles
- ENVSOCTY 2EI3 - Environmental Issues
- ENVSOCTY 3EC3 - Environmental Catastrophes
- ENVSOCTY 3ER3 - Sustainability and the Economy
- ENVSOCTY 3EE3 - Energy and Society
- ENVSOCTY 4HH3 - Environment and Health
- HTHSCI 4MS3 - Toxic Tales: The Social Lives of Molecules
- LIFESCI 2X03 – Environmental Change and Human Health
- POLSCI 3GC3 - Global Climate Change
- STATS 2B03 - Statistical Methods for Science
- SUSTAIN 2S03 - Evaluating Problems & Sustainable Solutions
- SUSTAIN 3S03 - Implementing Sustainable Change

As in the case of the current Chemistry and Chemical Biology undergraduate programs, there will be a co-op version of Sustainable Chemistry that will include four 16-week work terms. This addition will result in the academic work done during the last two years in the regular program being distributed in three years. The work terms will take place during the winter and summer of the third year, the summer of the fourth year and the fall of the fifth year. Anticipated enrolment for co-op is 10-15 students per year, a level that has been approved by Science Co-op Office.

The Sustainable Chemistry program will require 45 units of chemistry or chemical biology beyond level I but only three such courses will be fixed requirements. These will be the new courses (CHEM 2SC3, 3SC3, 4SC3) that will be established to achieve the learning outcomes specific to the sustainable chemistry program (details are provided in section 4.2). Six units per year will be reserved for a selection of highly relevant courses in sustainability (SUSTAIN), environmental science (ENVIRSC), geography (GEOG), Earth Science (EARTHSC), and Statistics (STATS) which are offered by other academic units within McMaster. Nine units per academic year will be set aside for elective courses. Compared to the Honours Chemistry program, Sustainable Chemistry offers significant flexibility in course selection and leaves plenty of room for studies in other disciplines allowing students to complete a minor if that is of their interest.

The current Honours Chemistry program requires 54-60 units of CHEM or CHEMBIO courses out of the total 90 units required over 3 years. By contrast, the proposed Sustainable Chemistry course will require 45 units of CHEM or CHEMBIO courses.

4.2 PROGRAM INNOVATION

The Department of Chemistry & Chemical Biology at McMaster is known across the country for its creativity in undergraduate education. Key features that make its current offerings stand out amongst the chemical programs available at Canadian post-secondary institutions are:

- A chemical biology undergraduate curriculum with courses specifically designed for this program.
- Sustained access to top-quality resources and modern instrumentation that is relevant to today's world of science.
- An innovative laboratory program featuring experiments that blur the distinctions between classical sub-disciplines and projects that, because of their complexity, must be executed in multiple consecutive sessions.
- Frequent experimentation with new teaching and evaluation methods.
- The widespread use of inquiry as a teaching method. Students in Chemistry and Chemical Biology have a dedicated inquiry course in the first semester of level II which will also be open to sustainable chemistry students.

Establishment of the sustainable chemistry program is the next step in the evolution of chemical undergraduate education at McMaster. A key feature of the curriculum are three new courses in sustainable chemistry, one to be taken each year.

CHEM 2SC3 - Sustainable Chemistry: Green Chemistry. This course will introduce the 12 principles of green chemistry, which provide guidelines for ways to 'reduce the harm' that chemical processes do the planet. Here students will develop a better appreciation of chemical methods used to generate useful molecules and the ways to practice them with more sustainable approaches, by increasing efficiency, using more sustainable starting materials, and forming fewer by-products. Consideration of those principles provides a forum for the discussion of the broader aspects of sustainability related to the introduction and life cycle analysis of chemical processes and products in academia and industry.

CHEM 3SC3 - Sustainable Chemistry: Natural Resources & Energy. Using examples and case studies, this course will apply the principles of green chemistry and sustainability to the life cycles of a major industrial chemical (hydrogen) and a heavily used natural resource (water). The third part of the course will discuss the challenges arising from the use of *endangered elements* (chemical elements projected to be in short supply in the near future, such as Helium and Lithium as well as many rare-earth elements essential for magnets, electric motors and other advanced technologies) in the development of materials for 'sustainable' energy solutions (wind turbines, solar cells, fuel cells, batteries, etc.).

CHEM 4SC3 - Sustainable Chemistry: Analysis and Regulation. This course will provide students with the skills necessary to work effectively in a *Quality System* environment. By the end of this course the student will be able to participate in the design, execution, and audit of processes compliant with regulatory frameworks such as those of the International Organization for Standardization (ISO), the International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH), and good manufacturing practice (GMP).

4.3 MODE(S) OF DELIVERY

While the traditional methods (lectures, tutorials) are still used in most courses offered by the Department, most employ multiple teaching methods, including inquiry, problem-based learning, and self-directed projects, methods enabled by modern electronic technologies (e.g. lecture capture, podcasting, etc.) have been implemented across the two currently offered programs. The

new courses in sustainable chemistry (CHEM 2SC3, 3SC3 and 4SC3) will emphasize active learning with specially designed exercises and cap-stone projects.

4.4 EXPERIENTIAL LEARNING

Chemistry is an eminently practical discipline. Experimental training in laboratory work is an essential component of any chemistry curriculum. However, there is a gap between such highly prescribed activities and actual professional practice. The Department offers an opportunity to engage in an experience related to careers in chemistry through the experiential placement course CHEM 3EP3. In this non-traditional course, there is no instructor or class meeting. Instead, the student identifies their own learning goals and spends the course time working 60 hours with a placement supervisor of record to achieve those goals. A McMaster faculty member acts as academic supervisor of record in order to assign a final grade. Placement for students in the proposed program must be relevant to sustainable chemistry.

The opportunities for experiential learning are broad and will likely be more attractive to students than co-op positions (although those will still be possible). Participants in our focus group composed of potential government and industry partners were enthusiastic about developing a "menu" of opportunities for such educational placements and a formal mechanism for connecting students with potential placement supervisors. Such pre-planned 3EP3 projects with these industrial and government partners who are already engaged in the new program will significantly ease the accessibility of this program for interested undergraduates.

4.5 ACCESSIBILITY

McMaster is committed to be fully compliant with the Accessibility for Ontarians with Disabilities Act (AODA) and Ontario Human Rights Code. Corresponding training is mandatory for all McMaster faculty, staff, student-staff, student leaders and volunteers. Additional Accessible Education training is strongly encouraged for all instructional staff. Students with disabilities who require academic accommodation are served by the office of Student Accessibility Services. Academic Accommodation is also possible for Religious, Indigenous or Spiritual Observances in the form of making alternative arrangements for classes, assignments, and tests. McMaster also provides students, staff and faculty access to SensusAccess, an online document conversion system supporting the transformation of text and image-based file types into different formats, including output in audio, Braille, or e-text formats. Renovations of the teaching laboratories included establishment of bench space for students with disabilities.

4.6 RESEARCH REQUIREMENTS (IF APPLICABLE)

Although it is not a requirement, students who are interested in acquiring experience in chemical research have access to three courses. The level-III research practicum in chemistry (CHEM 3RP3) will award 3 units of academic credit for research done for at least 120 h during one semester in an academic research laboratory; completion of the course requires the submission of a written report to the supervisor. In level IV, students can take a 240-h research project (CHEM 4RP6) or the senior thesis course (CHEM4G12). The latter takes a greater time commitment as it is worth 12 units of academic credit and requires the submission of a thesis and a seminar presentation to the Department.

5 ASSESSMENT OF LEARNING

5.1 METHODS FOR ASSESSING STUDENTS

Traditional evaluation methods such as written exams and assignments are the most frequently used in the Department of Chemistry and Chemical Biology. However, our courses emphasize application of knowledge and this typically is the focus of exams and assignments. Rote memorization is seldom enough to succeed in the courses. It is, of course, not possible to probe the full scope of a student's abilities with exams and assignments. Consequently, all courses include additional evaluation methods. Written reports and oral presentations serve not only as an evaluation method, but also as a means to develop communication skills.

In the research courses CHEM 3RP3, CHEM 4RP6 and CHEM 4G12 students conduct research under the supervision of faculty members. Written progress reports are submitted during the first semester; a full thesis report document and a 20-minute oral presentation are required at the end of the course. Evaluation in these courses includes components for the written reports, the oral presentation and experimental performance. Execution of such research projects requires students to apply all the background and skills developed throughout their undergraduate program. This is the prime opportunity for students to demonstrate and apply their breadth and depth of knowledge, familiarity with methodologies, communication skills, and awareness of the limits of their own knowledge and autonomy. It all sums up to a demonstration of their abilities as professionals of the chemical sciences, ready to pursue a career and/or further education.

For students who are unable to secure a position in a research group for the thesis courses, a selection of advanced courses provide alternative options for graduation. These courses provide a good alternative to the capstone experience provided by the thesis courses because they emphasize the application of knowledge to complex problems, in cutting-edge areas of the chemical sciences, usually require some independent research, and include the development of communication skills amongst their objectives.

5.2 CURRICULUM MAP

The following table provides a curriculum map for the sustainable chemistry program. The map demonstrates the alignment of the Learning Outcomes of individual courses with the departmental expectations specific to the proposed program (D.1-4, section 1.4). Naturally each course impacts only a subset of the Learning Outcomes, and to differing extents. The progression towards mastering the learning outcomes is apparent in the map.

Naturally, the specific learning outcomes addressed in the experiential and research courses (CHEM 3EP3, 3RP3, 4RP6, 4G12) will depend on the details of the tasks and research undertaken by the student. The Department will ensure that the activities of the students in sustainable chemistry are relevant to at least one of the learning outcomes of the new program.

Table 4. Curriculum Map

Course Code	Course Name	Sustainable Chemistry LOs			
		D.1	D.2	D.3	D.4
Required Courses					
CHEM 1AO3*	Introductory Chemistry I	I	I	I	
CHEM 1AA3*	Introductory Chemistry II	I	I	I	
CHEM 2SC3	Sustainable Chemistry - Green Chemistry	I	I	I	
CHEM 2A03	Quantitative Chemical Analysis	I	I	I	I
CHEM 20G3	Structure and Reactivity of Organic Molecules		I		
CHEM 2II3	Introductory Inorganic Chemistry	I	I	I	
CHEM 2P03	Physical Chemistry			I	
CHEM 2PC3	Mathematical Tools for Chemical Problems				
CHEM 2Q03	Inquiry for Chemistry	R	R	R	
CHEM2LB3	Tools for Chemical Discovery	R	R	R	
BIOCHEM 3G03	Proteins and Nucleic acids				
CHEM 2OD3	Synthesis and Function of Organic Molecules		R		
CHEM 3SC3	Sustainable Chemistry - Natural Resources and Energy	R	R	R	R
CHEM 3I03	Industrial Chemistry	R	R	R	
CHEM 3AA3	Instrumental Analysis	R	R	R	R
CHEM 3II3	Transition Metal Chemistry	R	R	R	
CHEM 3PA3	Quantum Mechanics and Spectroscopy			R	
CHEMBIO 3BM3	BioMaterials	R	R	R	R
CHEM 3EP3	Experiential Chemistry Placement	R [‡]	R [‡]	R [‡]	R [‡]
CHEM 3RP3	Research Practicum in Chemistry	R [‡]	R [‡]	R [‡]	R [‡]
CHEM 4RP6	Research Project in Chemistry	R [‡]	R [‡]	R [‡]	R [‡]
CHEM 4G12	Senior Thesis	R [‡]	R [‡]	R [‡]	R [‡]
CHEM 4SC3	Sustainable Chemistry - Analysis and Regulation	M	M	M	M

Course Code	Course Name	Sustainable Chemistry LOs			
		D.1	D.2	D.3	D.4
Course List 2					
BIOLOGY 3ET3	Ecotoxicology	R			
EARTHSCI 2GG3	Natural Disasters	R			
EARTHSCI 3CC3	Earth’s Changing Climate	R			
EARTHSCI 4CC3	Stable Isotopes in Earth and Environmental Systems	R			
ENVIRSC 2B03	Soils and the Environment	R			
ENVIRSC 2C03	Environment and Surface Climate Processes	R			
ENVIRSC 2Q03	Introduction to Environmental Geochemistry	R			
ENVIRSC 2WW3	Water and the Environment	R			
ENVIRSC 3O03	Contaminants, Fate and Transport	R		R	
ENVIRSC 4EA3	Environmental Assessment	R		R	R
ENVIRSC 4N03	Global Biogeochemical Cycles	R			
ENVSOCY 2EI3	Environmental Issues	R			
ENVSOCY 3EC3	Environmental Catastrophes	R			
ENVSOCY 3ER3	Sustainability and the Economy	R		R	
ENVSOCY 3EE3	Energy and Society	R	R	R	
ENVSOCY 4HH3	Environment and Health				
HTHSCI 4MS3	Toxic Tales: The Social Lives of Molecules	R			
LIFESCI 2X03	Environmental Change and Human Health	R			
POLSCI 3GC3	Global Climate Change	R			
STATS 2B03	Statistical Methods for Science	R			
SUSTAIN 2S03	Evaluating Problems & Sustainable Solutions	R		R	
SUSTAIN 3S03 -	Implementing Sustainable Change			R	

I: Introduced, R: Reinforced, M: Mastery * Required for admission. ‡ Depending on the specific project or placement.

5.3 DEMONSTRATING STUDENT ACHIEVEMENT

Definition of Success:

The program will be externally evaluated during cyclical reviews and assessed on an ongoing basis through indicators such as student grades and awards data. Success will be demonstrated by the reputation that the program establishes in education locally, nationally and globally. The ultimate goal is to be recognized as a leader in this field through a cutting-edge interdisciplinary approach that serves as a model for success in higher education. Based on this definition, student success will be determined by: 1) the level of achievement of its students, in-program and five years post-graduation, and 2) their degree of satisfaction with the program, in-program and five years post-graduation. Student achievement and satisfaction will be assessed both during the program as well as beyond graduation.

Documenting and Communicating Evidence of Student Achievement:

The key assessment pieces outlined above combined with the summative measures from all courses in the program will provide the necessary evidence demonstrating that students have met the program learning outcomes. This information will be maintained to provide information for cyclical IQAP reviews.

Determining Success beyond Graduation:

Beyond graduation, we will judge success by assessing the career success and satisfaction of our graduates and thus we will make every effort to maintain contact with our graduates to this end. University advancement maintains contact lists but the program will attempt to maintain a strong post-graduation community. Graduates will be invited to participate in both informal and in-class settings. The efforts to improve the program, whether in content or delivery, in response to the data/feedback will be routine and on-going.

6 RESOURCES

6.1 UNDERGRADUATE PROGRAMS

6.1.1 ADMINISTRATIVE, PHYSICAL AND FINANCIAL RESOURCES

The Department currently serves approximately 200-250 undergraduate students distributed in two programs, Honours Chemistry and Honours Chemical Biology, plus their respective co-op versions. There currently is capacity within existing departmental resources to administer the new program. The financial template submitted to McMaster reflects the true cost of the program (versus identifying incremental costs to the Faculty). We do not anticipate recruiting additional students into the Faculty of Science; instead it is expected that sustainable chemistry will attract students that otherwise would register for Honours Life Science.

The Department has a designated Associate Chair for Undergraduate Studies who oversees the academic administration of the programs, an Undergraduate Advisor that evaluates academic credentials and evaluates requests for academic permission, and an Undergraduate Administrative Assistant who also serves as Academic Program Advisor and is the primary contact for students in all matters related to this program. The proposed program will be served by the same team.

The total number of (3-unit) course sections that need to be filled annually currently sits at ca. 50-55, over all four levels of instruction. The “normal” teaching assignment for full-time faculty in the department is 2 course sections (6 units) of undergraduate and 1.5 units of graduate teaching per year. Our department’s faculty complement consists of 29 full-time faculty members. After reduced teaching responsibilities due to joint appointments with other academic units, administrative loads, research fellowships or chairs, or medical issues, and research leaves, the total number of course sections that can in principle be filled by full-time faculty members in a given year is 45-50. The resulting shortfall in assignable teaching units is filled by sessional instructors or (infrequently) by faculty teaching on overload. Currently the Department has initiated the search for three new faculty members, one would be a teaching-track appointment, the other two will be aregular tenure-track professors in Molecular Medicine and Environmental Chemistry. All three of these appointments will be beneficial to the new program.

Six technical staff members in the Department (two PhD- and the rest at the BSc level) focus all or part of their activities on undergraduate education, either as Instructional Assistants (2.0 FTEs) or Technicians (4.0 FTEs). The majority of the TAs employed in our department are Chemistry or Chemical Biology graduate students, supplemented by some level 4 Chemistry and Chemical Biology undergraduate students in the laboratory sections of the level-I courses (all three terms) and the level-II organic chemistry service courses CHEM 20A3 and 20B3 (summer term only). With the exception of the “peer mentors” who serve in CHEM/CHEMBIO 2Q03, the TAs for the courses in the Honours programs are Chemistry or Chemical Biology graduate students exclusively. The total number of 65-hour TA positions filled each year varies, but was ca. 302 in 2018-19 and ca. 284 in 2017-18. Roughly 75% of these positions are filled by graduate students while the remainder are filled by senior undergraduates from our Honours programs; the latter are

employed exclusively in the level-I laboratory programs. We consider the employment of our senior Honours students as TAs to be a very valuable and effective way of supplementing and reinforcing the training they receive in our programs. The three new sustainable-chemistry courses would require 6 TA units in total.

Pro-rated costs for all staff members, including the Chair have been included in the budget template. Undergraduate course offerings will be monitored over the next three to five years; unnecessary low-enrolment courses will be discontinued.

Physical Resources. The department uses a total of ca. 27,000 ft² of undergraduate laboratory space (see Section 5.3), of which 5850 ft² is used for level 1 chemistry (laboratories + level 1 Help Centre), 3600 ft² is used by the level 2 organic service courses, and ca. 9000 ft² is used by the two Honours programs (3284 ft² dedicated laboratory space / program + 4000 ft² of equipment or overflow space that is shared between the two). In addition to this, a 540 ft² room provides well-used study space for students in the two Honours programs. The level I program occupies the laboratories for 15 sessions / week and the level II service courses 6 sessions / week, whilst the space dedicated to the Honours programs is used for 3-5 sessions per week. The footprints and usage rates of the various laboratory spaces are a reflection of the types and amounts of glassware, small equipment, and instrumentation required by the various programs (high for the Honours programs; low for the level II service courses; very low for the level I courses) and the amount of effort required from our staff members to clean and refit or reconfigure the labs between sessions and/or courses. The Honours laboratories are used in a total of 6 different courses, each with unique materials and equipment requirements, while the levels I and II organic labs are used by a single course per term. Technical space exists on each floor of the undergraduate laboratory wing and in the basement of the building, and totals ca. 4800 ft² in combined area, divided roughly equally between equipment storage space and chemical storage and preparation space. Implementation of the proposed program can be achieved within the space currently available to the Department, thus no additional costs for space would be incurred.

6.1.2 LIBRARY, TECHNOLOGY, AND LABORATORY RESOURCES

Instrumental methods are essential to modern chemistry. Undergraduate chemistry and chemical biology students have access to an array of techniques that includes ultraviolet-visible, infrared, fluorescence, nuclear magnetic resonance and Raman spectroscopies, high performance and gas chromatography. The corresponding instrumentation has been acquired thanks to a combination of funds from the University, alumni donations and partnerships with corporations such as Varian Canada and Bruker Canada. That is on top of equipment for synthesis and characterization that includes facilities for handling very reactive materials under inert atmosphere using Schlenk lines and a glove box. The same equipment will be available to sustainable chemistry students. In this regard, no investment is envisioned for the new program beyond the current capital replacement plan. Recent donations to the Department may be utilized if necessary. For example, the Audrey Cameron Estate, which in first instance has been earmarked to support undergraduate research scholarships within the Department.

Operating Expenses. Annual expenditures on undergraduate laboratory supplies (i.e. consumables such as chemicals, etc., glassware, and small equipment) are in the range of ca. \$100K / year. Our laboratory coordinators are very conscientious – and quite creative – in finding ways to save money on expenses. For example, purchasing of chemicals, new glassware, and consumables for the laboratory programs is done through bulk orders placed once or twice a year through a competitive bidding process. Glassware accounts for the largest fraction of the supplies budget. We are as frugal as possible with glassware in the undergraduate laboratories, and charge students for the replacement of anything we can establish they had a hand in breaking, up to a limit of \$50/item.

When possible, broken glassware is sent for repairs to glassblowers at nearby institutions such as Brock and Western University.

The library resources available provide sufficient scholarly support for the teaching and research needs of the proposed undergraduate curriculum. McMaster University Library's holdings currently total more than 2.2 million volumes, with some 2 million distinct titles. Print books, print journals, and reference resources for students in the existing Chemistry and Chemical Biology programs are housed primarily in the H. G. Thode Library of Science and Engineering. Currently, the McMaster community has access to more than 1.1 million electronic resources, including approximately 90,000 electronic journals and more than 600,000 e-books. Additionally, the Library makes additional e-book titles available through a user-driven "purchase on demand" process. The Library welcomes input from faculty in the program regarding needed information resources and priority of acquisition within the established budget for Chemistry and Chemical Biology. The annual expenditure figures for the acquisition of library materials for Chemistry and Chemical Biology over recent fiscal years are listed in Table 5. In addition to those expenditures specific to the Department, the Library now spends in excess of \$6.8 million annually on electronic resources, many of which are multi-disciplinary.

Table 5. Library expenditures in support of Chemistry & Chemical Biology, 2014-2018

FISCAL YEAR	MONOGRAPH	SERIALS	TOTAL	ELECTRONIC RESOURCES
14/15	\$6,374	\$40,965	\$47,340	\$5,608,823
15/16	\$4,323	\$42,283	\$46,606	\$6,316,841
16/17	\$5,554	\$46,763	\$52,317	\$7,005,009
17/18	\$2,432	\$41,438	\$43,870	\$7,018,965
18/19	\$10,005	\$61,375	\$71,380	\$7,635,996

6.1.3 FACULTY

The department now consists of 29 full-time faculty members, including 2 teaching professors. Four of the faculty members hold joint appointments with the Department of Biochemistry & Biomedical Sciences. There are four Canada Research Chairs.

Table 6.

Name	Class of Appointment
Alex Adronov	Professor
Paul W. Ayers	Professor ^b
Paul J. Berti	Professor ^a
John D. Brennan	Professor ^b
Philip Britz-McKibbin	Professor
Michael A. Brook	Professor
David J.H. Emslie	Professor
Gillian R. Goward	Professor
Adam P. Hitchcock	Professor
William J. Leigh	Professor
Yingfu Li	Professor ^c
Jim McNulty	Professor
Giuseppe Melacini	Professor ^a
Yuriy Mozharivskyj	Professor ^d
Gary J. Schrobilgen	Professor
Harald D.H. Stöver	Professor
John F. Valliant	Professor
Alfredo Capretta	Associate Professor
Randall S. Dumont	Associate Professor
Paul H.M. Harrison	Associate Professor
Peter Kruse	Associate Professor
Pippa Lock	Associate Professor ^e
Nathan A. Magarvey	Associate Professor ^c
Jose M. Moran-Mirabal	Associate Professor ^d
Kalaichelvi Saravanamuttu	Associate Professor
Ignacio Vargas-Baca	Associate Professor
Anthony Chibba	Assistant Professor (CLA)
Sharonna Greenberg	Assistant Professor
Ryan Wylie	Assistant Professor

a) Joint appointment with Biochemistry & Biomedical Sciences, with primary undergraduate teaching in Chemistry & Chemical Biology

b) Canada Research Chair (Tier I)

c) Joint appointment with Biochemistry & Biomedical Sciences; no undergraduate teaching in Chemistry & Chemical Biology

d) Canada Research Chair (Tier II)

e) On leave

The standard teaching load in the Department is 7.5 units; i.e. two 1-semester undergraduate courses plus 1 graduate module. Two of the joint appointments carry out all their formal teaching in Biochemistry while the other two have 4.5-unit duties in our department. After teaching relief associated with major awards, and administrative positions is subtracted out, the total number of undergraduate teaching units available to the Department is 136-140. The number of teaching units that must be covered off in a given year to accommodate research leaves ranges from 6 to 18.

6.1.4 ANTICIPATED CLASS SIZE

The strongest indicator of potential enrollment in the new program is given by the number of students (27) already enrolled in CHEM2SC3. Once the program is established, this would likely scale up to 50 in each class.

6.1.5 PROGRAM IMPLEMENTATION

Although this proposal is being submitted to McMaster during the fall of 2019, as noted in 1.5, CHEM 2SC3 is already being offered under Dean's permission. Full approval of the program is expected by the summer of 2020 for the first class of Sustainable Chemistry to start in September 2020. The new courses CHEM 3SC3 and CHEM 4SC3 will be offered for the first time in 2020-2021 and 2021-2022. After that, there will be no need to open any new course for Sustainable Chemistry to be fully established.

7 QUALITY AND OTHER INDICATORS

7.1 ACADEMIC QUALITY OF THE PROGRAM

Evidence of Quality of the Faculty:

Faculty members are assessed based on their research performance through the quality of publications, research funding, supervision of graduate and undergraduate students, teaching evaluations and administrative service to the university or community.

Funding, Publications and Graduate Supervision:

Faculty from Chemistry and Chemical Biology are highly successful, well-funded and recognized in their respective fields. During the 2017 calendar year, the department held \$6.2M in research funding, and published 148 articles. Faculty within the program who are either tenured or tenure-track are highly involved in student supervision at all levels, including undergraduate, Master's, Doctoral and Post-Doctoral. In the 2017 time period, faculty supervision of graduate students totalled just under 80 students within Chemistry and Chemical Biology alone.

Undergraduate students in this program will work with graduate students work in state-of-the-art laboratory facilities that have the necessary equipment to conduct cutting-edge and innovative research, which is supported through the various research awards summarized above.

From the student perspective, academic quality will be monitored through means such as enrolment monitoring and student feedback. As indicated in section 5.3, academic success of the student body will be demonstrated through monitoring students throughout the program as well as after graduation. Academic quality and academic success will be monitored carefully throughout the program to ensure strong correlation of the two.

7.2 INTELLECTUAL QUALITY OF THE STUDENT EXPERIENCE

Students will experience a unique combination of rigorous training in chemistry, along with an additional sustainability component that is primarily, but not exclusively, focussed on the role that chemistry plays not just in creating unsustainable human processes, but in correcting them to make them greener. The strong chemistry core will allow students to follow a single sub-discipline of chemistry to the same depth as a student in the regular chemistry program, should they wish: no higher-level chemistry courses will be unavailable to students in this program. At the same time, less focus on other sub-disciplines releases elective space that can be used in each level to complete the core sustainability courses, CHEM 2SC3, 3SC3 and 4SC3, while still allowing space where students might choose a sustainability theme outside the world of chemistry. As such, we fully expect that students will benefit from the greater ability to make choices in their elective courses (a much sought attribute) without losing the rigour of a traditional science component.

Faculty of Social Sciences
Undergraduate Curriculum Report to
Undergraduate Council
FOR THE 2020-2021 UNDERGRADUATE
CALENDAR

Approved by
The Faculty of Social Sciences
Faculty Council

November 11, 2019

**REPORT TO SENATE
FACULTY OF SOCIAL SCIENCES**

SUMMARY OF MAJOR CURRICULUM CHANGES FOR 2020-2021

Below is the summary of substantive curriculum changes being proposed by the Faculty of Social Sciences. For complete review of all of the changes, please refer to the November 2019 Faculty of Social Sciences Report to Undergraduate Council for changes to the 2020-2021 Undergraduate Calendar, found on MacDrive at

<https://macdrive.mcmaster.ca/f/ff988b9ff28d47a0aaf8/>

1.0 NEW PROGRAMS: N/A

2.0 PROGRAM CLOSURES:

2.1 Honours Geography and Environmental Studies

See attached memo from Dr. Jeremiah Hurley, Dean of Social Sciences and Dr. Maureen McDonald, Dean of Science.

3.0 MAJOR REVISIONS:

**3.1 ~~Human Geography~~ Environment & Society Subfields
(Applicable to all ~~Geography~~ Environment & Society programs)**

~~Human Geography~~ Environment & Society programs at McMaster are interdisciplinary in nature, drawing from Human Geography, Environmental Studies, Geographic Information Science, and Urban Studies. Environment & Society courses reflect this interdisciplinarity and encompass five major subfields or themes: Economic Development, Environment and Sustainability, Geographic Information Science (GIS) & Spatial Analysis, Health & Population, and Urban Geography & Planning. ~~encompasses five major subfields or themes: Economic Geography, Environmental Issues & Policy, Geographic Information Systems (GIS) & Spatial Analysis, Health & Population, and Urban Geography & Planning.~~ It should be noted that each subfield has its own sequence of courses and prerequisites (See the *Course Listings* section of this Calendar). Students can elect to take some or all of the upper- level courses from different subfields.

- **Economic Development:** ~~GEOG~~ ENVSOCY 2LE3, ~~GEOG~~ ENVSOCY 3LT3, ~~GEOG~~ ENVSOCY 4LE3, ~~GEOG~~ ENVSOCY 4LP3, ~~GEOG~~ ENVSOCY 4LW3
- **Environment and Sustainability:** ~~GEOG~~ ENVSOCY 2EI3, ~~GEOG~~ ENVSOCY 2EK3, ~~GEOG~~ ENVSOCY 3EC3, ~~GEOG~~ ENVSOCY 3EE3, ~~GEOG~~ ENVSOCY 3EG3, ~~GEOG~~ ENVSOCY 3ER3, ~~GEOG~~ ENVSOCY 4EA3, ~~GEOG~~ ENVSOCY 4ET3, ~~GEOG~~ ENVSOCY 4HH3

- **Geographic Information Science (GIS) & Spatial Analysis:** GEOG ENVSOCY 2GI3, GEOG ENVSOCY 3GI3, GEOG ENVSOCY 3GV3, GEOG ENVSOCY 3SR3, GEOG ENVSOCY 4GA3, GEOG ENVSOCY 4GS3, GEOG ENVSOCY 4GT3
- **Health & Population:** GEOG ENVSOCY 2HI3, GEOG ENVSOCY 3HP3, GEOG ENVSOCY 4HD3, GEOG ENVSOCY 4HH3
- **Urban Geography & Planning:** GEOG ENVSOCY 2UI3, GEOG ENVSOCY 3UP3, GEOG ENVSOCY 3UR3, GEOG ENVSOCY 3UW3, GEOG ENVSOCY 4UD3, GEOG ENVSOCY 4UH3, GEOG ENVSOCY 4US3

Other Courses

Courses not distinguished by subfield include core courses such as research methods, statistics, field courses, internship opportunities and capstone experiences, as well as a broad suite of regional and topical geography courses.

- **Core (Research Methods, Field Courses, Internships, and Capstone):** GEOG ENVSOCY 3MA3, GEOG ENVSOCY 3MB3, GEOG 3ME3, ENVIRSC 3ME3, GEOG ENVSOCY 3MF3, GEOG ENVSOCY 3MI3, GEOG ENVSOCY 4MF3, GEOG ENVSOCY 4MS3, GEOG ENVSOCY 4MT6 A/B
- **Regional Geography:** GEOG ENVSOCY 2OC3, GEOG ENVSOCY 2RC3, GEOG ENVSOCY 2RU3, GEOG ENVSOCY 2RW3, GEOG ENVSOCY 3RW3
- **Topics in Geography:** ENVSOCY 2TF3, GEOG ENVSOCY 2TS3, GEOG ENVSOCY 3TG3, GEOG ENVSOCY 4UF3

In planning a program, it is important for students to take note of the prerequisites for certain upper-level courses. Further, not every Geography Environment & Society course listed above is offered every year. For course availability, students are advised to consult "Class Search" on Mosaic or contact the School of Geography and Earth Sciences after April 1st for the list of courses that will be offered in the following academic year.

For additional information regarding Environmental Science Geography and Earth Sciences, please see the School of Geography and Earth Sciences (Faculty of Science) section of this calendar.

3.2 Combined Honours in Environment & Society Geography and Another Subject (B.A.)

Completion of any Level I program with a Grade Point Average of at least 5.0 including a grade of at least C in one of ENVSOCY 1HA3, ENVSOCY 1HB3, GEOG 1HA3 or GEOG 1HB3 and satisfaction of admission requirements for the Honours program in the other B.A. subject (See *Note 1* and *4* below). For continuation in the program, see the section on *Minimum Requirements for Entering and Continuing in a Program Beyond Level I* in the Faculty of Social Sciences Academic Regulations.

Notes

1. Subject to meeting admission requirements, students may combine two subjects and be graduated with a combined Honours B.A. degree. These combinations are available within the Faculty of Social Sciences, with programs in the Faculty of Humanities and with the Arts & Science Program.
2. Not every ~~Geography~~ **Environment & Society** course listed in this Calendar is offered every year. For course availability, students are advised to consult "*Class Search*" on Mosaic or contact the School of Geography and Earth Sciences after April 1st for the list of courses that will be offered in the following academic year.
3. Students are strongly encouraged to check prerequisites of upper-level ~~Geography~~ **Environment & Society** courses and to speak with an Undergraduate Advisor in the School of Geography and Earth Sciences regarding course selection.
4. ~~Two of~~ **ENVSOCY 1HA3, ENVSOCY 1HB3, GEOG 1HA3 and GEOG 1HB3** must be completed by the end of 60 units.
5. Students intending to enrol in ~~GEOG~~ **ENVSOCY 4MT6 A/B** must submit an application to the course coordinator by April 1 of the academic year prior to registration. Application forms are available from the School of Geography and Earth Sciences main office after March 1. Students will be informed of their permission to register in ~~GEOG~~ **ENVSOCY 4MT6 A/B** on April 15. Registration in this course is conditional upon achieving a GPA of at least 7.5.
6. Students interested in completing courses in the Geographic Information Systems (GIS) & Spatial Analysis subfield are strongly encouraged to complete MATH 1K03 if a Grade 12 Mathematics U was not completed.
7. Students interested in taking courses in Environmental Science and/or Earth Science subfields are strongly encouraged to complete ENVIRSC 1C03 and/or EARTHSC 1G03. ~~No more than 9 units from GEOG 2OC3, GEOG 2RC3, GEOG 2RU3, GEOG 2RW3, GEOG 3RW3 may count towards a student's program; additional units taken from this group of courses will count towards elective units.~~
8. With permission from an Undergraduate Advisor in the School of Geography and Earth Sciences, students enrolled in a combined Honours ~~Environment & Society~~ **Geography** program may substitute ~~GEOG-ENVSOCY 3MA3 and/or GEOG ENVSOCY 3MB3~~ with an equivalent research methods and/or statistics course from the other subject.

Requirements

Students who entered the Combined Honours in Geography and Another Subject (B.A.) program prior to September 2020 should refer to the 2019-2020 Undergraduate Calendar or their personal Advisement Report for program requirements.

120 units total (Levels I to IV), of which 48 units may be Level I

Level I: 30 Units

30 units

from

- the Level I program completed prior to admission to the program
(See *Admission* above.)

Levels II to IV: 90 Units

~~36~~ 6 units

from

- ENVSOCY 2GI3 - Geographic Information Systems
- ENVSOCY 2EI3 – Environment & Society: Challenges and Solutions
- GEOG 2GI3 – ~~Geographic Information Systems~~

6 units

from

- ENVSOCY 3MA3 - Research Methods
 - ENVSOCY 3MB3 - Data Analysis
 - GEOG 3MA3 - ~~Research Methods in Human Geography~~
 - GEOG 3MB3 - ~~Data Analysis~~
- (See Note 8 above.)

3 units

from

- ENVSOCY 3MF3 – Urban Field Camp
- ENVIRSC 3ME3 – Environmental Field Camp
- GEOG 3MF3 – ~~Human Geography Field Camp~~

12-9 units

- Level II ~~Geography~~ ENVSOCY, EARTHSC, ENVIRSC, GEOG
- (See Note 7 above.)

15 units

- Level III or IV ~~Geography~~ ENVSOCY, EARTHSC, ENVIRSC, GEOG
- (See Note 7 above.)

36 units

- courses specified for the other subject

0-3 units

from

- ENVSOCY 1HA3 - Society, Culture and Environment
 - ENVSOCY 1HB3 - Population, Cities and Development
 - GEOG 1HA3 - ~~Society, Culture and Environment~~
 - GEOG 1HB3 - ~~Population, Cities and Development~~
- (See Note 4)

12-15 units

- Electives

3.3 Honours ~~Geography~~ Environment & Society (B.A.)

Completion of any Level I program with a Grade Point Average of at least 5.0 including a grade of at least C in one of ENVSOCY 1HA3, ENVSOCY 1HB3, GEOG 1HA3 or GEOG 1HB3 (see Note 3 below). For continuation in the program, see the section on *Minimum Requirements for Entering and Continuing in a Program Beyond Level I* in the Faculty of Social Sciences Academic Regulations.

Notes

1. Not every ~~Geography~~ Environment & Society course listed in this Calendar is offered every year. Students are advised to consult the Master Timetable published by the

- Office of the Registrar or contact the School of Geography and Earth Sciences after April 1st for the list of courses that will be offered in the following academic year.
2. Students are strongly encouraged to check the prerequisites of upper-level Geography Environment & Society courses and to speak with an Undergraduate Advisor in the School of Geography and Earth Sciences regarding course selection.
 3. Two of ENVSOCY 1HA3, ENVSOCY 1HB3, GEOG 1HA3 and 1HB3 must be completed by the end of 60 units.
 4. Students intending to register in GEOG ENVSOCY 4MT6 A/B must submit an application to the course coordinator by April 1 of the academic year prior to registration. Application forms are available from the School of Geography and Earth Sciences main office after March 1. Students will be informed of their permission to register in GEOG-ENVSOCY 4MT6 A/B on April 15. Registration in this course is conditional upon achieving a GPA of at least 7.5.
 5. Students interested in completing courses in the Geographic Information Systems (GIS) & Spatial Analysis subfield are strongly encouraged to complete MATH 1K03 if a Grade 12 Mathematics U was not completed.
 6. Students interested in taking courses in Environmental Science and/or Earth Science subfields are strongly encouraged to complete ENVIRSC 1C03 and/or EARTHSC 1G03. ~~No more than 9 units from GEOG 2OC3, GEOG 2RC3, 2RU3, 2RW3, 3RW3 may count towards a student's program; additional units taken from this group of courses will count towards elective units.~~
 7. The School of Geography & Earth Sciences encourages students to embrace academic breadth in both knowledge and skills. As such, a minimum of 6 units of the 39 elective units (above Level I) must be taken from outside of the School of Geography & Earth Sciences.

Requirements

Students who entered the Honours Geography (B.A.) program prior to September 2020 should refer to the 2019-2020 Undergraduate Calendar or their personal Advisement Report for program requirements.

120 units total (Levels I to IV), of which 48 units may be Level I

Level I: 30 Units

30 units

from

- the Level I program completed prior to admission to the program (See *Admission* above.)

Level II: 30 Units

~~36~~ 6 units

from

- ENVSOCY 2GI3 - Geographic Information Systems
- ENVSOCY 2EI3 – Environment & Society: Challenges and Solutions
- GEOG 2GI3 - ~~Geographic Information Systems~~

~~45~~ 12 units

- Level II Geography ENVSOCY, EARTHSC, ENVIRSC, GEOG (See *Note 6* above.)

0-3 units

from

- ENVSOCY 1HA3 - Society, Culture and Environment
 - ENVSOCY 1HB3 - Population, Cities and Development
 - GEOG 1HA3 - Society, Culture and Environment
 - GEOG 1HB3 - Population, Cities and Development
- (See Note 3)

9-12 units

- Electives
- (See Note 7 above.)

Levels III: 30 Units

9-12 units

from

- ENVSOCY 3MA3 – Research Methods
- ENVSOCY 3MB3 - Data Analysis
- GEOG 3MA3 - Research Methods in Human Geography
- GEOG 3MB3 - Data Analysis
- GEOG 3MF3 – Human Geography Field Camp

3 units

from

- ENVSOCY 3MF3 – Urban Field Camp
- ENVIRSC 3ME3 – Environmental Field Camp

12 units

- Level III Geography ENVSOCY, EARTHSC, ENVIRSC, GEOG
- (See Note 6 above.)

9 units

- Electives
- (See note 7 above.)

Level IV: 30 Units

12 units

- Level IV Geography ENVSOCY, EARTHSC, ENVIRSC, GEOG

18 units

- Electives
- (See Note 7 above.)

3.4 Geography Environment & Society (B.A.)

Completion of any Level I program with a Grade Point Average of at least 3.5 including a grade of C- 4.0 in one of ENVSOCY 1HA3, ENVSOCY 1HB3, GEOG 1HA3 or GEOG 1HB3. (See Note 3 below.)

Notes

1. Not every Geography Environment & Society course listed in this Calendar is offered every year. For course availability students are advised to consult "Class Search" on Mosaic or contact the School of Geography and Earth Sciences after April 1st for the list of courses that will be offered in the following academic year.

2. Students are strongly encouraged to check prerequisites of upper-level ~~Geography~~ ~~Environment & Society~~ courses and to speak with an Undergraduate Academic Advisor in the School of Geography and Earth Sciences regarding course selection.
3. ~~Two of ENVSOCTY 1HA3, ENVSOCTY 1HB3, GEOG 1HA3 and 1HB3 must be completed by the end of 60 units.~~
4. Students interested in completing courses in the Geographic Information Systems (GIS) & Spatial Analysis subfield are strongly encouraged to complete MATH 1K03 if a Grade 12 Mathematics U was not completed.
5. ~~Students interested in taking courses in Environmental Science and/or Earth Science subfields are strongly encouraged to complete ENVIRSC 1C03 and/or EARTHSC 1G03. No more than 9 units from GEOG 2OC3, GEOG 2RC3, 2RU3, 2RW3, 3RW3 may count towards a student's program; additional units taken from this group of courses will count towards elective units.~~
6. The School of Geography & Earth Sciences encourages students to embrace academic breadth in both knowledge and skills. As such, a minimum of 6 units of the 36 elective units (above Level I) must be taken from outside of the School of Geography & Earth Sciences.

Requirements

Students who entered the Geography (B.A.) program prior to September 2020 should refer to the 2019-2020 Undergraduate Calendar or their personal Advisement Report for program requirements.

90 units total (Levels I to III), of which 42 units may be Level I

Level I: 30 Units

30 units

from

- the Level I program completed prior to admission to the program.
(See *Admission* above.)

Level II and III: 60 Units

12 units

- Level II ~~Geography~~ ENVSOCTY, EARTHSC, ENVIRSC, GEOG
(See *Note 5* above.)

12 units

- Level III or IV ~~Geography~~ ENVSOCTY, EARTHSC, ENVIRSC, GEOG
(See *Note 5* above.)

0-3 units

from

- ENVSOCTY 1HA3 - Society, Culture and Environment
 - ENVSOCTY 1HB3 - Population, Cities and Development
 - GEOG 1HA3 - ~~Society, Culture and Environment~~
 - GEOG 1HB3 - ~~Population, Cities and Development~~
- (See *Note 3*)

33-36 units

- Electives
(See *Note 6* above.)

Justification: *The changes presented in 3.1-3.4 are the outcome of a review of the undergraduate programs in the School of Geography and Earth Sciences conducted in 2018-19. Over the course of the 2018-19 academic year, we conducted a comprehensive review of our undergraduate BA and BSc programs. This review gathered information from the following sources: 1) meetings with Assistant Deans and Academic Advisors in Science and Social Sciences; 2) focus groups with current students in BA and BSc program; 3) online survey of current Level III students asking about program choice; 4) analysis of program and course enrolment data; and informal conversations with both recent, and more distant, alumni.*

From the review we learned: 1) students in focus groups and online surveys are most interested in environmental issues, expressing both academic interest and personal concern with current environment problems; 2) reflecting these sentiments, interest and enrolment in our standalone Human Geography program has declined steadily in recent years while the Environmental Studies program has grown. In part, this stems from a systematic erosion of geography within the high school curriculum, 3) students value flexible programs that offer multiple pathways to degree completion; and 4) students want to see meaningful connections between subject matter and potential careers.

On the basis of the review, we are changing the name of our existing Honours and Combined Honours programs in Geography to Honours Environment & Society, while discontinuing the standalone Honours Geography & Environmental Studies program. The renamed program draws from Environmental Studies, Human Geography, GIS, and Urban Studies to offer a flexible program of study. Reflecting this change (and the forthcoming change to the name of our unit), we are changing our course codes from GEOG to ENVSOCTY.

November 12, 2019

TO: Associate Vice-President (Faculty)
Chair, Undergraduate Council

FROM: Dr. Maureen McDonald, Dean, Faculty of Science
Dr. Jeremiah Hurley, Dean, Faculty of Social Sciences

SUBJECT: Program Closure/Merger of Honours Geography & Environmental Science and Honours
Geography and Environmental Studies

During the 2018-19 academic year, the School of Geography and Earth Science (SGES) undertook a comprehensive review of its undergraduate programs. The SGES program review involved focus groups with program students, an online survey of Level III students asking about program choice, meetings with academic advisors in Science and Social Sciences, and an analysis of SGES program and course enrolment data.

The review found significant overlap between the Honours Environmental Sciences and Honours Geography and Environmental Sciences programs. For this reason, SGES recommended merging these programs into a single Honours Environmental Sciences program (also available as a Coop program).

The review also found significant overlap between the Honours Geography program and the Honours Geography & Environmental Studies program. For this reason, SGES recommended merging these programs into a renamed Honours Environment & Society program. The new name signals the program's central focus on the interrelationship between human societies and the built, social, economic and natural environments they inhabit; and the explicitly interdisciplinary nature of the program, which spans Environmental Studies, Human Geography, Geographic Information Science, and Urban Studies.

For details, see Major Modifications section below.

As per the proposed changes, the Faculty is proposing to do the following:

- Notify students that the existing Honours Geography & Environmental Science program is no longer available and direct Level I students who intended to register in this program to the merged Honours Environmental Science program. Admissions requirements to the merged program will be the same as those required for Honours Geography & Environmental Science. All currently enrolled students will be given the opportunity to complete their program requirements.

- Notify students that the Coop version of the Honours Geography & Environmental Science program will be phased out. Admission will be last available in September 2020. All currently enrolled students will be given the opportunity to complete their program requirements.
- Notify students that the existing Honours Geography & Environmental Studies program is no longer available and direct Level I students who intended to register in this program to the merged Honours Environment and Society program. Admissions requirements to the merged program will be the same as those required for Honours Geography & Environmental Studies. All currently enrolled students will be given the opportunity to complete their program requirements.
- Notify students that the existing Honours Geography program will be renamed Honours Environment and Society. All currently enrolled students will be given the opportunity to graduate with the existing program name, but they can also elect to graduate with the new name.

Students were consulted extensively during the program review process (in focus groups and surveys), and the broader student population has been made aware of these impending changes through email communications from the SGES Associate Director (Undergraduate):

SGES Program Changes

I want to update you on some exciting changes to our undergraduate programs. Before I outline what's changing (and what's not changing), ~~let me be clear that these revisions will not impact to you as current program students, although there are some changes that you can choose to adopt if you wish (see 1.c and 2.a below).~~ If you have specific questions, please feel free to contact Kara Salvador or myself for further information. We'll also be organizing information sessions in the winter term to provide additional guidance for students.

Let me offer some context for the changes. As some of you know, we undertook a review of our undergraduate BA and BSc programs last year. This involved focus groups with students in BA and BSc program, an online survey of Level III students asking about program choice, meetings with academic advisors in Science and Social Sciences, and an analysis of SGES program and course enrolment data. From the review, we learned a number of things:

- *On the BSc side, students and academic advisors felt we had too many programs and the differences between them were not clear. This was particularly the case for our Honours Environmental Sciences and Geography & Environmental Sciences programs.*
- *On the BA side, we noted significant overlaps between our Human Geography and Geography & Environmental Studies programs.*
- *Across all programs, many students in focus groups and online surveys were very interested in environmental issues, expressing both academic interest and personal concern with current environment challenges.*
- *Many students value flexible programs that offer multiple pathways to degree completion (e.g., some BA students take courses on climate science, while many BSc students take urban planning, environmental policy and sustainability courses)*

On the basis of the review, we are making a number of changes that we believe will better showcase the strengths of the school and ensure future growth in enrolments.

1. Science

- a. Our Honours Earth and Environmental Sciences program is not changing.
- b. We are merging our Honours Environmental Sciences and Geography & Environmental Sciences programs to create a single, flexible program that will allow students to take course from across the school. This program will retain the Honours Environmental Sciences name. As of Fall 2020, there will be no new students admitted to Honours Geography & Environmental Sciences. However, if you're currently in Level II and thinking about the co-op option for Honours Geography and Environmental Science, you will still be able to enroll in co-op for the 2020-21 academic year.
- c. We are changing the name of Honours Biology and Environmental Science to Biodiversity and Environmental Sciences as of Fall 2020. This reflects a growing focus in ecological and environmental research generally (and in this program specifically) on how diverse organisms are able to adapt to their changing environments at both the community and ecosystem levels. If you are currently in this program you will graduate with the existing name, but you can choose to graduate with the new name if you wish.

2. Social Sciences

- a. The big change to our BA programs is that we are merging our Honours Geography and Geography & Environmental Studies programs into a single program that will be called Honours Environment and Society. We believe this name captures our central focus on the dynamic interrelationship between human societies and the environments (built, social, economic and natural) they inhabit; and the interdisciplinary nature of our courses, which span Environmental Studies, Human Geography, Geographic Information Science, and Urban Studies. ~~This change will have no impact if you are currently enrolled in one of the existing programs unless you would like to graduate with the new program name.~~ Please contact Kara if this is something you're interested in.
- a. Reflecting the new program name, we are changing our GEOG course codes to ENVSOCTY. This means that when you go to register this summer all of our social science courses in the undergraduate calendar and on Mosaic will be listed under ENVSOCTY. For the most part, the course titles and descriptions will remain the same.

As faculty members, we are really excited by these changes and firmly believe they will help us to welcome even more students into our programs and courses in the coming years. Again, please contact Kara or myself if you have further questions.

Faculty members within SGES have been made aware of these impending changes through review process and an associated SGES retreat. The revisions were given unanimous faculty support. More broadly, the

changes were discussed and voted on the Faculty of Science Academic Planning & Policy Committee, and General Faculty. The changes to the Honours Geography and Honours Geography & Environmental Studies BA programs were also discussed and approved by the Faculty of Social Sciences Undergraduate Curriculum Committee.

The above changes are being made in the best interests of students, faculty, and the Faculty of Science.

**Office of the Registrar
Undergraduate Curriculum Report
to
Undergraduate Council
for the 2020-2021 Undergraduate Calendar**

Revisions for the following sections:

- Glossary
- Admission Requirements
- General Academic Regulations
- Aid & Awards

November 2019

1.0 Glossary

Intersession

The Intersession is a time period in which students may explore novel interdisciplinary and experiential opportunities that may not be available during the Fall or Winter terms. The Intersession begins in the first week of May (concurrent with the Spring Session) and lasts for a 4-week period. See the *Sessional Dates* and INSPIRE course listings for more information.

Rationale:

To provide students with a description of the upcoming Intersession project.

2.0 Admission Requirements

2.1 American High School Curriculum

Applicants from the continental United States of America or international schools offering the American high school curriculum must satisfactorily complete a secondary school diploma with a minimum overall average of at least 80% in the Grade 12 academic program of an accredited American high school/International American Curriculum high school and must present all prerequisite courses for their chosen program. Admission is competitive and many programs will require grades/averages well above the minimum 80% for admission consideration. For complete requirements for American Curriculum applicants, please visit our website: <https://future.mcmaster.ca/admission/requirements/>.

McMaster programs that have specific math and/or science prerequisites require Advanced Placement subjects only for those requirements. Non A.P. courses will not be deemed sufficient to meet the program prerequisites in the math and science subjects for students coming from American style curriculum schools. If applicants believe that their schools' locally developed curriculum in math and science subjects is equivalent to all of the topics covered in A.P. level courses, then the applicant must provide the Office of the Registrar, Admissions with a detailed and comprehensive syllabus supplied by their school for each course that they are seeking equivalency to A.P. level courses.

American Curriculum applicants must also present results from the Critical Reading and Mathematics components of SAT-I with a minimum combined score of 1200 (minimum 580 Critical Reading, 520 Mathematics) OR a minimum combined score for the Redesigned SAT result of at least 1200 as a combined score with a minimum of 600 in each section OR from ACT with a minimum composite score of 27.

American Curriculum High School applications are reviewed for admission based on McMaster's own calculation of the admission average. McMaster's calculations of the admission averages may vary from those used at other institutions. Applicants from an American high school curriculum must satisfactorily complete a secondary school diploma with a minimum overall average of at least 80% in a Grade 12 academic program from an accredited American high school/International American Curriculum high school AND must present all prerequisite courses for their chosen program(s). Admission is competitive and many programs will require grades/averages well above the minimum 80% for admission consideration. For complete requirements for American Curriculum applicants, please visit our website: <https://future.mcmaster.ca/admission/requirements/>.

General Requirements:

High school Diploma from an accredited school with prerequisite subjects including English completed at the AP or Senior Grade 12 academic level.

Students may be required to satisfy our English language proficiency requirements:

<https://future.mcmaster.ca/admission/language/>

McMaster will consider a minimum of five Senior Grade 12 academic courses including all prerequisite subjects for the applicant's selected program(s). **Students applying to programs in Engineering, Science, Health Sciences, Economics and Business programming that have mandatory Science and/or Mathematics prerequisites should note the following requirements for each subject:**

Biology – 2 years/ 2 full credits (Junior and Senior) or AP Biology (or equivalent)

Physics - 2 years/2 full credits (Junior and Senior) or AP Physics (or equivalent)

Chemistry - 2 years/ 2 full credits (Junior and Senior) or AP Chemistry (or equivalent)

Calculus – 4 years of high school Mathematics including Pre-Calculus and AP Calculus or equivalent.

McMaster University will accept the results of an equivalent **AP challenge examination** in lieu of ONE of the science/math prerequisites for your chosen subject if your school does not offer the subject. A minimum score of 4 or 5 will be required for AP challenge exams.

Students who are presenting AP courses that are prerequisite to their selected program(s) will be required to complete and submit the AP Examination(s) via the College Board and minimum grades of at least 3 will be required from the examinations to meet admission conditions.

SAT II Subject Test with a score of at least 670 or higher may be considered on a case-by-case basis in lieu of ONE of the science/math prerequisites for your chosen program.

For claimed equivalencies, detailed syllabi including all topics covered, total hours and textbooks used are required for our evaluation and should be submitted alongside official high school transcripts/reports.

Students in continental US high schools must supply results from either the **SAT or ACT** testing. The SAT Essay and the ACT Writing Test are optional for McMaster. All other applicants in American Style Curriculum schools outside of the US are also encouraged to submit the results of SAT/ACT tests as admission to all of McMaster's undergraduate programs is highly competitive and preference may be given to applicants presenting excellent scores.

Students in **China** and who are completing an International hybrid curriculum (National curriculum concurrent with an AP/American style curriculum are required to supply results from either SAT or ACT testing:

SAT – minimum overall score of 1200 or greater (Reading/Math sections only) with minimum scores of 600 in each section. (Institutional Code for SAT/AP 0936)

ACT – minimum composite score of 27 or greater (Institutional Code 5326)

High scores in external tests such as SAT, SATII Subject Tests, ACT and AP may help your applications to be more competitive for your selected program.

Rationale:

To clarify and provide more detail about admission requirements for students coming from an American high school curriculum.

3.0 General Academic Regulations

3.1 Student Responsibilities

Academic

McMaster University provides many resources to help students achieve their academic goals, including the Undergraduate Calendar, program advisement reports and academic advisors. The University endeavours to enable students to enrol in required courses so that their program admission requirements and course requisites can be met in a timely manner. The University reserves the right to change a student's enrolment in classes should the need occur (e.g. low enrolment, urgent timetable changes, etc.).

Students must assume certain responsibilities. They include:

- meeting admission requirements and application deadlines for their intended program(s) of study
- selecting and completing courses in an order that meets requisite and program requirements
- becoming familiar with and respecting University Sessional Dates, the General Academic Regulations, their Faculty/Program-specific regulations, and the Regulations for Aid and Awards as found in the appropriate sections of this Calendar.

Students who do not follow these guidelines may experience academic consequences such as cancellation of course enrolment, completion of courses that are not counted toward their degree, or delayed graduation.

In addition to the responsibilities listed above, students are expected to:

- know and follow the Senate policies
- keep their student account in good standing, paying all charges on time
- be aware that changes to course load and program may affect eligibility for government and University aid and awards (e.g. OSAP, work programs, bursaries, scholarships, etc.)
- consult with Student Accessibility Services in a timely manner to make disability related accommodation requests under the [Academic Accommodation of Students with Disabilities](#) policy

Communication

It is the student's responsibility to:

- maintain current contact information with the University, including address, phone numbers, and emergency contact information
- use the university provided e-mail address or maintain a valid forwarding e-mail address
- regularly check the official University communications channels, including the Mosaic Student Centre. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca account
- accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca account

3.2 ~~Academic Commitments~~ Academic Obligations

~~Students should expect to have academic commitments (e.g., classes, labs, tests, examinations, etc.) Monday through Saturday, normally 8:30 a.m. to 10:00 p.m., but not on Sunday or statutory holidays, as outlined in the Sessional Dates.~~

Students should expect to have academic commitments for instructional activities (e.g., lectures, labs, tutorials, etc.) Monday through Saturday, normally 8:30 a.m. to 10:30 p.m., but not on statutory holidays, as outlined in the *Sessional Dates*. Also, students may be required to write tests or examinations on Saturday or Sunday. Students are responsible for meeting all course requirements, including final examinations, as scheduled. ~~Students are responsible for meeting all course~~

requirements, including final examinations, as scheduled. Students who require accommodations to meet religious, Indigenous or spiritual observances must make their requests within 10 working days from the beginning of the start of term to their Faculty/Program Office.

Rationale:

Provides the option for an extended time period to schedule tests and exams only when deemed necessary and/or to prevent the term from running too late in December.

Academic Accommodations - Religious, Indigenous or Spiritual Observances

Students who require accommodations to meet Religious, Indigenous or Spiritual Observances are expected to read the [Policy on Academic Accommodation for Religious, Indigenous and Spiritual Observances](#) ("RISO policy"). Students are expected to submit the RISO form to their Faculty, electronically or in person, normally within ten working days from the beginning of each term in which they are anticipating a need for Accommodation.

Academic Accommodations: Permanent Disability, Temporary Disability, and Retroactive Accommodation

Students who require accommodation related to a permanent disability, temporary disability, or require a retroactive accommodation, are expected to read the [Academic Accommodation of Students with Disabilities](#) policy. The language below is from the *Academic Accommodation of Students with Disabilities* policy and will be revised as required to remain consistent with the Policy

- students are not to seek accommodation directly from their professors, instructors, and/or teaching assistants. Accommodation requests should be directed to Student Accessibility Services or the Faculty Office;
- students are not required to reveal their private medical information, such as the cause of the disability, diagnosis, symptoms or treatment (unless these clearly relate to the accommodation being sought) to register with Student Accessibility Services, or receive accommodations or supports;
- students may request interim accommodations for disabilities (this includes mental health disabilities) pending receipt of medical documentation;
- both Temporary and Permanent disabilities will be accommodated
 - **Permanent Disability** is where a functional limitation will occur for *more than one academic term* or as defined by a regulated health professional.
 - **Temporary Disability** may be a short-term injury or illness (such as mononucleosis, a broken limb or concussion) or an episodic condition (e.g. mental illness) where a functional limitation *generally occurs within one academic term or less* or as defined by a regulated health professional.
- requests for accommodation should be submitted in a prompt and timely manner. Requests made after a deadline has passed may be considered Retroactive Accommodations. A **Retroactive Accommodation** may be for either a Permanent or Temporary Disability when the request is made **after-the-fact** (e.g. after a course has been completed), as the result of the discovery or diagnosis of an existing disability of which the student was previously unaware.

Restrictions: Due Date Restrictions

- Academic assessments, due dates and evaluations are described in course outlines except where other University policies, e.g., Student Accessibility Services (SAS) accommodations, deferred exams, etc. When students are aware of their progress early in a course they can make informed decisions. Restrictions are placed on academic obligations to enable students to plan their work schedules.
- Due dates for all term work must be on or before the final day of classes for courses with a final examination. For courses with no final examination, academic assessments can be due on or before the final date of examinations.
- Tests, quizzes, exams and take-home exams worth more than 10% cannot be assigned or due during the last 5 days of classes plus the day(s) between the end of classes and the beginning of examinations. Assignments worth more than 10% that are assigned at the beginning of the course and noted on the course outline can be due during this time period, provided students are given sufficient additional detail to enable them to work on the assignment in advance of the due date.
- Academic assessments cannot be due during the December holiday break or the fall and winter mid-term recesses, with the exception of deferred exams scheduled by the [Office of the Registrar](#).

Maximum Value of Academic Assessments

- Student learning in undergraduate courses should be assessed on more than one occasion. To that end, no single academic obligation (e.g., essay, test, examination, etc.) should have a value of more than 75% of the final grade without approval from the Department Chair or Associate Dean's Office. Clinical, placement, thesis and capstone courses are exempt.
- For students requiring relief from an academic obligation, it is at the discretion of the instructor to determine the nature of the relief. In cases such as this, students can be offered the choice of another assessment or the option of writing a final examination which may be worth more than 75% of the course grade.

Early Feedback

- All students must receive feedback regarding their progress prior to the final date by which a student may cancel the course without failure by default.
- For Level I and Level II courses, this feedback must equal a minimum of 20% of the final grade.
- For Level III courses and above, this feedback must equal a minimum of 10% of the final grade.
- For courses where it is difficult to achieve a numeric grade due to the design of the course (e.g., supervised study, thesis, capstone, inquiry, independent research/study, experiential courses, etc.), clear and early feedback must be provided.
- When academic obligations are completed by the due dates in the course outline, early feedback will be received by the final date by which a student can ~~withdrawal from~~ cancel a course without failure by default. Students who use the MSAF process and other petitionable accommodations may not receive feedback by the early feedback deadline.

Residence Requirements

Most students complete all undergraduate work at McMaster University. However, students who complete work at other universities must meet the minimum requirements set out below.

To obtain any four- or five-level, first undergraduate degree:

- at least two levels (approximately 60 units of work) beyond Level I, including the final level, must be completed at McMaster University.

To obtain a three-level, first undergraduate degree:

- the final level and at least one other level (a minimum of approximately 60 units of work) must be completed at McMaster University, or,
- the final level (approximately 30 units of work) including at least 18 units of program- specific requirements must be completed at McMaster University.

Courses taken at another university on a *Letter of Permission* will not count toward the residence requirements.

All course work for a second bachelor's degree must be completed at McMaster University.

3.3 McMaster University Statement on the Collection of Personal Information and the Protection of Privacy

McMaster University collects and retains personal information of students, alumni and other parties, including but not limited to faculty, staff, visiting academics and private citizens using services provided by McMaster University, under the authority of The McMaster University Act, 1976. This information is used for the academic, administrative, employment-related, safety and security, financial and statistical purposes of the University, including for the administration of admissions, registration, awards and scholarships, convocation, alumni relations and other fundamental activities related to being a member of the University community, a user of services provided by McMaster or an attendee of, or applicant to, a public post-secondary institution in the Province of Ontario. The information will be used, among other things, to admit, register and graduate students, record academic achievement, issue library cards and, where applicable, local transit passes, event tickets etc., to provide access to information systems and to operate academic, financial, athletic, recreational, residence, alumni and other University programs. Additionally, this information may be shared with other institutions of higher education in order to administer collaborative programs. Information on admissions, registration and academic achievement may also be disclosed and used for statistical and research purposes by the University, other post-secondary educational institutions and the federal and provincial governments. The names of alumni, their Faculty and program, award information, degree(s) awarded and date of graduation is considered public information and may be published by McMaster University. In addition, student photographs posted by the University in the form of individual pictures or class pictures may be publicly displayed. Aside from the foregoing, the information you provide and any other information placed in a student record, or in a personnel record, will be protected and used in compliance with Ontario's Freedom of Information and Protection of Privacy Act (RSO 1990) and will be disclosed only in accordance with this Act. If you have any questions about the collection and use of this information please contact the University Registrar, University Hall, Room 209, Student Records, Gilmour Hall, Room 108, or the University Secretary, Gilmour Hall, Room 210, McMaster University. McMaster University may also collect personal information from other relevant sources including, without limitation, the Ontario Universities' Application Centre, secondary schools, colleges, universities and other institutions previously attended, including third-party services and test score providers where the items collected form a part of the application or admission process to a university program. Furthermore, McMaster is required to disclose personal information such as Ontario Education Numbers, student characteristics and educational outcomes to the Ministry of Training, Colleges and Universities (the "MTCU"). The Ministry collects this data for purposes such as planning, allocating and administering public funding to colleges, universities and other post-secondary educational and training institutions and to conduct research and analysis, including longitudinal studies, and statistical activities conducted by or on behalf of the Ministry for purposes that relate to post-secondary education and training. Any information collected by McMaster for the purposes of self-identification as a member of a specific group (i.e. First Generation, First Nations, etc.) may be subject to disclosure to the MTCU by McMaster and collected by the MTCU pursuant to its statutory authority. Further information on how the MTCU uses personal information is available on the ministry's website (<http://www.tcu.gov.on.ca/>). In addition to collecting personal information for the purposes noted above, McMaster University collects specific and limited personal information on behalf of the McMaster Student Union, Recognized Student Groups, the McMaster Association of Part-time Students and/or the McMaster Graduate Students Association. These constituent student groups use personal information for the purpose of membership, administration, elections, annual general meetings, health plans and other matters related to membership.

benefits only. Please contact the relevant Student Union or Association office if you have questions about this collection, use and disclosure of your personal information and their respective privacy policies.
June 2019

Rationale:

Updated to match the university's official statement on the Collection of Personal Information and the Protection of Privacy.

3.4 Second Bachelor's Degree Programs

Requirements for Second Bachelor's Degree Programs

- Honours Degree following a Three-Level Degree in the Same Subject: For consideration into an Honours B.A., ~~or~~ B.Sc., or B.A.Sc. degree program following a three-level degree in the same subject, a Cumulative GPA of at least 5.0 in the first degree program is required. For consideration into all other eligible degree programs, a Cumulative GPA of at least 6.0 in the first degree program is required. If admitted, at least 30 units beyond the first degree, including all program requirements, must be completed.
- B.A. or B.Sc. in Another Subject: For consideration, students must meet the admission requirements for the program. If admitted, at least 30 units beyond the first degree, including all program requirements, must be completed. Students are not eligible for a second B.A. or B.Sc. degree in a program in which they have been awarded a minor, however, they may apply for an honours second degree in that subject.
- Honours B.A., Honours B.A.Sc., Honours B.Sc. or Honours B.H.Sc. in Another Subject: For consideration, students must meet the admission requirements for the program and have a Cumulative GPA of at least 5.0. If admitted, at least 60 units beyond the first degree, including all program requirements, must be completed.
- B.M.R.Sc.: For consideration, students must meet the admissions requirements for the program. If admitted, students will be required to complete a minimum of 24 units during Level I of the program. Some of these units may be extra to the degree requirements.
- B. Eng., B.Tech., and B.A.Sc.: For consideration, students must meet the admission requirements for the program. If admitted, students must complete at least 60 units beyond the first degree including all program requirements.

Rationale:

Need to include a note indicating that the Honours B.A.Sc. can be completed as a second undergraduate degree.

3.5 Petitions for Special Consideration

The University wishes to assist students with legitimate difficulties. It also has the responsibility to ensure that degree, program and course requirements are met in a manner that is equitable to all students. Students may submit, in a prompt and timely manner, a Petition for Special Consideration to the Faculty/Program Office in those instances where a student acknowledges that the rules and regulations of the University have been applied fairly, but is requesting that an exception to the regulations be made because of special circumstances (requests related to temporary or permanent disabilities, or for retroactive accommodations related to a disability are excluded from petitions and must be processed under the [Academic Accommodation of Students with Disabilities](#) policy). Petitions should be submitted in a prompt and timely manner for the relevant term, but no later than July 31 immediately following the Fall/Winter Term or November 15 immediately following the Spring/Summer Term.

Two forms are available from your Faculty/Program Office:

Petition for Special Consideration (Form A):

The *Petition for Special Consideration (Form A)* is submitted for a variety of issues, including, when a student wishes to have a leave of absence or seeks to depart from University requirements based on compelling medical or personal reasons; or a student believes that an adverse ruling or decision about their academic performance, such as failing a course, or being required to withdraw from a program for failure to meet program requirements, should be waived because of compelling medical or personal circumstances. Requests related to temporary or permanent disabilities, or for retroactive accommodations related to a disability are excluded from petitions and must be processed under the [Academic Accommodation of Students with Disabilities](#) policy.

Petition for Special Consideration: Request for Deferred Examination (Form B):

The *Petition for Special Consideration: Request for Deferred Examination (Form B)* is used when a student misses an examination because of compelling medical or personal reasons. Should the Request for Deferred Examination (Form B) be related to a disability (permanent or temporary), the Petition will be handled in compliance with the [Academic Accommodation of Students with Disabilities](#)

1. Once a student has completed an examination, no special consideration will be granted.
2. A student who misses an examination because of compelling medical or personal reasons may submit a Petition for Special Consideration: Request for Deferred Examination (Form B) to the Faculty/Program Office, normally within five working days of the missed examination.
3. If the reason is medical, the approved McMaster University Medical Form must be used. The student must be seen by a doctor at the earliest possible date, normally on or before the date of the missed exam and the doctor must verify the duration of the illness. Relief will not be available for minor illnesses. If the reason is non-medical,

appropriate documentation with verifiable origin covering the relevant dates must be submitted, normally within five working days.

4. In deciding whether or not to grant a petition, the adequacy of the supporting documentation, including the timing in relation to the due date of the missed work and the degree of the student's incapacitation, will be taken into account.
5. It is the student's responsibility to check Mosaic Student Center > Deferred Exam Approvals or with the Faculty/Program Office for a decision on the request for a deferred examination. If the deferred examination is granted, the student will be informed officially by means of the notation DEF which will appear against the relevant course on the student's academic record and via Mosaic > Student Center > View My Grades.
6. Deferred examinations are written during the next official University deferred examination period. Default of the deferred examination will result in a fail for that examination.
7. Students who have been granted more than one deferred examination may be required by their Faculty/Program Office to reduce their course load during the term in which the deferred examinations are being written. The decision on a reduced load will be made and communicated with the decision on the request for deferred examinations.
8. At the discretion of the Faculty/Program Office, students who have been granted one or more deferred examinations, may not be allowed to enrol in a subsequent term until all deferred examinations have been completed and the Academic Standing calculated. Students will be notified of this decision by their Faculty/Program Office.
9. Students who will be living more than 160 kilometres from Hamilton during the deferred examination period and wish to write their approved deferred examination at an institution other than McMaster must submit a Request to Write Deferred Examination Off-campus Form at least 15 working days prior to the deferred examination period. Students are responsible for making arrangements for a presider to conduct the deferred examination at an outside institution and for paying any fees such as invigilation and return courier.
10. The authority to grant any petitions lies with the Faculty/Program Office and is discretionary. It is imperative that students make every effort to meet the originally-scheduled course requirements and it is a student's responsibility to write examinations as scheduled.

Decisions made on Petitions for Special Consideration are final. In accordance with the *Student Appeal Procedures*, decisions made on Petitions for Special Consideration cannot be appealed to the Senate Board for Student Appeals. However, if the student believes that a decision may be a violation of their human rights, they should contact the Equity and Inclusion Office to identify appropriate avenues of recourse as per the ~~should students believe a decision violates their human rights, they may wish to consult McMaster's Policy on Discrimination and Harassment: Prevention & Response and visit one of the four intake offices (Equity and Inclusion Office, Student Support & Case Management, Employee/Labour Relations, Professionalism Office in Faculty of Health Sciences) to initiate a complaint.~~

3.5 Requests for Relief for Missed Academic Term Work (MSAF)

The University recognizes that students periodically require relief from academic work for medical or other personal situations. This academic regulation aims to manage these requests by taking into account the needs and obligations of students, instructors and administrators. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in his/her course.

Any concerns regarding the granting of relief should be directed to the respective Faculty/Program Office. Requests for relief should be made with a commitment to academic integrity in mind. Requests that deviate from this commitment will be handled under the [Academic Integrity Policy](#) and [Code of Student Rights and Responsibilities](#), where appropriate.

1. Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days:
 - Use the McMaster Student Absence Form (MSAF) on-line self-reporting tool. No further documentation is required.
 - Students may submit requests for relief using the MSAF once per term.
 - An automated email will be sent to the course instructor, who will determine the appropriate relief. Students must immediately follow up with their instructors. Failure to do so may negate the opportunity for relief.
 - The MSAF cannot be used to meet a religious obligation or to celebrate an important religious holiday.
 - The MSAF cannot be used for academic work that has already been completed/ attempted.
 - An MSAF applies only to work that is due within the period for which the MSAF applies, i.e. the 3-day period that is specified in the MSAF; however, all work due in that period can be covered by one MSAF.
 - The MSAF cannot be used to apply for relief for any final examination or its equivalent. See *Petitions for Special Consideration*.
2. For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term where the MSAF has been used previously in that term:
 - Students must report to their Faculty/Program Office to discuss their situation and will be required to provide appropriate supporting documentation (see *Documentation Requirements* below).
 - If warranted, the Faculty/Program Office will approve the absence, and the instructor will determine appropriate relief.

Documentation Requirements

If the reason for a request for relief is medical, the approved McMaster University Medical Form covering the relevant dates must be submitted. The student must be seen by a doctor at the earliest possible date, normally on or before the date of the missed work and the doctor must verify the duration of the illness.

If the reason is non-medical, appropriate documentation with verifiable origin covering the relevant dates must be submitted, normally within three working days.

In some circumstances, students may be advised to submit a Petition for Special Consideration (Form A) seeking relief for missed academic work. In deciding whether or not to grant a petition, adequacy of the supporting documentation, including the timing in relation to the due date of the missed work and the degree of the student's incapacitation, may be taken into account. Failure to do so may negate the opportunity for relief.

If the petition is approved, the Faculty/Program Office will notify the instructor(s) recommending relief. It is the prerogative of the instructor of the course to determine the appropriate relief for missed term work in their course.

3.6 Examinations

(See also *Office of the Registrar (Examinations)*)

Examinations conducted by the Office of the Registrar will appear in the Mosaic Student Center and may be scheduled in the morning, afternoon, or evening, Monday through ~~Saturday~~ **Sunday**. Other instructor-scheduled tests and examinations may be held throughout each term in compliance with Academic Obligations: Restrictions.

Rationale:

To establish the possibility of examinations or tests being conducted on Saturdays or Sundays to prevent the term from running too late in December.

Full details regarding examination procedures conducted by the Office of the Registrar are found in the Undergraduate Examinations Policy.

McMaster student photo identification cards are required at all examinations.

Examinations are not rescheduled for purposes of travel. Students must be available for the entire examination period as listed in the Sessional Dates section.

The Office of the Registrar will reschedule final examinations within the examination period for the reasons listed below. Application to reschedule examinations must be made at least 10 working days before the scheduled examination period. Failure to meet the stated deadline may result in the denial of the application.

- Conflict with religious obligations
- More than one examination scheduled at the same time
- Three examinations in one calendar day (midnight to midnight).
- Three consecutive examinations over two days (e.g., December 14th at 4:00 pm and 7:30 pm and December 15th at 9:00 am).

Students who miss a final examination for medical or personal reasons may submit a Petition for Special Consideration:

Request for Deferred Examination (Form B) to their Faculty/Program Office, normally within five working days of the missed examination.

Students who begin a final examination, but are unable to complete it for medical reasons, may submit a Petition for Special Consideration (Form A) to their Faculty/Program Office, normally within five working days of the examination.

Students with disabilities are required to inform Student Accessibility Services of accommodation needs for examinations on or before the last date for withdrawal from a course without failure by default. This allows sufficient time to verify and arrange appropriate accommodation.

Request to Write Deferred Examinations at an Off-Campus Location

Students living more than 160 kilometers from Hamilton during the deferred examination period and wishing to write their approved deferred examination at an institution other than McMaster must submit a Request to Write Deferred Examination Off-campus Form at least 15 working days prior to the deferred examination period.

If the deferred examination is written at an off-campus location, any fees incurred are the responsibility of the student. This includes the fee to courier the written examinations back to the Office of the Registrar, Scheduling and Examinations (GH 114).

For information regarding application for Deferred Examination, see *Petition for Special Consideration: Request for Deferred Examination (Form B)*.

3.7 Academic Evaluations Numeric Grading System

The results of all courses attempted will appear on the transcript. The method for determining final grades will be given in the course outline. Unless otherwise specified in the course outline, course results determined on a percentage scale will be converted to an official letter grade, as indicated in the following equivalent percentage scale.

Non-Numeric Grades and Notations:

Non-Numeric Grades		Notations
AUD: Audit	Audit	DEF
CAN: Cancelled	Cancelled	EXTRA
COM: Complete	Complete	REPEAT
CR: Credit	Credit	UPGRADE
F: Fail	Fail	(R)
INC: Incomplete	Incomplete	
IP: In Progress	In Progress	
LWD	Late Withdrawal	
MT: Multi-Term	Multi-Term	
NC: No Credit	No Credit	
NMR: No Mark Received	No Mark Received	
P: Pass	Pass	
T: Transfer Credit	Transfer Credit	
W: Withdrawn	Withdrawn	
XCH: Exchange	Exchange	

Notations	
DEF	Deferred Examination
EXTRA	Extra credits not used towards degree
REPEAT	Repeat of a previously failed course (under discontinued repeat regulations)
(R)	Repeat of a previous course (under current repeat regulations)
UPGRADE	Repeat of a previously passed course (under discontinued repeat regulations)

Rationale:

Provides up-to-date information and notations in a clear/concise manner. Reflects the information displayed on the official transcript.

3.8 Level I Registration and Academic Standing Requirements

When you are admitted to McMaster University for a first degree, you will enrol in one of the following Level I programs: Automation Engineering Technology I Co-op (B.Tech.), Automotive and Vehicle Engineering Technology I Co-op, Arts & Science I, Biotechnology I Co-op, Business I, Chemical and Physical Sciences Gateway, Computer Science I, Economics I (effective 2019-2020), Engineering I, Environmental and Earth Sciences Gateway, Health Sciences I, Honours Health and Society I (effective 2019-2020), Humanities 1, Honours Integrated Science (Level I), Honours Kinesiology (Level I), Integrated Biomedical Engineering and Health Sciences (IBEHS) I, Integrated Business & Humanities I, Life Sciences Gateway, Mathematics and Statistics Gateway, Medical Radiation Sciences (Level I), Midwifery I, Music 1, Nursing I, Process Automation Technology I, Social Sciences I, and Studio Art 1. If you enter the University without Advanced Standing being granted, you must normally attempt a full load of Level I work before proceeding to the work of higher levels.

If you are studying part-time, the Office of the Associate Dean has the discretion to permit you to take some of the work in the higher levels prior to having attempted the full load of Level I. Decisions will be made on an individual basis, according to the special circumstances that apply in the particular case.

At any review during Level I before you complete the Level I work, as in the case of a part-time student, you must attain a GPA of at least 3.5 to continue at the University in good standing. If you attain a GPA of 3.0 to 3.4 you may remain at the University for one reviewing period, but will be placed on academic probation. You may be on academic probation only once during your University career. If your GPA is less than 3.0 you may not continue at the University.

At the review when you complete the Level I work, if you attain a GPA of at least 3.0 and have not previously been on academic probation, but fail to meet the admission requirements of any program, you may continue at the University for one additional reviewing period on academic probation. You will be enrolled in your original Faculty, and will be classified as a Level I transition student if your work may only qualify you to be considered for admission to a program in another Faculty. If, at the end of the next reviewing period, you again do not qualify for admission to a program, you may not continue at the University. If your GPA is less than 3.0 you may not continue at the University.

Students in Arts & Science I should refer to the Arts & Science Program regulations listed below.

Health Sciences I, Nursing I and Midwifery I students should refer to the program regulations listed in the Faculty of Health Sciences section in this Calendar.

3.9 Graduation

The following minimum Cumulative GPA are required to graduate:

- B.A. - 3.5
- B.A. (Honours) - 5.0
- B.S.W. (Honours), B.A. /B.S.W. and B.S.W. - 6.0
- B.Arts Sc. and B.Arts Sc. (Honours) - 5.0

- B.A.Sc. (Faculty of Engineering) - 4.0
- B.A.Sc. (Honours) (Faculty of Science) - 5.0
- B.Com. - 4.0
- B.Com. (Honours) - 5.0
- B.Eng., B.Eng.BME., B.Eng.Biosciences, B.Eng.Mgt., B.Eng.Society - 4.0
- B.F.A. (Honours) - 5.0
- B.H.Sc. - 3.5
- B.H.Sc. (Honours) - 5.0
- B.H.Sc. (Midwifery) - 6.0
- B.H.Sc. (Honours) (HESE Specialization) - 4.0
- B.M.R.Sc.* - 4.5
- B.Mus. (Honours) - 5.0
- B.Sc. - 3.5
- B.Sc. (Honours) - 5.0
- B.Sc.Kin. (Honours) - 5.0
- B.Sc.N. - 5.0
- B.Tech - 3.5

** All requirements must be completed within five years from the time of registration in Level II.*

Students who intend to graduate must complete the online Graduation Information Centre form by the appropriate deadline in their final term of study. Students wishing to graduate with a Minor must complete the application in the Minor/Certificate Application Centre.

Degrees will be conferred at the Convocation immediately following the completion of the degree. Students unable to attend the convocation ceremony who wish to attend a later ceremony should consult the [Policy on Deferral of Attendance at Convocation](#) and must contact the Office of the Registrar within the prescribed deadlines.

Parchments, Diplomas and Certificates

Diplomas will not be released to students with an outstanding financial account with the University. Diplomas are held for a period of 12 months following the Convocation date before being destroyed. Students requesting diplomas after this period are required to pay a replacement fee.

Graduates may request a duplicate or replacement degree parchment, diploma or certificate (fees apply). A duplicate copy will be issued when requested by a graduate or when the original document has been lost or destroyed.

The words *duplicate copy* or *reissued* will be affixed to all degree parchments, diplomas or certificates requested in this manner and will bear the signatures of the current Chancellor, President and Vice-Chancellor, and Registrar.

Damaged parchments must be returned to the Office of the Registrar before the new parchment, diploma or certificate is issued.

4.0 Student Financial Aid & Scholarships Aid & Awards

OFFICE OF THE REGISTRAR, STUDENT FINANCIAL AID & SCHOLARSHIPS AWARDS

Gilmour Hall,

Room 120

McMaster

University

Hamilton, Ontario,

L8S 4L8

Telephone: (905) 525-9140, ext. 24319

<https://registrar.mcmaster.ca/financial-aid/>

sfas@mcmaster.ca

SENIOR ASSOCIATE REGISTRAR AID & AWARDS

Tracie Long

ASSOCIATE ASSISTANT REGISTRAR GOVERNMENT AID PROGRAMS

Leanne Ruiz Rita Mukherjee

The Office of the Registrar, Student Financial Aid & Scholarships (SFAS Aid & Awards) is committed to professional student service. We delivers government and University aid and award programs that support access, financial wellness and excellence at the post- secondary level. Government student aid, such as the Ontario Student Assistance Program (OSAP), is administered on behalf of the Ministry of Training Colleges and Universities federal and provincial governments. McMaster University aid and awards programs include academic grants, awards, bursaries and work programs. For more information about our programs and services, visit the SFAS website at <https://registrar.mcmaster.ca/financial-aid/>.

Regulations for Aid and Awards

The University promotes access to available Aid and Awards and seeks to maximize opportunities for students while ensuring equity and consistency in administration. In doing so, the University operates within the Senate approved University Aid and Awards Policy to ensure its responsibilities to students and donors are met. While all regulations for Aid and Awards are established within this approved policy, the University may choose to offer additional Aid and Award programs, establish regulations through which to administer these programs, and/or modify existing regulations with Senate approval after the Undergraduate Calendar has been published.

It is important to note that Financial Awards are not covered by the University Aid and Awards Policy and are not administered through the Aid and Award regulations that follow. Financial Awards support students in a manner consistent with the goals of the University, but do not necessarily meet all of the policy regulations of established Aid and Award programs. Financial Awards may be administered centrally through the Office of the Registrar, ~~Student Financial Aid & Scholarships~~ (SFAS) Aid & Awards, through the School of Graduate Studies (SGS), or through designated representatives in University faculties and departments that have established processes to administer their own funds (e.g. Athletics and Recreation). Financial Awards are not Senate-approved awards and thus, are not recognized at convocation or included on University transcripts. Information about Financial Awards is made available through department websites.

The following regulations apply to all Undergraduate Aid and Award Programs (and excludes Financial Awards, as detailed above):

Application Requirements

Some Aid and Awards require students to submit an application:

1. Application records for Aid and Awards, supporting documentation (e.g. transcripts, letters of reference, income tax notices of assessment, student loan entitlements, etc.) and responses to applications shall be handled by the administering office in accordance with the *Freedom of Information and Protection of Privacy Act (FIPPA)*.
2. Where advertised Aid and Award application deadlines fall on a non-business day (i.e. Saturday, Sunday or University-recognized holiday), the deadline is 8:30 am the next business day.
3. Requirements for Aid and Awards by application typically include -
 - An online application submitted electronically through Mosaic with a completed and signed cover page, or a completed signed paper-based application form
 - A statement of eligibility
 - A curriculum vitae/academic resume
 - A transcript (McMaster University transcripts may be unofficial)
 - In addition, for the types of awards noted below, at least one academic or personal (non-family member) letter of reference may be required -
 - i. University-wide Aid and Awards
 - ii. Aid and Awards with a value exceeding \$2000
 - iii. Renewable Aid and Awards
 - iv. Aid and Awards at the discretion of the Office of the Registrar, ~~Student Financial Aid & Scholarships~~ Aid & Awards
4. The University may choose to audit and verify any or all information provided to complete an Aid or Award Application.
5. Application records and supporting documentation is used by the Office of the Registrar, ~~Student Financial Aid & Scholarships~~ Aid & Awards, Award Chairs and Selection Committees for the sole purpose of administering Aid and Award programs, including, but not limited to, determining student eligibility.
6. All application records and supporting documentation submitted by unsuccessful applicants will be retained for a minimum period of twelve months after last use. All application records and supporting documentation submitted by successful applicants will be retained for a minimum period of seven years after last use.
7. All application records and supporting documentation remain the property of McMaster University.

Gender Criteria

For the purpose of Aid and Award criteria and eligibility, references to "Woman" or "Female" include all students who identify as Woman/Female and references to "Man" or "Male" include all students who identify as a Man or Male.

Maximums

To ensure a fair and wide allocation of Undergraduate Aid and Awards, the University restricts the number and value of aid and awards which students may receive for an academic year.

An eligible entering student may receive:

- a. One Entrance Award granted solely on the basis of academic merit (e.g. a McMaster Honour Award); and
- b. One Indigenous Student Entrance Award or one Entrance Award granted on the basis of earned merit that

- requires an additional assessment process, including, but not limited to, application, interview and/or audition; and
- c. One Entrance Academic Grant or Indigenous Student Entrance Academic Grant; and
- d. One Entrance Bursary granted on the basis of earned merit that requires an additional assessment process, including, but not limited to, application, interview and/or audition, and additional bursary funding up to the amount eligible; and
- e. Fall/Winter and Summer Work Program funding; and
- f. Any number of Financial Awards

An eligible in-course or graduating student may receive:

- a. Awards granted on the basis of academic merit, limited to either one award greater than or equal to \$800 (considered a 'major' award) and one academic award less than \$800 (considered a 'minor' award), or two academic awards less than \$800; and
- b. Two awards granted on the basis of earned merit that requires an additional assessment process, including, but not limited to, application, interview and/or audition; and
- c. Academic Awards continued from a previous year to a maximum of one Entrance and one In-Course Renewable Award; and
- d. Any number of prizes, which include non-monetary awards such as books and medals, and awards of nominal monetary value (currently \$100 or less), whether based on academic merit or an additional assessment process; and
- e. One Travel or Exchange Award; and
- f. One Academic Grant (including any renewable Entrance, Indigenous Student Entrance, or In-Course Academic Grant continued from a previous year); and
- g. One Community Contribution Award; and
- h. One In-Course Bursary granted on the basis of earned merit that requires an additional assessment process, including, but not limited to, application, interview and/or audition, and additional bursary funding (including any renewable Entrance or In-Course Bursary continued from a previous year) up to the amount eligible; and
- i. Fall/Winter and Summer Work program funding; and
- j. Any number of Financial Awards

T4A tax slips are issued to students for all Aid and Award amounts received during the tax year.

It is important to note that Aid and Award income may affect federal and/or provincial student aid (e.g. full-time OSAP) entitlements. Students are advised to review the status of their government student aid applications often and refer to the appropriate government website for further information.

Review of Aid and Award Decisions

1. Decisions made by Aid and Award selection committees are final. Students may not appeal these decisions.
2. Students who believe an error occurred at the University, that may have impacted an Aid and/or Award decision, are asked to write to the Senior Associate Registrar, *Student Financial Aid & Scholarships Aid & Awards* requesting a review of their file.
3. Students who have compelling personal circumstances that preclude them from receiving initial payment and/or renewal of Aid and/or Award funding may submit a petition for special consideration to request that an exception to the policy and/or regulations be made. Petitions should be submitted to the Senior Associate Registrar, *Student Financial Aid & Scholarships Aid & Awards* and should include a cover letter explaining the need for special consideration, as well as any relevant documentation. Petitions must be submitted in a prompt and timely manner and will be accepted no later than one year after the decision being petitioned.

Privacy

1. The *Freedom of Information and Protection of Privacy Act (FIPPA)* and McMaster University's *Notice of Collection* statement shall govern the information provided to donors and others concerning award recipients, including publications such as convocation programs and Award booklets. As such, the University is permitted to publish an individual's name, Faculty, program, plan, level, and Award information. The University may publish the names of recipients of scholarships listed in the Undergraduate Calendar in the University's convocation program and other Award publications.
2. With permission, the University may also release an Aid recipient's first name, last name, Faculty, program, plan, level, Aid received and amount to the donor(s) of the Aid.
3. With permission, the University may also release an academic grant recipient's first name, last name, email id, faculty, program, plan, level, Academic Grant received and amount to the Faculty for the purpose of Faculty award ceremony invitations and Award booklets.
4. From time to time, the Office of the Registrar, *Student Financial Aid & Scholarships Aid & Awards* may reach out to

Award

recipients with requests for thank you letters, invitations to donor luncheons and events, invitations to discuss summer job opportunities or internships, interviews for McMaster University Advancement or Communications and Public Affairs, etc. Responses to these requests and/or attendance at these functions is entirely voluntary. While a response is appreciated, acceptance or rejection of these offers in no way impacts Aid and Award eligibility.

5. Mandatory annual reporting to Undergraduate Council Awards Committee, Undergraduate Council, and Senate include the release of an Award recipient's first name, last name, Faculty, program, plan, level, Award received and amount, submitted Travel Award reports, Aid and Award summary information and identification of participating University-wide Selection Committee members.
6. Students with concerns regarding Aid and Award privacy, are asked to write to the Senior Associate Registrar, **Student Financial Aid & Scholarships: Aid & Awards**.

Entrance Bursaries

Entrance Bursary Regulations

1. Entrance Bursaries are non-repayable grants allocated on the basis of demonstrated financial need, which may also include a minimum expectation of academic achievement or other miscellaneous criteria.
2. Entrance Bursaries are available to students admitted on the basis of high school admission requirements.
3. Entrance Bursaries are available to full-time and part-time students entering Level I of their first baccalaureate degree program.
4. Entrance Bursaries requiring full-time status are available to students enrolled in a full-time OSAP eligible full-time course load or equivalent in both the fall and winter terms.
5. Students who have enrolled at any post-secondary institution after graduation from high school are not eligible for Entrance Bursaries, unless:
 - i. They are completing a certificate or diploma at McMaster University as a requirement of admission (e.g. the McMaster English Language Diploma), and/or
 - ii. They have withdrawn from post-secondary studies before attending or before the deadline to drop and add courses in their first term of study.
6. Entrance Bursaries are available to students who are Canadian Citizens or Permanent Residents of Canada regardless of where they completed their high school education.
7. Entrance Bursaries are allocated on the basis of financial need, as demonstrated through a completed full-time OSAP application, for the academic year in which the student is entering Level I of their program.
8. Entrance Bursaries are allocated in adherence with the Ministry of Training, Colleges and Universities (MTCU) policies, procedures and guidelines in place for the given academic year. The MTCU Student Access Guarantee (SAG) currently specifies bursary amounts and payment deadlines for students in high tuition programs (e.g. Engineering, Business).
9. Entrance Bursary funds are limited.
10. Students may receive more than one Entrance Bursary to fill their Student Access Guarantee obligation or to meet the total bursary amount for their level of financial need.
11. In some cases, students may receive more than one Entrance Bursary (e.g. where a student meets a particular donor fund requirement or applies via a separate earned merit application process). In these cases, the bursary is awarded to the eligible student who demonstrates the greatest financial need as determined by the Office of the Registrar, **Student Financial Aid & Scholarships: Aid & Awards**.
12. Entrance Bursaries may specify a minimum admission average requirement and may consider one or more McMaster University calculated admission averages. An admission audition or portfolio score or equivalent may be included in the calculation of an average. Final grades for courses completed after June 30th in the year of admission application will not be considered in assessing eligibility for Entrance Bursaries.
13. Entrance Bursaries may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements including, but not limited to, submitting an application.
14. In order to be considered for an Entrance Bursary by application, students must submit a completed application by the specified deadline date.
15. Entrance Bursary applications which meet eligibility criteria are forwarded to a selection committee for review and ranking.
16. The greater calculated financial need is used to break any tie.
17. Students may receive a maximum of one Entrance Bursary by application.
18. Students must be enrolled in at least the full-time OSAP eligible course load used to determine their eligibility for the Entrance Bursary to have the Entrance Bursary payment processed.
19. All Entrance Bursary payments are disbursed through the McMaster Student Account and are applied to outstanding charges.
A few exceptions to this regulation may be approved by the Office of the Registrar, **Student Financial Aid &**

Scholarships Aid & Awards.

20. All Entrance Bursaries are disbursed September through the end of December.
21. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture or adjustment in the value of the Entrance Bursary. Students are advised to consult with the Office of the Registrar, Student Financial Aid & Scholarships, prior to making any changes to their program of study or course load.
22. Students who withdraw before November 1 up to the last day for withdrawing from courses without failure by default in the Fall term may see an adjustment in the value of their Entrance Bursary or see the full amount returned to the University.
23. Any adjustment made to a student's account, in order to return all or a portion of an Entrance Bursary to the University, will be calculated on consider the balance available at the time of the adjustment and will not may put a student's account into deficit.
24. Some Entrance Bursaries may be renewable (see In-Course and Renewal Bursary Regulations).
25. The University may choose not to grant an Entrance Bursary in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools for bursaries by application, where complete applications have not been received.
26. The University may remove specific Entrance Bursaries from the University Calendar, may revise the terms and stated value and/or suspend the granting of Entrance Bursaries (e.g. donor funds).
27. Entrance Bursaries supported by donor funds may have additional eligibility requirements.

In-Course Bursaries

In-Course and Renewal Bursary Regulations

1. In-Course Bursaries are non-repayable grants, allocated on the basis of demonstrated financial need, which may also include a minimum expectation of academic achievement or other miscellaneous criteria.
2. In-Course Bursaries are available to full-time and part-time students enrolled in an undergraduate degree program, excluding the Physician Assistant and M.D. Programs. A limited number of bursaries are also available to true part-time students enrolled in diploma and certificate programs offered through McMaster's Centre for Continuing Education, who have completed at least 50% of that course work on a part-time basis.
3. In-Course Bursaries requiring full-time status are available to students enrolled in an OSAP eligible full-time course load or equivalent in both the fall and winter terms.
4. Second degree students are eligible for In-Course Bursaries
5. In-Course Bursaries are available to students who are Canadian Citizens, Permanent Residents, Convention Refugees and Protected Persons of Canada.
6. Students who are not Canadian Citizens, Permanent Residents, Convention Refugees or Protected Persons of Canada, who are enrolled in Level II or higher, are eligible for a limited number of In-Course Bursaries for International students.
7. In-Course Bursaries are allocated on the basis of financial need, as demonstrated through a completed Canadian federal and/or provincial government student aid application (e.g. full-time OSAP), completed standard University need profiles and/or discussions with designated staff on campus (e.g. a Student Loans Officer) who confirm the need for bursary assistance through submission of additional supporting documentation, for the academic year in which the student is being considered.
8. In-Course Bursaries are allocated in adherence with the Ministry of Training, Colleges and Universities (MTCU) policies, procedures and guidelines in place for the given academic year. The MTCU Student Access Guarantee (SAG) currently specifies bursary amounts and payment deadlines for students in high tuition programs (e.g. Engineering, Business).
9. In-Course Bursaries for non-SAG students are allocated according to financial need based on government student aid entitlements, or equivalent, with higher bursary amounts assigned to students demonstrating higher levels of financial need. Bursary amounts are set by the Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards annually.
10. In-Course Bursary funds are limited.
11. Students may receive more than one In-Course or Renewal Bursary to cover their Student Access Guarantee obligation or up to the total bursary amount for which they are eligible.
12. In some cases, students may receive more than one bursary (e.g. where a student meets a particular donor fund requirement or applies via a separate earned merit application process). In these cases, the bursary is awarded to the eligible student who demonstrates the greatest financial need as determined by the Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards.
13. The greater demonstrated financial need is used to break any tie.

14. In-Course Bursaries may consider one or more McMaster University calculated averages (e.g. Cumulative Grade Point Average).
15. In-Course Bursaries may specify a minimum average requirement.
16. In-Course Bursaries may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements including, but not limited to, submitting an application.
17. In order to be considered for an In-Course Bursary by application, students must submit a completed application by the specified deadline date.
18. In-Course Bursary applications which meet eligibility criteria are forwarded to a selection committee for review and ranking.
19. Students must be enrolled in at least the course load used to determine their eligibility for the In-Course Bursary to have the In-Course Bursary payment processed.
20. Students must meet the renewal requirements specified in the terms of their Entrance or In-Course Bursary to receive a renewal payment.
21. All In-Course Bursary payments are disbursed through the McMaster Student Account and are applied to outstanding charges.
A few exceptions to this regulation may be approved by the Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards.
22. MAPS bursary payments are disbursed in the fall, winter and spring/summer terms, once the drop and add period for the term has passed. All In-Course Bursaries are typically disbursed no later than mid-February (the MTCU winter term payment deadline).
23. Forfeiture of a renewable Entrance or In-Course Bursary also cancels all future instalments of the bursary.
24. Students wishing to defer the benefits of bursary renewal to the next academic year should make the request in writing to the Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards. Approval is not automatic and deferments are not normally granted for more than one academic year.
25. Students holding a renewable Entrance or In-Course Bursary who choose to accelerate their program and to complete their degree earlier than normal by completing Spring/Summer courses and who wish to employ the benefits of their renewable bursary to defray the tuition and compulsory fees for those courses should make the request in writing to The Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards.
26. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture or adjustment in the value of the In-Course Bursary. Students are advised to consult with the Office of the Registrar, Student Financial Aid & Scholarships, prior to making any changes to their program of study or course load.
27. Students who withdraw may see an adjustment in the value of their In-Course or Renewal Bursary or see the full amount returned to the University.
28. Any adjustment made to a student's account, in order to return all or a portion of an In-Course or Renewal Bursary to the University, will be calculated on ~~consider~~ the balance available at the time of the adjustment and ~~will not~~ may put a student's account into deficit.
29. The University may choose not to grant an In-Course Bursary in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools for bursaries by application, where complete applications have not been received.
30. The University may remove specific In-Course Bursaries from the University Calendar, may revise the terms and stated value and/or suspend the granting of In-Course Bursaries (e.g. donor funds).
31. In-Course Bursaries supported by donor funds may have additional eligibility requirements.

Emergency Bursary Regulations

1. An Emergency Bursary is a non-repayable grant sometimes available to enrolled students who find themselves in extreme circumstances or are experiencing unexpected financial hardship.
2. Students with emergency needs must meet with a representative in the Office of the Registrar, Student Financial Aid & Scholarships, during drop-in counselling hours to discuss their financial circumstances. Indigenous students may choose to meet with representatives in Indigenous Student Services to discuss their financial circumstances.
3. Students are required to complete a bursary application.
4. Students may be required to submit supporting documentation to confirm financial need and/or extreme circumstances, as determined by the Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards.
5. All Emergency Bursary payments are disbursed through the McMaster Student Account.
6. The University may remove specific Emergency Bursaries from the University Calendar, may revise the terms and stated value and/or suspend the granting of Emergency Bursaries (e.g. donor funds).
7. Emergency Bursaries supported by donor funds may have additional eligibility requirements.

Exchange Bursaries Exchange Bursary Regulations

1. Exchange Bursaries are non-repayable grants intended to assist students who otherwise would not be able to participate in exchange opportunities due to financial hardship.
2. Exchange Bursaries are allocated on the basis of demonstrated financial need, which may also include a minimum expectation of academic achievement or other miscellaneous criteria for students approved for exchange.
3. Exchange Bursaries are available to full-time and part-time students enrolled in Level II or above of their first undergraduate degree program, at the time of bursary application and selection, who are returning to McMaster to continue their studies.
4. Exchange Bursaries requiring full-time status are available to students enrolled in a full-time OSAP eligible course load or equivalent at the time of bursary application and selection.
5. Exchange Bursaries are only available to students who are Canadian Citizens, Permanent Residents, Convention Refugees and Protected Persons of Canada.
6. Exchange Bursaries are allocated on the basis of financial need, as demonstrated through a completed Canadian federal and/or provincial government student aid application (e.g. full-time OSAP) or completed standard University need profiles and an Exchange Bursary Application for the academic year in which the student is being considered.
7. Exchange Bursaries are allocated according to financial need, with higher bursary amounts assigned to students demonstrating higher levels of financial need. Bursary amounts are set by the Office of the Registrar, ~~Student Financial Aid & Scholarships~~, ~~Aid & Awards~~.
8. Exchange Bursary funds are limited.
9. Students are limited to one Exchange Bursary in their first undergraduate degree program.
10. The greater demonstrated financial need is used to break any tie.
11. Exchange Bursaries may consider one or more McMaster University calculated averages (e.g. Cumulative Grade Point Average).
12. Exchange Bursaries may specify a minimum average requirement.
13. Exchange Bursaries may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements including, but not limited to, submitting an application.
14. In order to be considered for an Exchange Bursary by application, students must submit a completed application by the specified deadline date.
15. Exchange Bursary applications which meet eligibility criteria are forwarded to a selection committee for review and ranking.
16. Students must be enrolled in at least the course load used to determine their eligibility for the Exchange Bursary to have the Exchange Bursary payment processed.
17. All Exchange Bursary payments are disbursed through the McMaster Student Account and are applied to outstanding charges.
A few exceptions to this regulation may be approved by the Office of the Registrar, ~~Student Financial Aid & Scholarships~~, ~~Aid & Awards~~.
18. Exchange Bursaries are typically disbursed no later than the end of April.
19. Exchange Bursaries are available to students participating in an approved formal exchange program during the academic year immediately following the application deadline.
20. It is the responsibility of Exchange Bursary recipients to make all exchange arrangements. Recipients are required to assess travel risks, have a plan of action in place for emergencies, and ensure they have proper medical and other insurance in place prior to departure.
21. Exchange Bursaries will not be issued for travel to areas deemed as 'do not travel areas' per Global Affairs Canada.
22. Exchange Bursary recipients may be required to complete a risk assessment and/or safety component and/or waiver prior to departure as dictated by other University policies and must attend mandatory Exchange Pre-Departure Orientation sessions and complete Terms for Participation Forms, Liability Waivers, and Statement of Responsibilities Forms.
23. Students who do not participate in their formal exchange as identified on their application will forfeit their bursary.
24. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture of an Exchange Bursary. Students are advised to consult with the Office of the Registrar, ~~Student Financial Aid & Scholarships~~, prior to making any changes to their program of study or course load.
25. Students who forfeit their Exchange Bursary must return the full bursary amount to their McMaster Student Account.
26. The University may choose not to grant an Exchange Bursary in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools for bursaries by application where complete applications have not been received.
27. The University may remove specific Exchange Bursaries from the University Calendar, may revise the terms and stated value and/or suspend the granting of Exchange Bursaries.
28. Exchange Bursaries supported by donor funds may have additional eligibility requirements.

**Bursaries for the Michael G. DeGroote School of Medicine
Michael G. DeGroote School of Medicine Aid Regulations
Medicine (M.D) Bursary Regulations**

1. M.D. Bursaries are non-repayable grants, allocated on the basis of demonstrated financial need, which may also include a minimum expectation of academic achievement or other miscellaneous criteria.
2. M.D. Bursaries are available to students in good standing enrolled in the M.D. Program.
3. M.D. Bursaries are available to students who are Canadian Citizens, Permanent Residents, Convention Refugees or Protected Persons of Canada.
4. Students who are not Canadian Citizens, Permanent Residents, Convention Refugees or Protected Persons of Canada are not eligible for M.D. Bursaries.
5. M.D. Bursaries are allocated on the basis of highest financial need, as demonstrated through a completed Canadian federal and/or provincial government student aid application (e.g. full-time OSAP), completed standard University need profiles and/or discussions with designated staff on campus (e.g. the M.D. Program Office) who confirm the need for bursary assistance through submission of additional supporting documentation, for the academic year in which the student is being considered.
6. M.D. Bursaries are allocated in adherence with the Ministry Training, Colleges and Universities (MTCU) policies, procedures and guidelines in place for the given academic year. The MTCU Student Access Guarantee (SAG) currently specifies bursary amounts and payment deadlines for M.D. Program students. M.D. Program students who are eligible for SAG will receive bursary support without need of an application.
7. M.D. Program students may receive more than one M.D. Bursary up to the amount for which they are eligible.
8. The greater demonstrated financial need is used to break any tie.
9. M.D. Bursaries may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements.
10. In order to be considered for an M.D. Bursary that is a named donor bursary, students must submit a completed application by the specified deadline date.
11. All M.D. Bursary applications are evaluated for eligibility, **and** reviewed and ranked according to level of financial need. A selection committee may be struck depending on the bursary and donor requirements.
12. Students must be enrolled in the M.D. Program to have the M.D. Bursary payment processed.
13. If an M.D. Bursary is renewable, students must meet the renewal requirements specified in the bursary terms to receive a renewal payment.
14. All M.D. Bursary payments are disbursed through the McMaster Student Account and are applied to outstanding charges. A few exceptions to this regulation may be approved by the M.D. Program Office.
15. All M.D. Bursaries are typically disbursed no later than the end of November.
16. Forfeiture of a renewable M.D. Bursary also cancels all future instalments of the bursary.
17. Change in course load may result in forfeiture or adjustment in the value of the M.D. Bursary. Students are advised to consult with their M.D. Program Office prior to making any changes to their course load.
18. Students who withdraw or take a leave of absence from the program may see an adjustment in the value of their M.D. Bursary or see the full amount returned to the University.
19. Any adjustment made to a student's account, in order to return all or a portion of an M.D. Bursary to the University, ~~will be calculated on~~ **will be calculated on** ~~consider~~ the balance available at the time of the adjustment and ~~will not~~ **will not** ~~may~~ put a student's account into deficit.
20. The University may choose not to grant an M.D. Bursary in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools for bursaries by application, where complete applications have not been received.
21. The University may remove specific M.D. Bursaries from the University Calendar, may revise the terms and stated value and/or suspend the granting of M.D. Bursaries (e.g. donor funds).
22. M.D. Bursaries supported by donor funds may have additional eligibility requirements.

Physician Assistant Education Program Bursaries Physician Assistant Program Bursary Regulations

1. Physician Assistant Bursaries are non-repayable grants, allocated on the basis of demonstrated financial need, which may also include a minimum expectation of academic achievement or other miscellaneous criteria.
2. Physician Assistant Bursaries are available to students enrolled in the Physician Assistant Program.
3. Physician Assistant Bursaries are available to students who are Canadian Citizens, Permanent Residents, Convention Refugees or Protected Persons of Canada.

4. Physician Assistant Bursaries are automatically allocated on the basis of financial need as demonstrated through a completed full-time OSAP application.
5. Physician Assistant Bursaries are allocated in adherence with the Ministry of Training, Colleges and Universities (MTCU) policies, procedures and guidelines in place for the given academic year. The MTCU Student Access Guarantee (SAG) currently specifies bursary amounts and payment deadlines for Physician Assistant Bursaries.
6. Physician Assistant Program students may receive more than one bursary up to the amount for which they are eligible.
7. The greater demonstrated financial need is used to break any tie.
8. Students must be enrolled in the Physician Assistant Program to have a bursary payment processed.
9. If a Physician Assistant Bursary is renewable, students must meet the renewal requirements specified in the bursary terms to receive a renewal payment.
10. All Physician Assistant Bursary payments are disbursed through the McMaster Student Account and are applied to outstanding charges. A few exceptions to this regulation may be approved by the Office of the Registrar, **Student Financial Aid & Scholarships Aid & Awards**.
11. All Physician Assistant Bursary payments are typically disbursed no later than the end of November.
12. Forfeiture of a renewable Physician Assistant Bursary also cancels all future instalments of the bursary.
13. Students wishing to defer the benefits of bursary renewal to the next academic year should make the request in writing to the Physician Assistant Program Office. Approval is not automatic and deferments are not normally granted for more than one academic year.
14. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture or adjustment in the value of the Physician Assistant Bursary.
15. Students who withdraw may see an adjustment in the value of their Physician Assistant Bursary or see the full amount returned to the University.
16. Any adjustment made to a student's account, in order to return all or a portion of a Physician Assistant Bursary to the University, will be calculated on **consider** the balance available at the time of the adjustment and **will not may** put a student's account into deficit.
17. The University may choose not to grant a Physician Assistant Bursary in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools for bursaries by application, where complete applications have not been received.
18. The University may remove specific Physician Assistant Bursaries from the University Calendar, may revise the terms and stated value and/or suspend the granting of Physician Assistant Bursaries (e.g. donor funds).
19. Physician Assistant Bursaries supported by donor funds may have additional eligibility requirements.

Work Programs

McMaster Work Program Regulations

1. Work Programs provide meaningful employment opportunities, with approved University employers, to students who demonstrate financial need.
2. Students with completed full-time Canadian federal and/or provincial government student aid applications (e.g. full-time OSAP) with a calculated entitlement of at least \$1 demonstrate financial need for the purpose of Work Program participation.
3. Students without government aid applications, including Indigenous students, International students, students with government aid restrictions, students with permanent disabilities studying at a lesser course load, Nursing students at the Mohawk site, and students on Social Assistance who complete a standard University need profile and show at least \$1 in need demonstrate financial need for the purpose of Work Program participation.
4. Students who meet with designated staff on campus (e.g. a Student Loans Officer) who confirm the need for Work Program assistance through submission of additional supporting documentation demonstrate financial need for the purpose of Work Program participation.
5. International Students with a valid study permit are able to participate in Work Programs.
6. Students wishing to participate in the fall and/or winter terms must be enrolled in the terms in which they wish to participate and must submit a complete Fall/Winter Work Program application through Mosaic by the specified deadline date.
7. Students wishing to participate in the summer term must have been in a full-time OSAP eligible course load in the preceding fall or winter term and must submit a complete Summer Work Program application through Mosaic by the specified deadline date.
8. Students are encouraged to apply for Work Program Approval as soon as the Work Program applications open, as there are more students interested in participating in Work Programs than jobs available.
9. Students approved for Work Program participation are provided a Work Program Approval notification in **Mosaic**.
10. Students approved for Work Program participation apply for approved positions posted under Career Opportunities in

Mosaic. Job posting dates are advertised on the Office of the Registrar, Student Financial Aid & Scholarships website <https://registrar.mcmaster.ca/financial-aid/>.

11. Students review approved positions and apply for those for which they feel they are qualified.
12. Students must provide a copy of their Work Program Approval when they apply to a position with a prospective employer.
13. Prospective employers review job applications and invite students to participate in their employee selection and hiring process. University employers use their own criteria for selecting eligible Work Program students for interview and/or hire.
14. Approval for Work Program participation does not guarantee the student will be hired for an approved Work Program position.
15. Approved Work Program students are restricted to accepting one Fall/Winter position and one Summer Work position in a given academic year.
16. Once hired, students may work no earlier than the published start date of the Work Program and no later than the published end date of the Work Program.
17. Employers and students must adhere to all applicable employment legislation and McMaster Human Resources' policies.
18. Students must maintain satisfactory work performance and attendance.
19. University employers have the right to terminate student employment where work performance and/or attendance is unsatisfactory.
20. Students are advised that employers may or may not recognize University mid-term recesses as a scheduled break from work and may or may not be able to accommodate requests for time off. Students should discuss work requirements with their employers.
21. Students must report enrolment status and work program earnings, as required, by their government aid program.
22. Students earn at least minimum wage and are paid by the hiring employer through Payroll.
23. The Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards, provides partial reimbursement of an approved Work Program student's salary to the employer from operating monies and donor trust funds.
24. The University may choose to no longer offer Work Programs and may choose to limit the number of approved participants due to funding limitations.
25. The University may remove specific Work Program funds from the University Calendar, may revise the terms and stated value and/or suspend the allocation of Work Program funds (e.g. donor funds).
26. Work Program participation supported by donor funds may have additional eligibility requirements.

McMaster Work Programs

Fall/Winter Specific Regulations

1. The Fall/Winter Work Program is available to students who are Canadian Citizens, Permanent Residents, Conventional Refugees and Protected Persons of Canada enrolled in OSAP eligible Graduate and Medicine degree programs.
2. The Fall/Winter Work Program is available to students who are Canadian Citizens, Permanent Residents, Conventional Refugees and Protected Persons of Canada in OSAP eligible Undergraduate degree programs (including Nursing students at the Mohawk Site). Students who are not Canadian Citizens, Permanent Residents, Conventional Refugees or Protected Persons of Canada, in OSAP eligible Undergraduate degree programs (excluding Nursing students at the Mohawk Site), may participate in Level II or above.
3. Students may work no more than 10 hours per week on average, during the fall and/or winter terms, through an approved Work Program.
4. To maintain Fall/Winter Work Program eligibility, students must be enrolled in a full-time OSAP eligible course load or equivalent in the term(s) in which they would like to participate in the Work Program, from the time of application through approval, hiring and start of employment.
5. Students must remain enrolled in the term(s) in which they participate in the Work Program, from start of employment to end of employment. Should a student drop all classes in a term or withdraw from the institution, their Fall/Winter Work Program participation ends on the date of withdrawal.

Fall/Winter Work Programs

Application details are available in Mosaic. Further information about our Work Programs is available at <https://registrar.mcmaster.ca/financial-aid/>.

The McMaster Fall/Winter Work Program

Established in 1996 by the University with the goal of creating meaningful employment opportunities for current students who demonstrate financial need.

Requirements: Students must be approved for the Fall/Winter Work Program through the Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards.

Entrance Academic Grants

Entrance Academic Grant Regulations

1. Entrance Academic Grants are monetary awards allocated on the basis of academic merit, and in some cases other forms of earned merit, and demonstrated financial need.
2. Entrance Academic Grants are available to students admitted full-time on the basis of high school admission requirements.
3. Entrance Academic Grants are available to full-time and part-time students entering Level I of their first baccalaureate degree program.
4. Students who have enrolled at any post-secondary institution after graduation from high school are not eligible for Entrance Academic Grant, unless:
 - i. They are completing a certificate or diploma at McMaster University as a requirement of admission (e.g. the McMaster English Language Diploma), and/or
 - ii. They have withdrawn from post-secondary studies before attending or before the deadline to drop and add courses in their first term of study.
5. Entrance Academic Grants are available to students who are Canadian Citizens or Permanent Residents of Canada regardless of where they completed their high school education.
6. Students who are not Canadian Citizens or Permanent Residents of Canada are not eligible for Entrance Academic Grants regardless of where they completed their high school education.
7. Entrance Academic Grants first consider one or more McMaster University calculated admission and scholarship averages (e.g. final admission average).
8. Students must achieve a minimum 80% in the average(s) used to determine Entrance Academic Grant eligibility. An admission audition, portfolio score, or equivalent may be included in the calculation of an average.
9. Averages for Entrance Academic Grants are calculated using the course grades that form the basis for admission to the Level I program. Final grades for courses completed after June 30th in the year of admission application will not be considered in assessing eligibility for Entrance Academic Grants.
10. Entrance Academic Grants requiring full-time status are available to students enrolled full-time or equivalent in both the fall and winter.
11. Entrance Academic Grants may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements including, but not limited to, submitting an application, participating in an interview, performing an audition, or developing a portfolio.
12. In order to be considered for an Entrance Academic Grant by application, students must submit a complete application by the specified deadline date.
13. Entrance Academic Grant applications which meet eligibility criteria are forwarded to a selection committee for review and ranking.
14. Entrance Academic Grants are allocated on the basis of an eligible course load and financial need as determined by a completed full-time OSAP application for the academic year in which the student is entering Level I of their program.
15. The greater calculated financial need is used to break any tie.
16. Students may receive a maximum of one Entrance Academic Grant.
17. Students must be enrolled in at least the full-time OSAP eligible course load used to determine their eligibility to have an Entrance Academic Grant payment processed.
18. All Entrance Academic Grant payments are disbursed through the McMaster Student Account and are applied to outstanding charges. A few exceptions to this regulation may be approved by the Office of the Registrar, ~~Student Financial Aid & Scholarships~~, **Aid & Awards**.
19. Entrance Academic Grants are disbursed September through the end of December.
20. Entrance Academic Grant recipients will have their awards noted on their University transcript.
21. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture or adjustment in the value of the Entrance Academic Grant. Students are advised to consult with the Office of the Registrar, ~~Student Financial Aid & Scholarships~~, prior to making any changes to their program of study or course load.
22. ~~Students who withdraw before November 1 up to the last day for withdrawing from courses without failure by default in the Winter/Fall term will forfeit their Entrance Academic Grant.~~
23. Students who forfeit their Entrance Academic Grant will have their grant cancelled and their transcript notation removed. Students must return the Entrance Academic Grant funding to their

- McMaster Student Account.
24. Some Entrance Academic Grants are renewable (see In-Course and Renewal Academic Grant Regulations).
 25. The University may choose not to grant an Entrance Academic Grant in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools for awards by application, where complete applications have not been received.
 26. The University may remove specific Entrance Academic Grants from the University Calendar, may revise the terms and stated value and/or suspend the granting of Entrance Academic Grants (e.g. donor funds).
 27. Entrance Academic Grants supported by donor funds may have additional eligibility requirements.

Community Contribution Awards

Community Contribution Awards Regulations

1. Community Contribution Awards are non-monetary, non-academic awards allocated on the basis of demonstrated qualities of leadership or innovative skills, service to the University or community at large, or outstanding athletic or artistic participation.
2. Community Contribution Awards are available to full-time and part-time students enrolled in Level II or above of their first undergraduate degree program at the time of award application and selection.
3. Community Contribution Awards requiring full-time status are available to students enrolled full-time or equivalent in both fall and winter terms.
4. Community Contribution Awards intended for true part-time students are available to students who have completed at least 50% of all units attempted in their undergraduate degree program at McMaster on a part-time basis.
5. Community Contribution Awards are available to all domestic and international students.
6. Community Contribution Awards are not available to second degree students.
7. Students are limited to one Community Contribution Award per academic year.
8. Community Contribution Awards are available to students with a minimum Cumulative Grade Point Average of 4.0 on a minimum of 18 graded units.
9. Community Contribution Awards seek to recognize current contributions of 75 hours or more during the year leading up to the application deadline.
10. In order to be considered for a Community Contribution Award, students must submit a complete application by the specified deadline date to a MAXIMUM of three Awards. If a student submits more than three completed applications, the Office of the Registrar, ~~Student Financial Aid & Scholarships~~ Aid & Awards will determine which applications, if any, are forwarded for review.
11. Community Contribution Award applications which meet award eligibility criteria are forwarded to a selection committee for review and ranking.
12. Community Contribution Award recipients receive a letter of recognition.
13. Letters of recognition are typically available no later than the end of September.
14. Community Contribution Award recipients will have their awards noted on their University transcripts.
15. A Community Contribution Award recipient may be eligible to receive a corresponding donor bursary of the same name if the student is able to demonstrate financial need (see In-Course Bursary Regulations).
16. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture of a Community Contribution Award. Students are advised to consult with the Office of the Registrar, ~~Student Financial Aid & Scholarships~~, prior to making any changes to their program of study or course load.
17. Students who forfeit their award will have their award cancelled and their transcript notation removed. Students must return their letter of recognition to the Office of the Registrar, ~~Student Financial Aid & Scholarships~~.
18. The University may choose not to grant a Community Contribution Award in the absence of a suitable candidate; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools where complete applications have not been received.
19. The University may remove specific Community Contribution Awards from the University Calendar, may revise the terms and stated number available for allocation and/or suspend the granting of Community Contribution Awards.
20. The terms of individual Community Contribution Awards may specify additional eligibility requirements.

Entrance Awards

Entrance Awards Regulations

Entrance Awards are monetary awards allocated on the basis of academic merit and, in some cases, other forms of earned merit.

1. Entrance Awards are available to students admitted full-time on the basis of high school admission requirements.
2. Entrance Awards are available to students entering Level I of their first baccalaureate degree program.
3. Students who have enrolled at any post-secondary institution after graduation from high school are not eligible for Entrance Awards unless:
 - i. They are completing a certificate or diploma at McMaster University as a requirement of admission (e.g. the McMaster English Language Diploma), and/or
 - ii. They have withdrawn from post-secondary studies before attending or before the deadline to drop and add courses in their first term of study.
4. Entrance Awards are available to students (including WUSC sponsored students) who are Canadian Citizens or Permanent Residents of Canada regardless of where they completed their high school education.
5. Canadian Citizens and Permanent Residents of Canada may receive a maximum of one Entrance Award granted solely on the basis of academic merit (e.g. a McMaster Honour Award) and one Entrance Award granted on the basis of an application or other earned merit.
6. Students who are not Canadian Citizens or Permanent Residents of Canada who complete their final year and graduate from a high school in Canada are eligible for Entrance Awards open to Canadian Citizens and Permanent Residents.
7. Students who are not Canadian Citizens or Permanent Residents of Canada who complete their final year and/or graduate from a high school outside of Canada are limited to one award from a limited number of International Student Entrance Awards. See International Student Entrance Awards section.
8. Entrance Awards first consider one or more McMaster University calculated admission and scholarship averages (e.g. final admission average).
9. Students must achieve a minimum 80% in the average(s) used to determine Entrance Award eligibility. An admission audition or portfolio score, or equivalent, may be included in the calculation of an average.
10. Averages for Entrance Awards are calculated using the course grades that form the basis for admission to the Level I program. Final grades for courses completed after June 30th in the year of admission application will not be considered in assessing eligibility for Entrance Awards.
11. Entrance Awards may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements, including, but not limited to, submitting an application, participating in an interview, performing an audition or developing a portfolio.
12. In order to be considered for an Entrance Award by application, students must submit a complete application by the specified deadline date.
13. Entrance Award applications which meet eligibility criteria are forwarded to a selection committee for review and ranking.
14. Students must enrol in the fall term to have an Entrance Award payment processed.
15. All Entrance Award payments are disbursed through the McMaster Student Account and are applied to outstanding charges. A few exceptions to this regulation may be approved by the Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards.
16. Entrance Awards are typically disbursed no later than the end of September.
17. Entrance Award recipients will have their awards noted on their University transcript.
18. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture or adjustment in the value of the award. Students are advised to consult with the Office of the Registrar, Student Financial Aid & Scholarships, prior to making any changes to their program of study or course load.
19. ~~Students who withdraw before up to the last day for withdrawing from courses without failure by default in the Fall term~~ November 4 will forfeit their Entrance Award.
20. Students who forfeit their Entrance Award will have their award cancelled and their transcript notation removed. Students must return the Entrance Award funding to their McMaster Student Account.
21. Some Entrance Awards are renewable (see In-Course Award and Renewals Regulations).
22. Students wishing to defer the benefits of an Entrance Award to the following academic year should apply to the Office of the Registrar, Admissions, for deferral of both admission and stated scholarship value. Approval of applications for deferral is not automatic, and deferrals are not normally granted for more than one academic year.
23. The University may choose not to grant an Entrance Award in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools for awards by application, where complete applications have not been received.
24. The University may remove specific Entrance Awards from the University Calendar, may revise the terms and stated value, and/or suspend the granting of Entrance Awards (e.g. donor funds).
25. Entrance Awards supported by donor funds may have additional eligibility requirements.

President's Awards and Honour Awards Program

An unlimited number of President's Awards and Honour Awards are automatically assessed on the basis of final admission averages. No application is required. The value awarded corresponds to the final admission average range in which the Level I entering student's average falls:

President's Award	95.0 - 100.00%	\$2500
Honour Award	90.0 - 94.99%	\$1000
Honour Award	85-88.0 - 89.99%	\$ 750
Honour Award	80.0 - 84.99%	\$ 500

Indigenous Student Entrance Award Regulations

1. Indigenous Student Entrance Awards are monetary awards allocated on the basis of academic merit and, in some cases, other forms of earned merit.
2. Indigenous Student Entrance Awards are available to students entering Level I of their first baccalaureate degree program, whether direct from high school or an alternate pathway, including, but not limited to college, an Indigenous post-secondary institution or other University.
3. Indigenous Student Entrance Awards are available to students who are Canadian Citizens or Permanent Residents of Canada, and those who self-identify as First Nations, Metis, or Inuit, regardless of status under the Indian Act or where they completed their high school education.
4. Indigenous students may receive a maximum of one Entrance Award granted solely on the basis of academic merit (e.g. a McMaster Honour Award), and either one Entrance Award granted on the basis of earned merit that requires an additional assessment process, including, but not limited to, application, interview and/or audition, or one Indigenous Student Entrance Award.
5. Indigenous Student Entrance Awards may consider one or more McMaster University calculated admission and scholarship averages (e.g. final admission average).
6. Students must achieve the minimum final admission average required for their program to be eligible for an Indigenous Student Entrance Award.
7. Averages for Indigenous Student Entrance Awards are calculated using the course grades that form the basis for admission to the Level I program. Final grades for courses completed after June 30th in the year of admission application will not be considered in assessing eligibility for Indigenous Student Entrance Awards.
8. Indigenous Student Entrance Awards may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements, including, but not limited to, submitting an application, participating in an interview, performing an audition or developing a portfolio.
9. In order to be considered for an Indigenous Student Entrance Award by application, students must submit a complete application by the specified deadline date.
10. Indigenous Student Entrance Award applications which meet eligibility criteria are forwarded to a selection committee for review and ranking.
11. Indigenous Students must enrol in the fall term to have an Indigenous Student Entrance Award payment processed.
12. All Indigenous Student Entrance Award payments are disbursed through the McMaster Student Account and are applied to outstanding charges. A few exceptions to this regulation may be approved by the Office of the Registrar, [Student Financial Aid & Scholarships Aid & Awards](#).
13. Indigenous Student Entrance Awards are typically disbursed no later than the end of September.
14. Indigenous Student Entrance Award recipients will have their awards noted on their University transcript.
15. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture or adjustment in the value of the award. Students are advised to consult with the Office of the Registrar, [Student Financial Aid & Scholarships](#), prior to making any changes to their program of study or course load.
16. ~~Students who withdraw before November 1 up to the last date for withdrawing from courses without failure by default in the Fall term will forfeit their Indigenous Student Entrance Award.~~
17. Students who forfeit their Indigenous Student Entrance Award will have their award cancelled and their transcript notation removed. Students must return the Indigenous Student Entrance Award funding to their McMaster Student Account.
18. Some Indigenous Student Entrance Awards are renewable (see In-Course Award and Renewals Regulations).
19. Students wishing to defer the benefits of an Indigenous Student Entrance Award to the following academic year should apply to the Office of the Registrar, Admissions, for deferral of both admission and stated scholarship value. Approval of applications for deferral is not automatic, and deferrals are not normally granted for more than one academic year.
20. The University may choose not to grant an Indigenous Student Entrance Award in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist, and/or may choose to generate applicant pools for awards by application, where complete applications have not been received.
21. The University may remove specific Indigenous Student Entrance Awards from the University Calendar, may revise the terms and stated value, and/or suspend the granting of Indigenous Student Entrance Awards (e.g. donor funds).
22. Indigenous Student Entrance Awards supported by donor funds may have additional eligibility requirements.

Graduating Student Awards Regulations

1. Graduating Student Awards are monetary and non-monetary awards allocated on the basis of academic merit and, in some cases, other forms of earned merit.
2. Graduating Student Awards are normally available to all full-time and part-time students graduating from their first undergraduate degree program. Graduating Student Awards are not available to second degree students unless the terms of a particular donor award specify eligibility and the student has not received the award previously.
3. Graduating Student Awards requiring full-time status are available to students enrolled full-time or equivalent in both the fall and winter terms.
4. Graduating Student Awards intended for true part-time students are available to students who have completed at least 50% of all units attempted in their undergraduate degree program at McMaster on a part-time basis.
5. Graduating Student Awards are available to all domestic and international students.
6. Students are considered for all available Graduating Student Awards in the spring following their graduating term.
7. While students typically apply for Graduating Student Awards in Mosaic, students with degrees conferred at Fall

Convocation are only able to apply for Graduating Student Awards by application the following spring using paper application forms available through the Office of the Registrar at <https://registrar.mcmaster.ca/financial-aid>.

8. Graduating Student Awards are available to students with a minimum Cumulative Grade Point Average of 8.0 calculated on at least 60 graded units.
9. Available averages, units upon which averages are calculated, program level, and enrolled units may be used to break any ties in an award competition.
10. Graduating Student Awards may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements including, but not limited to, submitting an application.
11. In order to be considered for a Graduating Student Award by application, students must submit a complete application by the specified deadline date.
12. Graduating Student Award applications which meet award eligibility criteria are forwarded to a selection committee for review and ranking.
13. All Graduating Student Award payments are disbursed through the McMaster Student Account and are applied to outstanding charges. A few exceptions to this regulation may be approved by the Office of the Registrar, ~~Student Financial Aid & Scholarships~~. **Aid & Awards**
14. Graduating Student Awards are typically disbursed no later than the end of May.
15. Graduating Student Award recipients will have their awards noted on their University transcripts.
16. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture of a Graduating Student Award. Students are advised to consult with the Office of the Registrar, ~~Student Financial Aid & Scholarships~~, prior to making any changes to their program of study.
17. Graduating Student Award recipients who do not have their degree conferred as expected will forfeit their award.
18. Students who forfeit their awards will have their award cancelled and their transcript notation removed. Students must return any non-monetary award to the Office of the Registrar, ~~Student Financial Aid & Scholarships~~ and any award funding to their McMaster Student Account.
19. The University may choose not to grant a Graduating Student Award in the absence of a suitable candidate; may choose to limit the number of recipients where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools where complete applications have not been received.
20. The University may remove specific Graduating Student Awards from the University Calendar, may revise the terms and stated value and/or suspend the granting of Graduating Student Awards (e.g. donor funds).
21. Graduating Student Awards supported by donor funds may have additional eligibility requirements.

In-Course and Renewal Academic Grant Regulations

1. In-Course Academic Grants are monetary awards allocated on the basis of academic merit, and in some cases other forms of earned merit, and demonstrated financial need.
2. In-Course Academic Grants are available to full-time and part-time students enrolled in their first baccalaureate degree program who are not in their graduating term.
3. In-Course Academic Grants requiring full-time status are available to students enrolled full-time or equivalent in both the fall and winter terms.
4. In-Course Academic Grants will require either a minimum Cumulative Grade Point Average of 8.0 calculated on at least 18 graded units or a Fall-Winter Average of 9.5 calculated on the basis of graded units in at least a full-time OSAP eligible course load per term in the prior academic year.
5. In-Course Academic Grants first consider available averages, units upon which averages are calculated, program level and enrolled units in the ranking of academic merit.
6. In-Course Academic Grants may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements including, but not limited to, submitting an application, participating in an interview, performing an audition or developing a portfolio.
7. In order to be considered for an In-Course Academic Grant by application, students must submit a complete application by the specified deadline date.
8. In-Course Academic Grant applications which meet eligibility criteria are forwarded to a selection committee for review and ranking.
9. In-Course Academic Grants are allocated on the basis of an eligible course load and financial need as determined by a completed full-time OSAP application for the current academic year.
10. The greater calculated financial need is used to break any tie.
11. Some In-Course Academic Grants are renewable.
12. Entrance, Indigenous Student Entrance and In-Course Academic Grant renewals may be based on a minimum

Cumulative Grade Point Average of 8.0, or a minimum Fall-Winter Average of 9.5 from the prior academic year based on their full-time OSAP eligible course load or equivalent. An OSAP application for the current year is not required to renew an Entrance or In-Course Academic Grant.

13. Students may receive a maximum of one In-Course Academic Grant or renewal of a prior year Entrance, Indigenous Student Entrance or In-Course Academic Grant.
14. Students must be enrolled in at least the full-time OSAP eligible course load or equivalent used to determine their eligibility to have an In-Course Academic Grant payment processed. Students must be enrolled in the fall term in a full-time OSAP eligible course load or equivalent to have the renewal of a prior year Entrance or In-Course Academic Grant payment processed.
15. All In-Course Academic Grants and Academic Grant renewal payments are disbursed through the McMaster Student Account and are applied to outstanding charges. A few exceptions to this regulation may be approved by the Office of the Registrar, **Student Financial Aid & Scholarships Aid & Awards**.
16. In-Course Academic Grants are typically disbursed no later than the end of December. Academic Grant renewal payments are typically disbursed no later than the end of September.
17. In-Course Academic Grant recipients will have their awards noted on their University transcript. Academic Grant renewals are not noted on transcripts.
18. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture or adjustment in the value of the In-Course Academic Grant or Entrance or In-Course Academic Grant renewal. Students are advised to consult with the Office of the Registrar, **Student Financial Aid & Scholarships Aid & Awards**, prior to making any changes to their program of study or course load.
19. Students who withdraw before November 1 up to the last day for withdrawing from courses without failure by default in the Winter Fall term will forfeit their Academic Grant renewal.
20. Students who forfeit their Academic Grant will have their grant cancelled and their transcript notation removed if forfeited in first year of payment only. Students must return the Academic Grant funding to their McMaster Student Account.
21. Forfeiture of a renewable Academic Grant also cancels all future instalments of the Academic Grant.
22. Students wishing to defer the benefits of an Academic Grant renewal to the next academic year should make the request in writing to the Office of the Registrar, **Student Financial Aid & Scholarships Aid & Awards**. Approval is not automatic and deferments are not normally granted for more than one academic year.
23. Students holding renewable Academic Grants who choose to accelerate their program and to complete their degree earlier than normal by completing Spring/Summer courses and who wish to employ the benefits of their renewable Academic Grant to defray the tuition and compulsory fees for those courses should make the request in writing to the Office of the Registrar, **Student Financial Aid & Scholarships Aid & Awards**.
24. The University may choose not to grant an In-Course Academic Grant in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools for awards by application, where complete applications have not been received.
25. The University may remove specific In-Course Academic Grants from the University Calendar, may revise the terms and stated value and/or suspend the granting of In-Course Academic Grants (e.g. donor funds).
26. In-Course Academic Grants supported by donor funds may have additional eligibility and renewal requirements.

Indigenous Student Entrance Academic Grant Regulations

1. Indigenous Student Entrance Academic Grants are monetary awards allocated on the basis of academic merit, and in some cases other forms of earned merit, and demonstrated financial need.
2. Indigenous Student Entrance Academic Grants are available to students entering Level I of their first baccalaureate degree program whether direct from high school or an alternate pathway including, but not limited to, college, an Indigenous post-secondary institution or other University.
3. Indigenous Student Entrance Academic Grants are available to students who are Canadian Citizens or Permanent Residents of Canada, and those who self-identify as First Nations, Metis, or Inuit, regardless of status under the Indian Act or where they completed their high school education.
4. Indigenous Student Entrance Academic Grants are available to full-time and part-time students entering Level I of their first baccalaureate degree program.
5. Indigenous Student Entrance Academic Grants first consider one or more McMaster University calculated admission and scholarship averages (e.g. final admission average).
6. Students must achieve the minimum final admission average required for their program to be eligible for an Indigenous

- Student Entrance Academic Grant.
7. Averages for Indigenous Student Entrance Academic Grants are calculated using the course grades that form the basis for admission to the Level I program. Final grades for courses completed after June 30th in the year of admission application will not be considered in assessing eligibility for Entrance Academic Grants.
 8. Indigenous Student Entrance Academic Grants requiring full-time status are available to students enrolled full-time or equivalent in both the fall and winter.
 9. Indigenous Student Entrance Academic Grants may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements including, but not limited to, submitting an application, participating in an interview, performing an audition or developing a portfolio.
 10. In order to be considered for an Indigenous Student Entrance Academic Grant by application, students must submit a complete application by the specified deadline date.
 11. Indigenous Student Entrance Academic Grant applications which meet eligibility criteria are forwarded to a selection committee for review and ranking.
 12. Indigenous Student Entrance Academic Grants are allocated on the basis of an eligible course load and financial need as demonstrated through a completed Canadian federal and/or provincial government student aid application (e.g. full-time OSAP) or a completed standard University need profile for the academic year in which the student is entering Level I of their program.
 13. The greater calculated financial need is used to break any tie.
 14. Students may receive a maximum of one Entrance Academic Grant or Indigenous Student Entrance Academic Grant.
 15. Students must be enrolled in at least the full-time OSAP eligible course load used to determine their eligibility to have an Indigenous Student Entrance Academic Grant payment processed.
 16. All Indigenous Student Entrance Academic Grant payments are disbursed through the McMaster Student Account and are applied to outstanding charges. A few exceptions to this regulation may be approved by the Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards.
 17. Indigenous Student Entrance Academic Grants are disbursed September through the end of December.
 18. Indigenous Student Entrance Academic Grant recipients will have their awards noted on their University transcript.
 19. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture or adjustment in the value of the Indigenous Student Entrance Academic Grant. Students are advised to consult with the Office of the Registrar, Student Financial Aid & Scholarships, prior to making any changes to their program of study or course load.
 20. Students who withdraw before November 1 up to the last day for withdrawing from courses without failure by default in the Fall term will forfeit their Indigenous Student Entrance Academic Grant.
 21. Students who forfeit their Indigenous Student Entrance Academic Grant will have their grant cancelled and their transcript notation removed. Students must return the Indigenous Student Entrance Academic Grant funding to their McMaster Student Account.
 22. Some Indigenous Student Entrance Academic Grants are renewable (see In-Course and Renewal Academic Grant Regulations).
 23. The University may choose not to grant an Indigenous Student Entrance Academic Grant in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools for awards by application, where complete applications have not been received.
 24. The University may remove specific Indigenous Student Entrance Academic Grants from the University Calendar, may revise the terms and stated value and/or suspend the granting of Indigenous Student Entrance Academic Grants (e.g. donor funds).
 25. Indigenous Student Entrance Academic Grants supported by donor funds may have additional eligibility requirements.

In-Course and Renewal Award Regulations

1. In-Course Awards are monetary and non-monetary awards allocated on the basis of academic merit and, in some cases, other forms of earned merit. Non-monetary awards such as medals and books as well as monetary awards of nominal value (currently \$100 or less) are called prizes.
2. In-Course Awards are available to full-time and part-time students enrolled in an undergraduate degree program (excluding the Physician Assistant and M.D. Programs), at the time of award application and selection, who are returning to McMaster to continue their studies.
3. In-Course Awards requiring full-time status are available to students enrolled full-time or equivalent in both the fall and winter terms.
4. In-Course Awards requiring part-time status are available to students who are not enrolled full-time in the fall and/or winter terms. In addition, true part-time awards are only available to students who have completed at least 50% of all

- units attempted at McMaster on a part-time basis.
5. In-Course Awards are available to all domestic and international students.
 6. In-Course Awards are not available to second degree students unless the terms of a particular donor award specify eligibility and they have not received the award previously.
 7. In-Course Awards are not available to students in their graduating term.
 8. In-Course Awards may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements, including, but not limited to, submitting an application.
 9. In-Course Awards requiring an application that are determined by Cumulative Grade Point Average require a minimum Cumulative Grade Point Average of 8.0 on at least 18 graded units, while those determined by Fall-Winter Average require a minimum Fall-Winter Average of 9.5 on at least 18 graded units.
 10. In-Course Awards adjudicated without need of an application that are determined by Cumulative Grade Point Average require a minimum 8.0 on at least 24 graded units, while those determined by Fall-Winter Average require a minimum 9.5 on at least 24 graded units.
 11. Available averages, units upon which averages are calculated, program level, and enrolled units, may be used to break any ties in an award competition.
 12. In order to be considered for an In-Course Award by application, students must submit a complete application by the specified deadline date.
 13. In-Course Award applications which meet award eligibility criteria are forwarded to a selection committee for review and ranking.
 14. Some In-Course Awards are renewable.
 15. Entrance, Indigenous Entrance, and In-Course Award renewals determined by Cumulative Grade Point Average or Fall-Winter Average require a minimum 8.0 on at least 18 graded units.
 16. All In-Course Award payments are disbursed through the McMaster Student Account and applied to outstanding charges. A few exceptions to this regulation may be approved by the Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards.
 17. In-Course Awards are typically disbursed no later than the end of September.
 18. In-Course Awards will be disbursed if the recipient continues to be enrolled in a McMaster degree program, or a specific McMaster program, when explicitly required by the terms of the award, or the student's record reflects they are on exchange, on letter of permission, or participating in a coop or internship opportunity at McMaster University.
 19. In-Course Award recipients will have their awards noted on their University transcripts. Entrance and In-Course renewals are not noted on transcripts.
 20. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture of an In-Course Award or Entrance or In-Course Award renewal. Students are advised to consult with the Office of the Registrar, Student Financial Aid & Scholarships, prior to making any changes to their program of study or course load.
 21. If a student is approved to graduate or transfers to graduate in the fall, after the awarding decision and/or disbursement is made, the student will forfeit the award.
 22. Students who withdraw before November 1 up to the last day for withdrawing from courses without failure by default will forfeit their In-Course Award or Entrance or In-Course Award renewal.
 23. Students who forfeit their In-Course award will have their award cancelled and their transcript notation removed if forfeited in first year of payment only. Students must return the In-Course Award or Entrance or In-Course Award renewal funding to their McMaster Student Account.
 24. Forfeiture of a renewable Entrance or In-Course Award also cancels all future instalments of the award.
 25. Students wishing to defer the stated value of an In-Course Award or Entrance or In-Course Award renewal to the next academic year should make the request in writing to the Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards. Approval is not automatic and deferments are not normally granted for more than one academic year.
 26. Students holding renewable Entrance or In-Course Awards who choose to accelerate their program and to complete their degree earlier than normal by completing Spring/Summer courses and who wish to employ the benefits of their renewable Entrance and/or In-Course Awards to defray the tuition and compulsory fees for those courses should make the request in writing to the Office of the Registrar, Student Financial Aid & Scholarships Aid & Awards.
 27. The University may choose not to grant an In-Course Award in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools where complete applications have not

been received.

28. The University may remove specific In-Course Awards from the University Calendar, may revise the terms and stated value and/or suspend the granting of In-Course Awards (e.g. donor funds).
29. In-Course Awards supported by donor funds may have additional eligibility and renewal requirements.

Part-Time In-Course Awards

In-Course and Renewal Award Regulations

1. In-Course Awards are monetary and non-monetary awards allocated on the basis of academic merit and, in some cases, other forms of earned merit. Non-monetary awards such as medals and books as well as monetary awards of nominal value (currently \$100 or less) are called prizes.
2. In-Course Awards are available to full-time and part-time students enrolled in an undergraduate degree program (excluding the Physician Assistant and M.D. Programs), at the time of award application and selection, who are returning to McMaster to continue their studies.
3. In-Course Awards requiring full-time status are available to students enrolled full-time or equivalent in both the fall and winter terms.
4. In-Course Awards requiring part-time status are available to students who are not enrolled full-time in the fall and/or winter terms. In addition, true part-time awards are only available to students who have completed at least 50% of all units attempted at McMaster on a part-time basis.
5. In-Course Awards are available to all domestic and international students.
6. In-Course Awards are not available to second degree students unless the terms of a particular donor award specify eligibility and they have not received the award previously.
7. In-Course Awards are not available to students in their graduating term.
8. In-Course Awards may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements, including, but not limited to, submitting an application.
9. In-Course Awards requiring an application that are determined by Cumulative Grade Point Average require a minimum Cumulative Grade Point Average of 8.0 on at least 18 graded units, while those determined by Fall-Winter Average require a minimum Fall-Winter Average of 9.5 on at least 18 graded units.
10. In-Course Awards adjudicated without need of an application that are determined by Cumulative Grade Point Average require a minimum 8.0 on at least 24 graded units, while those determined by Fall-Winter Average require a minimum 9.5 on at least 24 graded units.
11. Available averages, units upon which averages are calculated, program level, and enrolled units, may be used to break any ties in an award competition.
12. In order to be considered for an In-Course Award by application, students must submit a complete application by the specified deadline date.
13. In-Course Award applications which meet award eligibility criteria are forwarded to a selection committee for review and ranking.
14. Some In-Course Awards are renewable.
15. Entrance, Indigenous Entrance, and In-Course Award renewals determined by Cumulative Grade Point Average or Fall-Winter Average require a minimum 8.0 on at least 18 graded units.
16. All In-Course Award payments are disbursed through the McMaster Student Account and applied to outstanding charges. A few exceptions to this regulation may be approved by the Office of the Registrar, ~~Student Financial Aid & Scholarships Aid & Awards~~.
17. In-Course Awards are typically disbursed no later than the end of September.
18. In-Course Awards will be disbursed if the recipient continues to be enrolled in a McMaster degree program, or a specific McMaster program, when explicitly required by the terms of the award, or the student's record reflects they are on exchange, on letter of permission, or participating in a coop or internship opportunity at McMaster University.
19. In-Course Award recipients will have their awards noted on their University transcripts. Entrance and In-Course renewals are not noted on transcripts.
20. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture of an In-Course Award or Entrance or In-Course Award renewal. Students are advised to consult with the Office of the Registrar; ~~Student Financial Aid & Scholarships~~, prior to making any changes to their program of study or course load.
21. If a student is approved to graduate or transfers to graduate in the fall, after the awarding decision and/or disbursement is made, the student will forfeit the award.
22. ~~Students who withdraw before November 1 up to the last day for withdrawing from courses without failure by default in the Fall term~~ will forfeit their In-Course Award or Entrance or In-Course Award renewal.
23. Students who forfeit their In-Course award will have their award cancelled and their transcript notation removed if

- forfeited in first year of payment only. Students must return the In-Course Award or Entrance or In-Course Award renewal funding to their McMaster Student Account.
24. Forfeiture of a renewable Entrance or In-Course Award also cancels all future instalments of the award.
 25. Students wishing to defer the stated value of an In-Course Award or Entrance or In-Course Award renewal to the next academic year should make the request in writing to the Office of the Registrar, **Student Financial Aid & Scholarships Aid & Awards**. Approval is not automatic and deferments are not normally granted for more than one academic year.
 26. Students holding renewable Entrance or In-Course Awards who choose to accelerate their program and to complete their degree earlier than normal by completing Spring/Summer courses and who wish to employ the benefits of their renewable Entrance and/or In-Course Awards to defray the tuition and compulsory fees for those courses should make the request in writing to the Office of the Registrar, **Student Financial Aid & Scholarships Aid & Awards**.
 27. The University may choose not to grant an In-Course Award in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools where complete applications have not been received.
 28. The University may remove specific In-Course Awards from the University Calendar, may revise the terms and stated value and/or suspend the granting of In-Course Awards (e.g. donor funds).
 29. In-Course Awards supported by donor funds may have additional eligibility and renewal requirements.

In Course Awards-Second Degree Eligible In-Course and Renewal Award Regulations

1. In-Course Awards are monetary and non-monetary awards allocated on the basis of academic merit and, in some cases, other forms of earned merit. Non-monetary awards such as medals and books as well as monetary awards of nominal value (currently \$100 or less) are called prizes.
2. In-Course Awards are available to full-time and part-time students enrolled in an undergraduate degree program (excluding the Physician Assistant and M.D. Programs), at the time of award application and selection, who are returning to McMaster to continue their studies.
3. In-Course Awards requiring full-time status are available to students enrolled full-time or equivalent in both the fall and winter terms.
4. In-Course Awards requiring part-time status are available to students who are not enrolled full-time in the fall and/or winter terms. In addition, true part-time awards are only available to students who have completed at least 50% of all units attempted at McMaster on a part-time basis.
5. In-Course Awards are available to all domestic and international students.
6. In-Course Awards are not available to second degree students unless the terms of a particular donor award specify eligibility and they have not received the award previously.
7. In-Course Awards are not available to students in their graduating term.
8. In-Course Awards may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements, including, but not limited to, submitting an application.
9. In-Course Awards requiring an application that are determined by Cumulative Grade Point Average require a minimum Cumulative Grade Point Average of 8.0 on at least 18 graded units, while those determined by Fall-Winter Average require a minimum Fall-Winter Average of 9.5 on at least 18 graded units.
10. In-Course Awards adjudicated without need of an application that are determined by Cumulative Grade Point Average require a minimum 8.0 on at least 24 graded units, while those determined by Fall-Winter Average require a minimum 9.5 on at least 24 graded units.
11. Available averages, units upon which averages are calculated, program level, and enrolled units, may be used to break any ties in an award competition.
12. In order to be considered for an In-Course Award by application, students must submit a complete application by the specified deadline date.
13. In-Course Award applications which meet award eligibility criteria are forwarded to a selection committee for review and ranking.
14. Some In-Course Awards are renewable.
15. Entrance, Indigenous Entrance, and In-Course Award renewals determined by Cumulative Grade Point Average or Fall-Winter Average require a minimum 8.0 on at least 18 graded units.

16. All In-Course Award payments are disbursed through the McMaster Student Account and applied to outstanding charges. A few exceptions to this regulation may be approved by the Office of the Registrar, ~~Student Financial Aid & Scholarships~~. ~~Aid & Awards~~.
17. In-Course Awards are typically disbursed no later than the end of September.
18. In-Course Awards will be disbursed if the recipient continues to be enrolled in a McMaster degree program, or a specific McMaster program, when explicitly required by the terms of the award, or the student's record reflects they are on exchange, on letter of permission, or participating in a coop or internship opportunity at McMaster University.
19. In-Course Award recipients will have their awards noted on their University transcripts. Entrance and In-Course renewals are not noted on transcripts.
20. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture of an In-Course Award or Entrance or In-Course Award renewal. Students are advised to consult with the Office of the Registrar, ~~Student Financial Aid & Scholarships~~, prior to making any changes to their program of study or course load.
21. If a student is approved to graduate or transfers to graduate in the fall, after the awarding decision and/or disbursement is made, the student will forfeit the award.
22. ~~Students who withdraw before November 1 up to the last day for withdrawing from courses without failure by default in the Fall term will forfeit their In-Course Award or Entrance or In-Course Award renewal.~~
23. Students who forfeit their In-Course award will have their award cancelled and their transcript notation removed if forfeited in first year of payment only. Students must return the In-Course Award or Entrance or In-Course Award renewal funding to their McMaster Student Account.
24. Forfeiture of a renewable Entrance or In-Course Award also cancels all future instalments of the award.
25. Students wishing to defer the stated value of an In-Course Award or Entrance or In-Course Award renewal to the next academic year should make the request in writing to the Office of the Registrar, ~~Student Financial Aid & Scholarships~~. ~~Aid & Awards~~. Approval is not automatic and deferments are not normally granted for more than one academic year.
26. Students holding renewable Entrance or In-Course Awards who choose to accelerate their program and to complete their degree earlier than normal by completing Spring/Summer courses and who wish to employ the benefits of their renewable Entrance and/or In-Course Awards to defray the tuition and compulsory fees for those courses should make the request in writing to the Office of the Registrar, ~~Student Financial Aid & Scholarships~~. ~~Aid & Awards~~.
27. The University may choose not to grant an In-Course Award in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools where complete applications have not been received.
28. The University may remove specific In-Course Awards from the University Calendar, may revise the terms and stated value and/or suspend the granting of In-Course Awards (e.g. donor funds).
29. In-Course Awards supported by donor funds may have additional eligibility and renewal requirements.

Awards for Physician Assistant Education Program In-Course and Renewal Award Regulations

1. In-Course Awards are monetary and non-monetary awards allocated on the basis of academic merit and, in some cases, other forms of earned merit. Non-monetary awards such as medals and books as well as monetary awards of nominal value (currently \$100 or less) are called prizes.
2. In-Course Awards are available to full-time and part-time students enrolled in an undergraduate degree program (excluding the Physician Assistant and M.D. Programs), at the time of award application and selection, who are returning to McMaster to continue their studies.
3. In-Course Awards requiring full-time status are available to students enrolled full-time or equivalent in both the fall and winter terms.
4. In-Course Awards requiring part-time status are available to students who are not enrolled full-time in the fall and/or winter terms. In addition, true part-time awards are only available to students who have completed at least 50% of all units attempted at McMaster on a part-time basis.
5. In-Course Awards are available to all domestic and international students.
6. In-Course Awards are not available to second degree students unless the terms of a particular donor award specify eligibility and they have not received the award previously.
7. In-Course Awards are not available to students in their graduating term.
8. In-Course Awards may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements, including, but not limited to, submitting an

- application.
9. In-Course Awards requiring an application that are determined by Cumulative Grade Point Average require a minimum Cumulative Grade Point Average of 8.0 on at least 18 graded units, while those determined by Fall-Winter Average require a minimum Fall-Winter Average of 9.5 on at least 18 graded units.
 10. In-Course Awards adjudicated without need of an application that are determined by Cumulative Grade Point Average require a minimum 8.0 on at least 24 graded units, while those determined by Fall-Winter Average require a minimum 9.5 on at least 24 graded units.
 11. Available averages, units upon which averages are calculated, program level, and enrolled units, may be used to break any ties in an award competition.
 12. In order to be considered for an In-Course Award by application, students must submit a complete application by the specified deadline date.
 13. In-Course Award applications which meet award eligibility criteria are forwarded to a selection committee for review and ranking.
 14. Some In-Course Awards are renewable.
 15. Entrance, Indigenous Entrance, and In-Course Award renewals determined by Cumulative Grade Point Average or Fall-Winter Average require a minimum 8.0 on at least 18 graded units.
 16. All In-Course Award payments are disbursed through the McMaster Student Account and applied to outstanding charges. A few exceptions to this regulation may be approved by the Office of the Registrar, ~~Student Financial Aid & Scholarships Aid & Awards~~.
 17. In-Course Awards are typically disbursed no later than the end of September.
 18. In-Course Awards will be disbursed if the recipient continues to be enrolled in a McMaster degree program, or a specific McMaster program, when explicitly required by the terms of the award, or the student's record reflects they are on exchange, on letter of permission, or participating in a coop or internship opportunity at McMaster University.
 19. In-Course Award recipients will have their awards noted on their University transcripts. Entrance and In-Course renewals are not noted on transcripts.
 20. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture of an In-Course Award or Entrance or In-Course Award renewal. Students are advised to consult with the Office of the Registrar, ~~Student Financial Aid & Scholarships~~, prior to making any changes to their program of study or course load.
 21. If a student is approved to graduate or transfers to graduate in the fall, after the awarding decision and/or disbursement is made, the student will forfeit the award.
 22. ~~Students who withdraw before November 1 up to the last day for withdrawing from courses without failure by default in the Fall term~~ will forfeit their In-Course Award or Entrance or In-Course Award renewal.
 23. Students who forfeit their In-Course award will have their award cancelled and their transcript notation removed if forfeited in first year of payment only. Students must return the In-Course Award or Entrance or In-Course Award renewal funding to their McMaster Student Account.
 24. Forfeiture of a renewable Entrance or In-Course Award also cancels all future instalments of the award.
 25. Students wishing to defer the stated value of an In-Course Award or Entrance or In-Course Award renewal to the next academic year should make the request in writing to the Office of the Registrar, ~~Student Financial Aid & Scholarships Aid & Awards~~. Approval is not automatic and deferments are not normally granted for more than one academic year.
 26. Students holding renewable Entrance or In-Course Awards who choose to accelerate their program and to complete their degree earlier than normal by completing Spring/Summer courses and who wish to employ the benefits of their renewable Entrance and/or In-Course Awards to defray the tuition and compulsory fees for those courses should make the request in writing to the Office of the Registrar, ~~Student Financial Aid & Scholarships Aid & Awards~~.
 27. The University may choose not to grant an In-Course Award in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools where complete applications have not been received.
 28. The University may remove specific In-Course Awards from the University Calendar, may revise the terms and stated value and/or suspend the granting of In-Course Awards (e.g. donor funds).
 29. In-Course Awards supported by donor funds may have additional eligibility and renewal requirements.

Michael G. DeGroote School of Medicine Award Regulations

1. M.D. Awards are monetary awards allocated on the basis of specific criteria, which may include a minimum expectation of academic achievement, earned merit or other miscellaneous criteria.
2. M.D. Awards are available to students in good standing enrolled in the M.D. Program.
3. M.D. Awards are available to students who are Canadian Citizens, Permanent Residents, Convention Refugees or

- Protected Persons of Canada.
4. Students who are not Canadian Citizens, Permanent Residents, Convention Refugees or Protected Persons of Canada are not eligible for M.D. Awards.
5. M.D. Program students may receive more than one M.D. Award up to the amount for which they are eligible as determined by the M.D. Program Office.
6. M.D. Awards may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements, including but not limited to, submitting an application.
7. In order to be considered for an M.D. Award that is a named donor award, students must submit a completed application by the specified deadline date.
8. All M.D. Award applications are evaluated for eligibility, and reviewed and ranked according to specific criteria. A selection committee may be struck depending on the award and donor requirements.
9. Students must be enrolled in the M.D. Program to have the M.D. Award payment processed.
10. If an M.D. Award is renewable, students must meet the renewal requirements specified in the award terms to receive a renewal payment.
11. All M.D. Award payments are disbursed through the McMaster Student Account and are applied to outstanding charges. A few exceptions to this regulation may be approved by the M.D. Program Office.
12. All M.D. Awards are typically disbursed no later than the end of November.
13. Forfeiture of a renewable M.D. Award also cancels all future instalments of the award.
14. Change in course load may result in forfeiture or adjustment in the value of the M.D. Award. Students are advised to consult with their M.D. Program Office prior to making any changes to their course load.
15. Students who withdraw or take a leave of absence from the program may see an adjustment in the value of their M.D. Award or see the full amount returned to the University.
16. Any adjustment made to a student's account, in order to return all or a portion of an M.D. Award to the University, will be calculated on the balance available at the time of the adjustment and will not put a student's account into deficit.
17. The University may choose not to grant an M.D. Award in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools for awards by application, where complete applications have not been received.
18. The University may remove specific M.D. Awards from the University Calendar, may revise the terms and stated value and/or suspend the granting of M.D. Awards (e.g. donor funds).
19. M.D. Awards supported by donor funds may have additional eligibility requirements.

Travel and Exchange Award Regulations

1. Travel and Exchange Awards are monetary awards allocated on the basis of academic merit and, in some cases, other forms of earned merit.
2. Travel and Exchange Awards are available to full-time and part-time students enrolled in Level II or above of their first undergraduate degree program, at the time of award application and selection, who are returning to McMaster to continue their studies.
3. Travel and Exchange Awards requiring full-time status are available to students enrolled full-time or equivalent in both the fall and winter terms.
4. Travel and Exchange Awards are available to all domestic and international students.
5. Travel and Exchange Awards are not available to second degree students.
6. Travel and Exchange Awards are not available to students in their graduating term.
7. Students are limited to one Travel and Exchange Award per application cycle.
8. Travel and Exchange Awards are available to students with a minimum Cumulative Grade Point Average of 7.0 on a minimum of 18 graded units.
9. Available averages, units upon which averages are calculated, program level, and enrolled units may be used to break any ties in an award competition.
10. Exchange Awards are available to students participating in an approved formal exchange program during the academic year immediately following the application deadline.
11. Travel Awards are available to students travelling to earn academic credit, pursue experiential learning opportunities, complete research or projects, participate in relief efforts, volunteer or work. Some Travel Awards may be for travel within Canada, while others may support the student outside Canada or internationally. Travel Award recipients must travel during the summer, fall and/or winter terms immediately following the application deadline.
12. Travel and Exchange Awards may also consider other forms of earned merit. In order to evaluate earned merit, students may need to complete one or more additional requirements including, but not limited to, submitting an application.

13. In order to be considered for a Travel and Exchange Award by application, students must submit a complete application by the specified deadline date.
14. Travel and Exchange Award applications which meet award eligibility criteria are forwarded to a selection committee for review and ranking.
15. All Travel and Exchange Award payments are disbursed through the McMaster Student Account and applied to outstanding charges. A few exceptions to this regulation may be approved by the Office of the Registrar, ~~Student Financial Aid & Scholarships~~. **Aid & Awards**.
16. Travel and Exchange Awards are typically disbursed no later than the end of April.
17. Travel and Exchange Award recipients will have their awards noted on their University transcripts.
18. It is the responsibility of Travel and Exchange Award recipients to make all travel and exchange arrangements. Recipients are required to assess travel risks, have a plan of action in place for emergencies, and ensure they have proper medical and other insurance in place prior to departure.
19. Travel and Exchange Awards will not be issued for travel to areas deemed as 'do not travel areas' per Global Affairs Canada.
20. Travel and Exchange Award recipients may be required to complete a risk assessment and/or safety component and/or waiver prior to departure as dictated by other University policies. Those participating in exchange opportunities must attend mandatory Exchange Pre-Departure Orientation sessions and complete Terms for Participation Forms, Liability Waivers, and Statement of Responsibilities Forms.
21. Travel and Exchange Award recipients are asked to submit, and consent to the publication of, a report of their travel or exchange experience when they return to their studies at McMaster. Reports are submitted to the Office of the Registrar, ~~Student Financial Aid & Scholarships~~. Student submitted reports are included in the annual reports made to the Undergraduate Council Awards Committee, Undergraduate Council and Senate, and are shared with donors.
22. Travel and Exchange Awards allocated to students who do not travel or participate in their formal exchange as indicated on their application will forfeit their award.
23. Registration in, or transfer to, another program of study and/or a change in course load may result in forfeiture of a Travel and Exchange Award. Students are advised to consult with the Office of the Registrar, ~~Student Financial Aid & Scholarships~~, prior to making any changes to their program of study or course load.
24. Students who forfeit their award will have their award cancelled and their transcript notation removed. Students must return the Travel and Exchange Award funding to their McMaster Student Account.
25. The University may choose not to grant a Travel and Exchange Award in the absence of a suitable candidate; may choose to limit the number of recipients selected where funding is limited; may choose to limit the number of recipients selected where too few suitable candidates exist; and/or may choose to generate applicant pools where complete applications have not been received.
26. The University may remove specific Travel and Exchange Awards from the University Calendar, may revise the terms and stated value and/or suspend the granting of Travel and Exchange Awards.
27. Travel and Exchange Awards supported by donor funds may have additional eligibility requirements.

Faculty of Science

Proposal for a Concurrent Certificate in Geographic Information Science (GIS)

Certificate Overview:

The Concurrent Certificate in Geographic Information Science (GIS) provides students an opportunity to focus their academic development and expertise in the area of geographic information science, with the GIS Certificate serving to recognize that they have gained core knowledge in this area through their coursework.

Rationale:

The School of Earth, Environment and Society (formerly the School of Geography and Earth Sciences) offers students training in the use and application of geographic information systems and remote sensing in a breadth of disciplines, including environmental and earth sciences, geography, biology, anthropology, civil engineering, health science and business. The GIS Certificate will provide a comprehensive and rigorous academic credential that will significantly enhance students' employability, as well as their qualification for future graduate studies.

Structure:

The GIS Certificate may be taken by students pursuing any undergraduate degree and requires completion of 18 units of course work.

Learning Outcomes:

By completing the courses required for the GIS Certificate, students will:

- Develop problem-solving and critical-thinking skills
- Learn how to solve a wide variety of location-based problems using GIS techniques
- Learn how to design and manage geospatial databases
- Learn about geospatial data collection, error correction, and spatial uncertainty
- Learn how to automate workflows, develop customized geoprocessing tools, and develop web applications
- Learn how to design effective maps
- Learn how to leverage GIS for community engagement

Resources:

No new courses or teaching resources are required as all courses are currently being offered within the School of Earth, Environment and Society (formerly the School of Geography and Earth Sciences).

PROPOSED CALENDAR INFORMATION:

Concurrent Certificate in Geographic Information Science

Faculty of Science

The Concurrent Certificate in Geographic Information Science is administered by the School of Earth, Environment and Society (formerly the School of Geography and Earth Sciences).

General Science Building, Room 206, ext. 23534

ugadmin@mcmaster.ca

The Concurrent Certificate in Geographic Information Science (GIS) will train students in the use and application of geographic information systems and remote sensing relevant to a breadth of disciplines, including environment and earth sciences, geography, biology, anthropology, civil engineering, health science and business.

CERTIFICATE REQUIREMENTS

Any student in an undergraduate program at McMaster may declare the GIS Certificate at the time of graduation providing they satisfy the following requirements.

REQUIREMENTS

18 units

12 units

- ENVSOCY 2GI3 – Geographic Information Systems
- ENVSOCY 3GI3 – Advanced Raster GIS
- ENVSOCY 3GV3 – Advanced Vector GIS
- ENVSOCY 3SR3 – Remote Sensing

6 units from

- ENVSOCY 4GA3 – Applied Spatial Statistics
- ENVSOCY 4GS3 – GIS Programming
- ENVSOCY 4GT3 – Special Topics in GIS
- ENVSOCY 4SR3 – Advanced Remote Sensing

DATE: November 21, 2019

TO: Certificate & Diploma Committee

FROM: M Farquharson, Associate Dean, Academic, Faculty of Science

RE: Proposal for Geographic Information Science (GIS) Certificate

I have had an opportunity to review the Geographic Information Science Certificate program submission presented by School of Geography and Earth Science. The Certificate has also been discussed and reviewed by the members of the Academic Policy & Planning Committee within the Faculty of Science. I have determined that it meets all the criteria set out by the Undergraduate Council in its guidelines for diplomas and certificate. On this basis, we endorse this program submission with the support of the Faculty of Science.

The Faculty of Science welcomes the introduction of the Geographic Information Science Certificate. The School of Geography has developed a strong reputation within the field of GIS education, and is one of ten ESRI Canada Centres of Excellence in Higher Education for GIS across the country. We believe the proposed Certificate will provide students with rigorous training in GIS and spatial analysis techniques, which will enhance their opportunities for employment in this field.

Sincerely,



M Farquharson

Faculty of Science

Proposal for a Concurrent Certificate in Urban Studies & Planning

Certificate Overview:

The Concurrent Certificate in Urban Studies & Planning (USP) will provide students with an opportunity to develop expertise in the related fields of urban geography and urban planning.

Rationale:

The School of Earth, Environment and Society (formerly the School of Geography and Earth Sciences) has significant expertise and a strong tradition of teaching in urban geography and urban planning. Courses offered from Levels I through IV cover introductory, intermediate and advanced topics ranging from urbanization and urban systems in the global north and the global south, the social geography of cities, urban planning, and sustainable urbanism. These courses appeal to a wide audience of students including those pursuing programs offered by the School, many of whom see urban planning as a potential career path. The USP Certificate will permit students to earn an additional academic credential that will signal an in-depth knowledge of urban issues, enhancing their opportunities for graduate studies and employment in urban planning and related fields.

Structure:

The USP Certificate may be taken by students pursuing any undergraduate degree and requires completion of 18 units of course work.

Learning Outcomes:

By completing the courses required for the USP Certificate, students will:

- Understand processes of urbanization and urban development;
- Understand the factors shaping the internal organization of cities and their impacts on people's health and well-being;
- Understand the economic, environmental and social challenges confronting cities;
- Learn about the tools and techniques urban planners use to address these problems;
- Develop problem-solving and critical thinking skills; develop hands-on expertise in field work and research

Resources:

No new courses or teaching resources are required. Nine of the ten courses included in the certificate are currently offered by the School of Earth, Environment and Society (formerly the School of Geography and Earth Sciences); the remaining course is offered through the Department of Health Aging and Society.

PROPOSED CALENDAR INFORMATION:**Concurrent Certificate in Urban Studies & Planning****Faculty of Science**

The Concurrent Certificate in Urban Studies and Planning is administered by the School of Earth, Environment and Society (formerly the School of Geography and Earth Sciences).

General Science Building, Room 206, ext. 23534

ugadmin@mcmaster.ca

The Concurrent Certificate in Urban Studies & Planning (USP) will provide students with an opportunity to develop expertise in the related fields of urban geography and urban planning.

CERTIFICATE REQUIREMENTS

Any student in an undergraduate program at McMaster may declare the USP Certificate at the time of graduation providing they satisfy the following requirements.

REQUIREMENTS

18 units

3 units

- ENVSOCY 2UI3 – The Urban Experience

9 units from

- ENVSOCY 3UP3 – Planning our Cities
- ENVSOCY 3MF3 – Urban Field Camp
- ENVSOCY 4UD3 – Special Topics in Urban Planning
- ENVSOCY 4US3 – Sustainable Cities

6 units from

- ENVSOCY 3UW3 – Cities of the Developing World
- ENVSOCY 4LP3 – Transport Policy
- ENVSOCY 4MS3 – Independent Study (on an urban topic)
- ENVSOCY 4MT6 – Senior Thesis (on an urban topic)
- HLTHAGE 4S03 – Health and the Unfairly Structured City

DATE: November 21, 2019

TO: Certificate & Diploma Committee

FROM: M Farquharson, Associate Dean, Academic, Faculty of Science

RE: Proposal for Urban Studies and Planning Certificate

I have had an opportunity to review the Urban Studies and Planning Certificate program submission presented by School of Geography and Earth Science. The Certificate has also been discussed and reviewed by the members of the Academic Policy & Planning Committee within the Faculty of Science. I have determined that it meets all the criteria set out by the Undergraduate Council in its guidelines for diplomas and certificate. On this basis, we endorse this program submission with the support of the Faculty of Science.

The Faculty of Science welcomes the introduction of the Urban Studies and Planning Certificate. The School of Geography has significant expertise in urban research and teaching. The proposed certificate provides an opportunity to formally recognize students' mastery of this body of urban geography and urban planning scholarship, and will provide a solid grounding for students interested in graduate studies and employment in the fields of urban planning and development.

Sincerely,



M Farquharson



School of Graduate Studies

1280 Main Street West
Hamilton, Ontario, Canada
L8S 4L8

Phone 905.525.9140
Ext. 23679
Fax 905.521.0689
<http://www.mcmaster.ca/graduate>

To : Senate

From : Christina Bryce
Assistant Graduate Secretary

Re : Report from Graduate Council

At its meeting on January 21st Graduate Council approved the following for recommendation to Senate:

For Approval:

1. Research Plagiarism Checking Policy

The Research Checking Policy sets the expectation for the responsible conduct of research at the University and provides a framework for using research plagiarism checking software.

(attachment)

2. Faculty of Business

Professional Accountancy

Change to Admission Requirements (G.Dip.)

The program added a statement to their admission requirements noting that applicants must have at least a B+ average in their final year in the all courses in or related to the accounting discipline. The change is intended to fully align the program with the School of Graduate Studies admission requirements and ensure that candidates can successfully complete the graduate diploma and the requirements in pursuit of their Chartered Professional Accountants (CPA) designation.

This change will be effective May 1st, 2020 and will be included in the next Graduate Calendar.

For Information:

3. Faculty of Business

M.B.A. – Blended Learning Part-Time

Change to Course Requirements and Calendar Copy

The program proposed moving an elective course from term 8 to term 9 of the program, added 6 new blended learning elective options and corrected the name of a project in their calendar copy.

This change will be included in the next Graduate Calendar, effective September 2020.

Health Management (M.H.M.)

Change to Calendar Copy

The program proposed edits to their calendar copy to provide clarity within the degree requirements section for part-time and full-time students when selecting courses.

This change will be included in the next Graduate Calendar, effective September 2020.

Professional Accountancy

Change to Grading Scale (G.Dip)

The program proposed a change in the grading scale used by the program to comply with the standard School of Graduate Studies grade scale. This is intended to ensure candidates can successfully complete the requirements in pursuit of the CPA designation.

This change will be included in the next Graduate Calendar, effective September 2020.

4. Faculty of Engineering

Electrical and Computer Engineering

Change to Course Requirements (Ph.D.)

The program proposed a reduction in the number of required courses for Ph.D. students already holding a Master's degree from 4 to 3 and that the number of required courses for Ph.D. students transferring from the M.A.Sc. program or directly entering with a Bachelor's degree be reduced from 8 to 6. The change is the result of discussion within the department and surveys of students related to the optimal balance between graduate courses providing required background knowledge for the thesis research and time for doctoral students to spend on their thesis research projects.

This change will be included in the next Graduate Calendar, effective September 2020.

5. Faculty of Social Sciences

Anthropology

Change to Course Requirements and Calendar Copy (M.A., Ph.D.)

The program formalized a professional development workshop into a course and added it to the requirements for degree completion for both Masters and Ph.D. students.

This change will be included in the next Graduate Calendar, effective September 2020.

Economics

Change to Comprehensive Examination, Program Requirements and Calendar Copy (Ph.D.)

The program proposed three changes in response to recommendation arising from their IQAP review. The first was a change to the specializations available for their comprehensive examination, allowing the addition areas of specialization in which the department has research strength, with the approval of the graduate chair. The second was the creation of the requirement of a research paper for students after their comprehensive, which is a standard practice in departments at comparator institutions and is intended to enhance the research experience of Ph.D. students within the program. The final change

proposed was the creation of an active researcher milestone, to be achieved on an annual basis by post-comprehensive students until thesis submission and is intended to nurture students at the thesis stage and more deeply engage them in the research activities of faculty. To achieve the milestone students will need to demonstrate regular attendance at departmental seminars, Ph.D. workshops and the like. The evidence of participation will be reviewed by the supervisory committee annually and the graduate chair will review the agreement between the committee and student of how this milestone will be achieved to ensure consistency across committees and administrative oversight.

These changes will be included in the next Graduate Calendar, effective September 2020.

Labour Studies

Change to Calendar Copy (Ph.D. and M.A.)

The program revised their calendar copy to provide a better description of the offerings available from the School of Labour Studies. For the Masters program they added some language to clarify timelines and expectations between the major research paper and thesis options and at the Ph.D. level they change some language to clarify the comprehensive examination process.

This change will be included in the next Graduate Calendar, effective September 2020.

Social Work

Change to Calendar Copy M.S.W.)

The program added language in their calendar copy about practicum planning and added language noting that advanced credit was also available for students who had completed the Critical Leadership diploma (it had previously only referenced the Community-Engaged Research and Evaluation graduate diploma).

This change will be included in the next Graduate Calendar, effective September 2020.

6. New Scholarship

NAME OF FUND: Khyentse Foundation Graduate Scholarship in Buddhist Studies

TERMS OF REFERENCE FOR FUND:

Established in 2019 by the Khyentse Foundation. To be awarded by the School of Graduate Studies to a Ph.D. student enrolled in the Department of Religious Studies who, on the recommendation of the Director of the Centre for Buddhist Studies, demonstrates excellent academic achievement and is conducting research in Buddhist Studies.

Complete Policy Title:
Research Plagiarism Checking Policy

Policy Number (if applicable):

Approved by:
Senate

Date of Most Recent Approval:
Pending approval on February 12, 2020

Date of Original Approval(s):

Supersedes/Amends Policy dated:

Responsible Executive:
Vice Provost and Dean of Graduate Studies

Policy Specific Enquiries:
[Vice Provost and Dean of Graduate Studies](#)

General Enquiries:
[Policy \(University Secretariat\)](#)

DISCLAIMER: *If there is a Discrepancy between this electronic policy and the written copy held by the policy owner, the written copy prevails.*

INTRODUCTION

1. This Policy is meant to be read in conjunction with the [Research Integrity Policy](#) and the [Academic Integrity Policy](#). This document is not intended to supersede them.
2. The *Research Integrity Policy* sets the expectations for the responsible conduct of research at the University. All those conducting research under the auspices of McMaster University are responsible for familiarizing themselves with the Research Integrity Policy.
3. The definitions and the roles and responsibilities as defined in the [Research Integrity Policy](#) apply to this Policy. For the purposes of interpreting this Policy, readers are specifically directed to review the definitions of Research, Research Documents, Plagiarism, and Self-Plagiarism, and the roles and responsibilities of Researchers, Supervisors (both Academic and Employment), and Graduate Students.

This policy applies to all members of the McMaster community, including faculty, graduate and undergraduate students, postdoctoral and clinical fellows, and staff. This Policy is intended to provide researchers with a technical solution to check all Research Documents for plagiarism in their work, such as major research papers, thesis documents, scholarly articles, and other research materials as deemed necessary. This policy does not cover coursework.

4. All Research Documents to be seen publicly should normally be checked prior to publication to ensure that they meet the University's standards for research integrity. Furthermore, it is expected that public disclosure will only occur after the Research Documents satisfy the requirements of any intellectual property agreement related to the research.
5. The Office of Academic Integrity is the administrative office responsible for assisting instructors, students and staff with issues of academic integrity and research integrity.
6. The McMaster Industry Liaison Office (MILO) provides assistance in understanding how intellectual issues may be intersect with aspects of academic and research integrity.

PLAGIARISM CHECKING SOFTWARE

7. The plagiarism checking software provided by the University is an online subscription-based tool that compares a submitted research document to other documents in its database for similarities. The software does not determine plagiarized content but rather highlights similarities with other sources.
8. It is the expectation of the University that researchers review any similarities identified by the software with any contributors to the research document, and determine whether changes are necessary before public release.
9. The selected plagiarism checking software used under this Policy will not archive a copy of the submitted research document, which is different from some plagiarism checking software, such as Turnitin. The copyright ownership of the research document will not be affected by its submission to the plagiarism checking software provided by the University.

PROCEDURES

10. Each Faculty shall clearly publicize this Policy in their program handbooks and central websites, noting any additional and/ or stricter requirements that may be in place within that Faculty.

Submitting a Research Document (excluding theses)

11. It is recommended that the submitter be listed as the corresponding author of the research document though any author who identifies the University as their affiliation in that document may check using the plagiarism checking system with the permission of the other authors.
12. It is recommended that the submitter notify the other authors, preferably early in the preparation of the document, that the University has a policy urging plagiarism checking prior to being sent to the journal or society or other scholarly body accepting the document for public disclosure.
13. It is the responsibility of the submitting researcher to review the report by the plagiarism checking system.
14. Reports showing a low similarity score are likely attributed to the software detecting unintended matching content and can normally be corrected before public release. Instances of high similarity scores being reported by the plagiarism checking system do not necessarily mean that plagiarism/self-plagiarism have occurred however, the Office of Academic Integrity should be consulted if there are concerns regarding research misconduct.

Submitting a Graduate Thesis

15. It is expected that all graduate theses, whether Masters or Doctoral that will ultimately be seen by the public shall be checked for plagiarism in compliance with this Policy.
16. Theses shall be checked before being submitted to MacSphere or before being sent to an external reviewer. Since the plagiarism checking system does not need to maintain an archived copy of the thesis, copyright ownership is not affected by this academic requirement. Rare exemptions may be granted with the approval of a Faculty's Associate Dean of Graduate Studies where an alternative method of plagiarism checking is necessary.
17. Normally, the graduate student who owns the thesis shall request access to the plagiarism checking system through the University's subscription. The submission folder created for the student on the plagiarism checking site will allow both the student and Academic Supervisor to see the originality score of the thesis submitted for checking.
18. The student may make changes to their thesis and re-submit it a second time to ensure no concerning similarities are found. A student may not repeatedly submit revision after revision of their thesis.
19. The Academic Supervisor bears the responsibility of addressing allegations of academic and/or research misconduct with the Office of Academic Integrity should they believe that misconduct (as defined in the policies regarding academic and research integrity) has occurred.

20. The Academic Supervisor of the student must see the plagiarism checking similarity report and approve the thesis before the thesis may be given to the examining committee or external reviewers.
21. It is recommended that the supervisor retain a copy of the plagiarism checking similarity report should it be needed at a later time; a copy of the report should ideally be retained for at least three years or two years after the date the thesis is finally submitted to MacSphere, whichever is longer. In rare cases, the Departmental Chair or their delegate may approve the thesis based on the plagiarism checking similarity report instead and retain a copy of the report per the time limit mentioned above.
22. A thesis may not be sent to the examining committee until it has been checked by the plagiarism checking system. In rare cases where the software is inaccessible (for example, the subscription has expired or the University has exceeded its allocated number of submissions), a Faculty's Associate Dean of Graduate Studies may approve the thesis to be sent to the examining committee when the issue cannot be corrected in a timely manner.
23. The student understands and approves by following this action that the Associate Dean will submit the thesis to the plagiarism checking system once it is accessible again. The Academic Supervisor of the graduate student may submit the student's thesis to the plagiarism checking system themselves but only with written permission of the student.



SCHOOL OF GRADUATE STUDIES

RECOMMENDATION FOR CHANGE IN GRADUATE CURRICULUM - FOR CHANGE(S) INVOLVING DEGREE PROGRAM REQUIREMENTS / PROCEDURES / MILESTONES

IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:

1. This form must be completed for **ALL** changes involving degree program requirements/procedures. **All** sections of this form **must** be completed.
2. An electronic version of this form (must be in MS WORD **not** PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).
3. A representative from the department is **required to attend** the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.

DEPARTMENT		Accounting and Financial Management Services Area, DeGroote School of Business			
NAME OF PROGRAM and PLAN		Graduate Diploma in Professional Accountancy program			
DEGREE					
NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)					
Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No					
CREATION OF NEW MILESTONE <input type="checkbox"/>					
CHANGE IN ADMISSION REQUIREMENTS	<input checked="" type="checkbox"/>	CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE	<input type="checkbox"/>	CHANGE IN COURSE REQUIREMENTS	<input type="checkbox"/>
CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR		EXPLAIN:			
OTHER CHANGES	<input type="checkbox"/>	EXPLAIN:			

DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:

The admission requirements are:

- (i) A four-year honours bachelor degree;
- (ii) At least a B- (70 - 72%) average in courses on economics; statistics; corporate finance; introductory, intermediate and advanced financial accounting; introductory, intermediate and advanced managerial accounting; accounting theory; audit and assurance, and taxation with a passing grade ($\geq 60\%$) in each course; and
- (iii) At least a B (73 - 76%) average in each of the last two years of university study.

Candidates from other Canadian universities who have completed the equivalence of the technical and enabling competencies of the CPA PREP will be considered, on a case-by-case basis, for admission to the Graduate Diploma program, subject to an assessment of the detailed course outlines for courses listed under (ii). Candidates must submit the relevant course outlines in their application.

PROVIDE A DETAILED DESCRIPTION OF THE RECOMMENDED CHANGE (*Attach additional pages if space is not sufficient.*)

Proposed Admission Requirements:

The admission requirements are:

- (i) A four-year honours bachelor degree;
- (ii) At least a B- (70 - 72%) average in courses on economics; statistics; corporate finance; introductory, intermediate and advanced financial accounting; introductory, intermediate and advanced managerial accounting; accounting theory; audit and assurance, and taxation with a passing grade ($\geq 60\%$) in each course; and
- (iii) At least a B (73 - 76%) average in each of the last two years of university study.

To comply with the School of Graduate Studies' admission requirements for graduate diplomas, applicants must have at least a B+ average (equivalent to a McMaster 8.5 Grade Point Average (GPA) out of 12) in the final year in all courses in the accounting discipline, or relating to the accounting discipline.

Candidates from other Canadian universities who have completed the equivalence of the technical and enabling competencies of the CPA Preparatory Courses will be considered, on a case-by-case basis, for admission to the Graduate Diploma program, subject to an assessment of the detailed course outlines for courses listed under (ii). Candidates must submit the relevant course outlines in their application.

<p>RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):</p> <p>To ensure that candidates can successfully complete the Graduate Diploma in Professional Accountancy program and the Common Final Exam in their pursuit of the Chartered Professional Accountants (CPA) designation.</p>
<p>PROVIDE IMPLEMENTATION DATE: (Implementation date should be at the beginning of the academic year)</p> <p>May 1, 2020 (Spring/Summer 2020)</p>
<p>ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.</p> <p>n/a</p>
<p>PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):</p> <p>(https://academiccalendars.romcmaster.ca/preview_program.php?catoid=37&poid=19984&returnto=7582)</p> <p>The admission requirements are:</p> <ul style="list-style-type: none"> (i) A four-year honours bachelor degree; (ii) At least a B- (70 - 72%) average in courses on economics; statistics; corporate finance; introductory, intermediate and advanced financial accounting; introductory, intermediate and advanced managerial accounting; accounting theory; audit and assurance, and taxation with a passing grade (≥ 60%) in each course; and (iii) At least a B (73 - 76%) average in each of the last two years of university study. <p>To comply with the School of Graduate Studies' admission requirements for graduate diplomas, applicants must have at least a B+ average (equivalent to a McMaster 8.5 Grade Point Average (GPA) out of 12) in the final year in all courses in the accounting discipline, or relating to the accounting discipline.</p> <p>Candidates from other Canadian universities who have completed the equivalence of the technical and enabling competencies of the CPA Preparatory Courses will be considered, on a case-by-case basis, for admission to the Graduate Diploma program, subject to an assessment of the detailed course outlines for courses listed under (ii). Candidates must submit the relevant course outlines in their application.</p>

CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:
Name: Y. Lilian Chan Email: ylchan@mcmaster.ca Extension: 23974 Date submitted: June 5, 2019

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies,
cbryce@mcmaster.ca

SGS/2013

**REPORT TO SENATE
FROM THE
UNIVERSITY PLANNING COMMITTEE**

1. Establishment of New Program

At its meeting of January 22, 2020, the University Planning Committee approved a new program.

This item is for information.

2. Establishment of “Guidelines for the Governance and Review of Core Research Platforms”

At its meeting on January 22, 2020, the University Planning Committee approved, for recommendation to Senate, the establishment of “Guidelines for the Governance and Review of Core Research Platforms”.

The University Planning Committee now recommends,

That Senate approve the establishment of the policy on Guidelines for the Governance and Review of Core Research Platforms.

3. Proposal for Centre for Clinical Neuroscience (CCN)

At its meeting on January 22, 2020, the University Planning Committee approved, for recommendation to Senate, the establishment of the Centre for Clinical Neuroscience (CCN).

The University Planning Committee now recommends,

That Senate approve the establishment of new joint centre, the McMaster/St. Joseph’s Centre for Clinical Neuroscience (CCN), as an official research centre at McMaster.

**Senate: FOR APPROVAL/INFORMATION
February 12, 2020**

REPORT TO THE UNIVERSITY PLANNING COMMITTEE
from the
UNDERGRADUATE COUNCIL

a. Establishment of New Programs

**i. Honours Bachelor of Applied Science in Sustainable Chemistry and
Honours Bachelor of Applied Science in Sustainable Chemistry Co-op**

At its December 10, 2019 meeting, the Undergraduate Council reviewed and approved a proposal to establish the *Honours Bachelor of Applied Science in Sustainable Chemistry* and *Honours Bachelor of Applied Science in Sustainable Chemistry Co-op* programs. Details of the proposed programs are contained in Attachment I of the circulated report.

It is now recommended,

that the University Planning Committee, approve the establishment of the *Honours Bachelor of Applied Science in Sustainable Chemistry* and *Honours Bachelor of Applied Science in Sustainable Chemistry Co-op* programs for inclusion in the 2020-2021 Undergraduate Calendar, as recommended by the Faculty of Science, and set out in the attached.

University Planning Committee:
FOR APPROVAL January 22, 2020



**NEW PROGRAM PROPOSAL
Sustainable Chemistry
October 2019**

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1 PROGRAM

1.1 PROGRAM DESCRIPTION

Chemistry is often called the “central science” because it interacts with disciplines from physics and engineering to biochemistry and biology, and drives applications that range from business to the environment. The Department of Chemistry & Chemical Biology currently offers two undergraduate programs in Chemistry and in Chemical Biology. Both offer an intense, focused curriculum with little room for electives, and both are designed to prepare students for graduate or professional schools. By contrast, there is less emphasis on preparation for employment directly upon graduation from these undergraduate degrees, or on interdisciplinary studies that broaden the student experience, allow students to explore options in greater width, and focus on the key interactions of chemistry with other disciplines. This is in spite of extensive evidence that there is much demand for these attributes within the modern student body.

The proposed offering in Sustainable Chemistry aims to address these concerns. We envision a program that allows students to explore chemistry while leaving room for both chemistry-related courses and electives. We foresee (but do not require) that students would focus on either preparative chemistry (organic and inorganic) or measurement subdisciplines (physical, analytical and theoretical). This approach releases twelve units during the first three semesters (prior to co-op) compared to the current chemistry program; in the new program, these units can be used for a range of interdisciplinary courses that are relevant to the private sector employment environment. As well, a suite of Sustainable Chemistry courses will be prepared, which focus on environmental, regulatory and safety issues, matters that have a clear relationship to, but transcend, chemistry, and that are in heavy demand in the employment sector (e.g. government employment). The B.A.Sc. designation aligns with these goals, illustrating the greater breadth and applicability of this program relative to the B.Sc. in Chemistry

We anticipate that this program will not have a limited enrolment. However, participation in the co-op version will as usual require success in the co-op admission process. We believe that co-op students from this program will bring a unique and valuable skill set to employers.

More extensive opportunities for experiential placement, research practicum, workplace integrated learning, and thesis work will also be built into the program, and we will endeavour to assist students wherever possible to seek summer employment within the Department or in the chemistry industry.

PROPOSAL PREPARATION AND CONSULTATION PROCESS

The new program was initially proposed in 2018. Several possible permutations, for example including a business add-on, were extensively discussed by the Department’s Undergraduate Curriculum Committee, along with consultations between the Department Chair and the Undergraduate Curriculum Committee Chair with stakeholders within Faculties of Science, Business, and Health Science. By the end of 2018, a final framework for the proposed program had been agreed. Below is timeline for events in 2019 that led from this conceptual framework to the current proposal:

Jan. 2, 2019: Discussions of a program with business separated from current proposed program

Jan. 3, 2019: Program name proposed: Sustainable Chemistry

Jan. 22, 2019: New program sub-committee meets with Associate Dean

Feb. 3-4, 2019: Level I survey developed to gauge interest in program

Feb. 11, 2019: Level I survey executed in CHEM 1AA3 classes

Feb. 21, 2019: Level I survey results show extensive interest in program

Mar. 5, 2019: Department meeting to discuss survey results and program in general

Mar. 7, 2019: Chemistry Chair (GG) meets Dean MacDonald for preliminary discussion
 Mar. 20, 2019: Final version of statement of intent ready
 Mar. 29 et seq.: Discussions with Kate Whalen re new program and Sustainability minor
 Apr. 3, 2019: Statement of Intent circulated to APPC (Academic Planning and Priorities Cttee.)
 Apr. 4, 2019: Statement of Intent circulated to Dean MacDonald
 Apr. 6, 2019: Statement of Intent signed by Dean MacDonald
 Apr. 17, 2019: Statement of Intent signed by Vice-Provost Faculty
 May 13, 2019: Preparation for Program Learning Outcome workshop
 May 13, 2019: Invitations for Focus Groups
 May 24, 2019: Consultation with M. Padden of SGES re impact of new program
 May 28, 2019: Program Learning Outcome workshop
 May 28, 2019: New course codes confirmed (xSC3)
 May 29, 2019: CHEM 2SC3 proposed on Dean's permission for 2019/20 year
 May 31-Jun. 1, 2019: Focus Groups meet
 June 3, 2019: CHEM 2SC3 approved on Dean's permission for 2019/20 year
 June 8, 2019: CHEM 2SC3 added to course list for Sustainability minor
 Aug. 8, 2019: Resources section draft completed and discussed
 Aug. 8, 2019: CHEM 3SC3 and 4SC3 outlines completed
 Sept. 9, 2019: Consultation with the Dean; request for revision was received
 Oct. 24, 2019: Revised document approved by APPC
 Oct. 29, 2019: Final approval (unanimous), Department of Chemistry and Chemical Biology
 Nov. 7, 2019: Revisions accepted at APPC

1.2 CONSISTENCY WITH MCMASTER'S MISSION AND ACADEMIC PLAN

This proposed program enhances Ontario's vision by providing stronger community engagement and skills development elements to add to the already strong creativity, innovation and knowledge drivers in our current offerings. Aspects such as sustainability, the environment, health and safety, chemical hygiene, regulatory affairs and green chemistry will now be addressed, all areas which are of community concern.

Likewise, this new and innovative emphasis on interdisciplinary studies aligns with McMaster's vision, mission and mandate to "serve the social, cultural and economic needs of our community and our society". We will emphasize job skills together with more practical knowledge of sustainable chemistry, which has developed over the last decades, and continues to evolve to positively impact the environment and contribute to remediation. Moreover, novel chemistry can be effectively translated into new economic growth within the local, provincial and national sectors.

The proposed program will offer enhanced opportunities for students to undertake a sustainable-chemistry focused degree, yet including interdisciplinary study, along with a problem- and inquiry-based approach to learning that aligns with McMaster's signature pedagogies. Emphasis on environmental and green chemistry, for example, aligns with McMaster's aspiration of "advancing human and societal health and wellbeing," while enhanced opportunities for experiential- and self-directed learning will be incorporated in accord with McMaster's approach to innovation in teaching and learning.

By emphasizing jobs and economic development to a greater extent than our traditional programs, the new offering will build graduates who are trained in sustainable chemistry with experience in regulatory affairs, and who will offer an exceptional skill set in this area to potential employers.

This new program offers a significant departure from the traditional approach to teaching chemistry, allowing expanded options and a flexible learning experience for students. This new program aligns with two strengths in areas identified in previous SMAs as areas for growth at McMaster. In particular, expanded opportunities will be provided in this program for experiential and work-integrated learning as well as research.

The proposed program will begin in level II, and will draw students primarily from level I Science. We expect to attract science-oriented students with interdisciplinary interests in areas such as sustainability, environmental science, public policy and governmental regulations, health and safety, and the industrial job market.

The expected outcomes will be focused towards the broad industrial job market where chemical knowledge can be applied to new sustainability challenges in many sectors.

1.3 PROGRAM LEARNING OUTCOMES

Degree Level Expectations for all Programs Offered by the Department

Graduates from the undergraduate programs of the Department of Chemistry and Chemical Biology will be able to:

- A.1. Apply chemical principles to the solution of multidisciplinary problems and, in this way, demonstrate that chemistry is a central science that is connected to disciplines as diverse as the life sciences, medicine, physics, geology, astronomy, mathematics, statistics and engineering.
- A.2. Combine and apply the principles of Analytical, Inorganic, Organic and Physical Chemistry, to understand contemporary chemical research and solve problems using a combination of methods and principles from various sub-disciplines.
- A.3. Predict the structure and properties (physical and chemical) of simple substances based on knowledge of their constituent elements and functional groups.
- A.4. Work in a safe manner by assessing the hazards associated with chemicals, reactions and laboratory equipment, and proposing and implementing safe work procedures that include the appropriate use of safety equipment; dispose of chemicals in a safe and environmentally responsible manner.
- A.5. Design and execute synthetic routes to target substances using known reagents and methods including solution phase, air-sensitive and solid-state techniques.
- A.6. Relate the outcome of a physical or chemical process to the factors that determine its natural direction as well as its speed and the extent to which such change can happen.
- A.7. Predict reactivity and mechanisms based on known reactions and a compound's functional groups; illustrate mechanisms using standard conventions such as curly arrows in organic chemistry and reaction co-ordinate diagrams; interpret experimental data, such as rate laws, in terms of these mechanisms; design experimental approaches to identify and quantify reaction products.
- A.8. Apply the principles and mechanisms of catalysis to design and execute novel reactions.
- A.9. Apply modern spectroscopic techniques such as Infrared, ultraviolet-visible absorption and luminescence, atomic absorption/emission, nuclear magnetic resonance and mass spectrometry for the characterization of substances, and integrate the results in order to establish the identity of unknown species and mixtures.
- A.10. Select and apply modern analytical methods such as gas chromatography, high-performance liquid chromatography, and capillary electrophoresis to quantitatively establish the composition of a substance or mixture.
- A.11. Interpret experimental data taking into account the limits on the type of information provided by different experimental techniques, as well as the limits of experimental

accuracy and precision; validate quantitative methods and assess the quality of data based on statistical criteria.

- A.12. Use databases and other library resources to retrieve chemical information. Assess the quality of information, distinguish primary from secondary sources and use them accordingly to discover and evaluate the current state of research in specific chemistry fields
- A.13. Use proper citations to acknowledge others' contributions and employ copyright protection rules.
- A.14. Plan and execute the steps necessary to reproduce results from the primary literature.
- A.15. Propose original solutions to chemical problems using literature sources and knowledge of experimental methods in chemistry; assess the relative merits and drawbacks of alternative approaches based on the material and labour requirements, effectiveness of the methods, anticipated quality of the data, and cost.
- A.16. Design an experimental solution to a problem that includes realistic objectives, critical milestones and an appropriate distribution of tasks within the members of a scientific team.
- A.17. Effectively communicate scientific ideas and results both orally and in writing to specialist and non-specialist audiences in records of laboratory work, written reports, posters and lectures.
- A.18. Recognize that most chemical theories and models are built from simplifying assumptions and can be subject to updates and revision.
- A.19. Recognize the limits of their own understanding, the knowledge frontiers of the discipline and the most significant topics of current research.
- A.20. Assess his/her own performance in the completion of an experimental project, appraise his/her own strengths and weaknesses.
- A.21. Demonstrate initiative, personal responsibility, accountability, integrity and social responsibility; work effectively with others.
- A.22. Conduct work in the chemical sciences in a manner that is ethical, responsible and respectful of the environment.

Degree Level Expectations Specific to Chemistry Programs

In addition, graduates of the Honours Chemistry program will be able to:

- B.1. Explain the physical principles that underlie chemical phenomena and apply the corresponding quantitative models to interpret and predict the outcome of chemical and chemistry-relevant physical processes.
- B.2. Apply the quantum mechanical model of atoms and molecules to explain the properties of matter.
- B.3. Relate the similarities and differences between chemical elements to their positions in families, periods and blocks of the periodic table; examine trends in their properties; assess the feasibility of proposed (not yet observed) forms and combinations of the elements.
- B.4. Interpret the results of advanced spectroscopic (e.g. Raman) and structural (e.g. X-ray diffraction) methods used in the characterization of simple substances.
- B.5. Contrast alternative models used to account for the reactivity, spectroscopic and magnetic properties of compounds of the transition elements

Degree Level Expectations Specific to Chemical Biology Programs

In addition, graduates of the Honours Chemical Biology program will be able to:

- C.1. Integrate their knowledge of chemistry, cell biology, molecular biology, biochemistry and evolution, to investigate and solve problems in Chemical Biology.

- C.2. Apply knowledge of the biological counterparts of conventional organic reactions and their common mechanisms to explain biological processes; predict molecules' most likely biosynthetic pathways based on their structure.
- C.3. Interpret experimental data in terms of the intermolecular forces that determine biomolecular interactions, particularly those involving macromolecules, and apply that understanding to problems in biology and medicine.
- C.4. Apply knowledge of biological catalysts (enzymes and catalytic nucleic acids) to explain catalytic mechanisms and design inhibitors, and apply those principles to design disease treatments and explain biological processes.
- C.5. Design and interpret experiments that apply modern analytical methods such as capillary electrophoresis to interactions between small molecules and macromolecules, and to molecular interactions with whole cells and whole organisms.

Degree Level Expectations Specific to the new Sustainable Chemistry Programs

- D.1. Assess the short and long term impact of chemical research and industrial activity on society, health, quality of life and the environment by drawing on interdisciplinary knowledge.
- D.2. In anticipating their professional activities, apply the principles of green chemistry.
- D.3. Design, implement and advocate for sustainable technological solutions to practical problems.
- D.4. Design, execute and evaluate processes compliant with applicable regulatory frameworks.

The lists of expectations shown above demonstrate that Sustainable Chemistry is distinct from the programs currently offered by the Department of Chemistry and Chemical Biology. The expectations specific to the proposed program were reviewed and approved by the focus groups described in section 3.1. The B.A.Sc. designation reflects these distinctive elements.

1.4 CONSISTENCY WITH DEGREE LEVEL EXPECTATIONS

McMaster University has adopted the Undergraduate University Degree Level Expectations (UUDLEs) that were developed by the Ontario Council of Academic Vice-Presidents and endorsed by the Council of Ontario Universities in December 2005. These degree-level expectations are classified within six distinct categories, the full descriptions of which are provided in the [Policy on Academic Program Development and Review](#). The following table summarizes the alignment of the Departmental expected learning outcomes with the University's.

Table 1. Alignment of departmental learning outcomes with the McMaster's

McMaster's and Ontario's expectations	Corresponding entries in the list of DLEs
Depth and breadth of knowledge	A.1, A.2, A.6-A.11, B.1-B.5, C.1-C.5, D1-D4
Knowledge of methodologies	A.3-A.5, A.12-A.14, B.2, B.4, C.1, C.4, C.5, D.2-D.4
Application of knowledge	A.1, A.3-A.12, A.14-A.16, B.1-B.5, C.1-C.5, D1-D4
Communication skills	A.17, D3, D4
Awareness of limits of knowledge	A.1, A.2, A.12, A.18-A.20, D.1-D.3
Autonomy and professional capacity	A.4, A.13, A.15, A.16, A.20-A.22, C.5, D.1-D.4

1.5 DEMAND FOR PROGRAM

1.6 EVIDENCE OF SOCIETAL/LABOUR MARKET NEED

Several informal discussions with professional chemists employed externally to the University early in the program development process both revealed unbridled enthusiasm for the proposed program, and helped guide content development. In order to further understand the factors that contributed to the perceived success of the program, two workshops were organized in late May, in which externals including graduates of McMaster's Honours Chemistry program as well as representatives from local industry participated. Several factors were identified as strengths of the proposed program, most notably including the ability to select (a) sub-discipline(s) of focus at an earlier stage, and the development of critical transferrable skills through the new experientially-focused courses in sustainable chemistry. Externals also noted that the proposed skill set would align well with talents that were highly sought in industrial settings such as co-op. There was also discussion about students undertaking shorter experiential placements in industrial settings, for example through single-semester courses such as CHEM 3EP3 (experiential placement), or even shorter components of sustainable chemistry courses. The B.A.Sc. designation emphasizes alignment with labour market need.

I. EVIDENCE OF STUDENT DEMAND

Student demand was quantitatively evaluated first through a survey of students in the level I chemistry course, CHEM 1AA3, in February 2019. Because of McMaster's gateway program structure in the Faculty of Science in level I, at this time students were preparing to select their programs for level II and beyond, so interest in their future careers was high, contributing to an good response to the survey. The survey received 271 responses from a possible total of 1200 students enrolled in this course; of those 271, 80 indicated they already plan to choose a program in Chemistry and Chemical Biology; 90 said NO, they would not choose one of our Department's existing programs; and 96 said they don't know. Next, we asked each of those groups if they would consider enrolling in a Sustainable Chemistry program, if it were available. Here, 70 % of those who chose a CCB program said "yes", and most impressive, 50% of the Not-Chemists said yes, plus 70% of the "I don't know" responders said yes. These results amount to 168 potential applicants from the 271 surveyed, indicating that over 60% of respondents considered the proposed program a contender.

A second indicator of interest among students comes from enrolment in CHEM 2SC3 during the 2019/20 academic year. As the program planning evolved, it became apparent that there was demand for a sustainable chemistry course within the current student body, even without the proposed program. Accordingly, CHEM 2SC3 was added to our offerings under Dean's permission, albeit too late to be included in the calendar process. Thus, we anticipated that not all students would identify this course as an option, potentially reducing enrolment to allow the instructor to have a manageable class size. In contrast, uptake has been substantial, with 27 students already enrolled (as of Aug. 27, 2019) for the offering in January 2020. We anticipate that this number will only go up as students become aware of the offering, and change their course selections over the Fall 2019 semester.

Both these pieces of evidence point to a strong interest in this area, and suggest that our enrolment estimates (25 in year 1, 50 students/year thereafter) are reasonably conservative.

II. JUSTIFIABLE DUPLICATION

Although several international institutions offer M.Sc. programs aligned with sustainable chemistry (e.g. Valencia, Venice), Bachelor's degrees are less common, although several have emerged in the UK (York has a B.Sc. (Hons.) in chemistry, green principles and sustainable processes; Dublin has Chemistry with Environmental and Sustainable Chemistry). We are not aware of similar programs in Ontario, although some institutions offer courses in sustainable chemistry (e.g. Queen's, McGill). Thus, our approach will offer a unique program in which students can focus on sustainable issues within chemistry, but also learn about sustainability in a broader context such as through taking sustainability courses that are not focused on chemistry, but which are already offered through the sustainability minor at McMaster.

1.7 DEGREE NOMENCLATURE

The program will lead to an B.A.Sc. (Hons.) degree in Sustainable Chemistry. This designation reflects the overall academic rigour and graduation expectations associated with the program, while reflecting the specialization that the graduands have undertaken within chemistry and the breadth of sustainability courses. The applied designation emphasizes the more practical degree level expectations (p.8) and alignment with employment (p.9) within this program

2 ADMISSION & ENROLMENT

2.1 ADMISSION REQUIREMENTS

Like most B.Sc. programs in the Faculty of Science, Sustainable Chemistry will begin in level-II. level-I Science instruction at McMaster is organized in four “gateway” programs: Chemical & Physical Sciences, Environmental & Earth Sciences, Mathematics & Statistics and Life Sciences. Each level I program has its own admission requirements (high school courses and cut-off grade average). This structure is not meant to restrict access to any Bachelor's programs; therefore, all students can apply to level II Sustainable Chemistry as long as they satisfy the admission requirements. Since the implementation of this structure, the Department has drawn students from the Life Sciences and Chemical & Physical Sciences gateways in approximately equal numbers. While it is expected that those will remain the main sources of students for the new program; it is expected that Sustainable Chemistry will be especially interesting to students in the Life Sciences gateway.

Specifically, admission to level II of the Sustainable Chemistry Program will require completion of any level I program (30 units of academic credit, i.e. ten 3-unit courses) with a Grade Point Average of at least 5.0 including:

6 units from

- CHEM 1A03 – Introductory Chemistry I
- CHEM 1AA3 – Introductory Chemistry II
- CHEM 1E03 – General Chemistry for Engineering I

3 units from

- MATH 1A03 – Calculus for Science I
- MATH 1LS3 – Calculus for the Life Sciences I

- MATH 1M03 – Calculus for Business, Humanities and the Social Sciences
- MATH 1X03 – Calculus for Math and Stats I
- MATH 1ZA3 – Engineering Mathematics I

6 units from

- The Science I Course List

Courses in level I will provide the foundation on which the Honours B.Sc. program is built; they also act as the bridge between high school and advanced university courses. As shown in Table 2, the level I courses required for admission to the program directly contribute to fulfilling the departmental learning expectations. Naturally, Chem 1A03 and 1AA3 introduce multiple concepts that will be expanded in later years. Both courses will be updated to introduce topics relevant to Sustainable Chemistry in order to raise awareness of the new program amongst students and contribute to recruitment. One Mathematics course provides the numerical skill sets that are highly desirable to fully understand the physical principles and quantitative models that underlie and explain chemical phenomena; as such the proposed program requires at least one of these courses from level I. Admission to Honours Sustainable Chemistry will require a minimum cumulative average (C.A.) of 5.0/12 but students with at least 4.5 could be admitted under probation and would be expected to attain 5.0 in the subsequent academic year. In any case, the combined average of CHEM 1A03 and CHEM 1AA3 must be at least 6.0.

Table 2. Specific admission requirements for level-II of the proposed program.

Admission Requirements for Honours Sustainable Chemistry	Alignment to Departmental Learning Objectives
CHEM 1A03(or 1E03)	A.1-A.4, A.6, A.19-A.22, D.1-D.3
CHEM 1AA3	A.1-A.4, A.6, A.7, A.19-A.22, D.1-D.3
MATH 1A03 (or 1LS3, or 1M03, or 1X03, or 1ZA3)	A.1, A.18, D.1-D.3
2 Courses from the Science I course list	A.1, variable
5 Elective Courses	

2.2 ENROLMENT PLANNING AND ALLOCATIONS

The following enrolment targets are based on a survey intended to assess interest of current Science students in the new program (see 1.2) as well as current and planned Departmental resources (see 6.1).

Table 3. Expected enrolment in Sustainable Chemistry.

Academic Year	Cohort Year 1	Cohort Year 2	Cohort Year 3	Total Enrolment	Maturity
20-21	25			25	
21-22	50	25		75	
22-23	50	50	25	125	
23-24	50	50	50	150	150

2.3 ALTERNATIVE REQUIREMENTS

Students already registered at McMaster and applicants who transfer to McMaster from other postsecondary institutions will be eligible for admission to level II of the Sustainable Chemistry Program if they have completed a set of courses equivalent to those in the list of Admission requirements. Course equivalencies will be determined by the Office of the Registrar and the Faculty of Science.

3 STRUCTURE

3.1 ADMINISTRATIVE, GOVERNANCE AND COMMUNICATION

The program will be administered by the Department of Chemistry and Chemical Biology and by the Faculty of Science. The Associate Chair (Undergraduate) will coordinate the program, oversee the curriculum, and provide student and faculty support. The Associate Chair (Undergraduate) will liaise and coordinate with outside experts, many of whom will provide guest lectures and serve as mentors on group projects. The Associate Chair (Undergraduate) will report to the Chair, who will in turn report to the Dean of the faculty. The Associate Chair (Undergraduate) will work in collaboration with the Associate Dean of Science (Academic) and provide information to APPC. Communications related to the program will originate from the Associate Chair or the Associate Dean (Academic).

The Undergraduate Curriculum Committee in Chemistry and Chemical Biology will develop curriculum recommendations for the program. Proposed changes to the Program and curriculum are presented for approval to APPC in the Faculty of Science.

As the program develops, an Industry Advisory Committee will be assembled, and chaired by an external member of industry. We have already taken steps to establish this committee by hosting two industry/government partner focus groups in June, 2019, with participants having agreed in principle to participate in the Advisory Committee. Members of the Industry Advisory Committee will include the Associate Chair (Undergraduate), and senior industry representatives from the chemical industry. The function of the Industry Advisory Committee will be to provide feedback on the Program's objectives and activities as they relate to current industry needs in the sustainable chemistry field and provide updates on technological advances as well as to secure connections to the chemical industry and government. An Industry Advisory Panel consisting of external stakeholders has existed for several years in the School of Biomedical Engineering.

The Department has already taken steps toward establishing the Advisory Committee by hosting two focus groups with potential industry/government partners in June 2019. The event gathered

input and perspectives on the development of the proposed program and invited participation in guest lectures of Sustainable Chemistry courses.

3.2 STRUCTURE AND REGULATION

The Associate Chair (Undergraduate) will be primarily responsible for overseeing the program in collaboration with the Associate Dean of Science (Academic). Each will meet with their respective Curriculum and Policy Committees to assess the program, courses and enrolments. The Associate Chair (Undergraduate) will be responsible for preparation of the documentation required for the cyclic IQAP reviews. Based on student feedback, the curriculum and/or the level of support and guidance will be routinely adjusted to meet the needs of the students, teaching assistants, faculty and the learning objectives of the program.

All students in the Program will take three courses in sustainable chemistry that highlight the sustainability component of the program. These courses ensure that all Program Learning Outcomes for the program, as outlined in Section 1.4, are met. Each course specific to the program is offered at a level that is appropriate to each students' expected knowledge base and provides the necessary content for each student to appropriately advance throughout the program. Regardless of the chosen discipline, enrolled students will have the necessary pre-requisites (from earlier core courses) to meet the learning outcomes for the SC3 core courses.

4 CURRICULUM AND TEACHING

4.1 PROGRAM CONTENT

Requirements

The program will start in level II and require 90 units to be completed over 3 years after level I. Program requirements by academic year will be as follows:

Level II: 30 Units

3 Units from CHEM 2SC3 - Sustainable Chemistry: Green Chemistry
12 Units from Level II Chemistry (Chem 2A03, 2II3, 2LB3, 2OD3, 2OG3, 2P03, 2Q03)
9 Units from elective courses
6 Units from course list 2

Level III, 30 units

3 Units from CHEM 3SC3 - Sustainable Chemistry: Natural Resources and Energy or 4SC3 – Sustainable: Chemistry Analysis and Regulation
12 Units from Level II-IV Chemistry or Chemical Biology (course list 1)
9 Units from elective courses
6 Units from course list 2

Level IV, 30 units

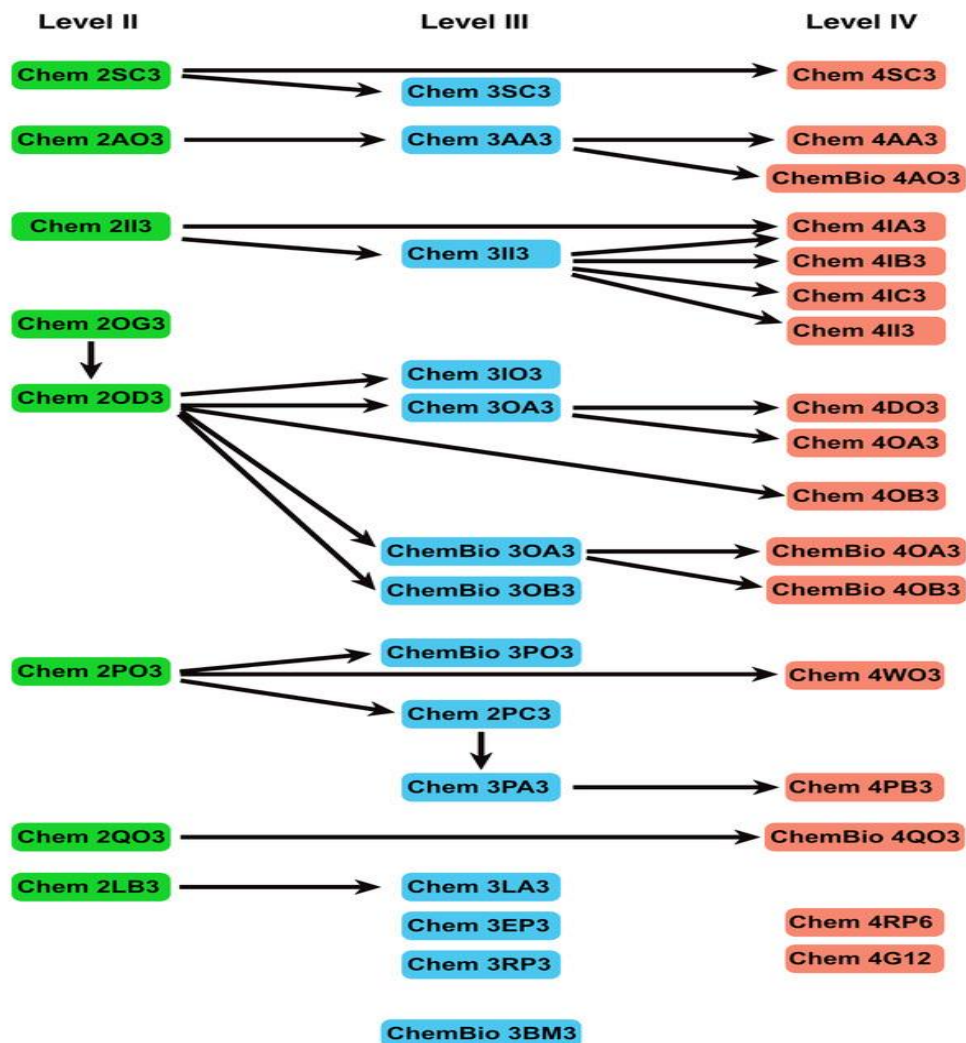
3 Units from CHEM 4SC3 - Sustainable Chemistry: Analysis and Regulation
12 Units from Level II-IV Chemistry or Chemical Biology (course list 1)
9 Units from elective courses
6 Units from course list 2

In order to fulfill the requirements of Level II, III and IV Chemistry and Chemical Biology, the following courses will be available to students registered in Sustainable Chemistry:

Course List 1:

- CHEM 2A03 - Quantitative Chemical Analysis
- CHEM 2II3 - Introductory Inorganic Chemistry: Structure and Bonding
- CHEM 2LB3 - Tools for Chemical Discovery
- CHEM 2OD3 - Synthesis and Function of Organic Molecules
- CHEM 2OG3 - Structure and Reactivity of Organic Molecules
- CHEM 2P03 - Applications of Physical Chemistry
- CHEM 2Q03 - Inquiry for Chemistry
- CHEM 3AA3 - Instrumental Analysis
- CHEM 3BC3 – Bad Chemistry
- CHEM 3EP3- Advanced Chemistry Placement
- CHEM 3II3 - Introduction to Transition Metal Chemistry
- CHEM 3LA3 - Strategies for Chemical Discovery
- CHEM 3I03 - Industrial Chemistry
- CHEM 3OA3 - Organic Synthesis
- CHEM 3PA3 - Quantum Mechanics and Spectroscopy
- CHEM 3PC3 - Mathematical Tools for Chemical Problems
- CHEM 3RC3 - Radioisotopes in Medicine
- CHEM 3RP3 - Research Practicum in Chemistry
- CHEM 4AA3 - Recent Advances in Analytical Chemistry
- CHEM 4D03 - Organic Structure and Synthesis
- CHEM 4G12 - Senior Thesis
- CHEM 4IA3 - Physical Methods of Inorganic Structure Determination
- CHEM 4IB3 -Bio-Inorganic Chemistry
- CHEM 4IC3 - Solid State Inorganic Materials: Structures, Properties, Characterization and Applications
- CHEM 4II3 - Transition Metal Organometallic Chemistry and Catalysis
- CHEM 4OA3 - Natural Products
- CHEM 4OB3 - Polymers and Organic Materials
- CHEM 4PB3 - Computational Models for Electronic Structure and Chemical Bonding
- CHEM 4RP6 - Research Project in Chemistry
- CHEM 4W03 - Natural and Synthetic Materials
- CHEMBIO 3BM3 - Implanted Biomaterials
- CHEMBIO 3OA3 - Organic Mechanistic Tools for Chemical Biology
- CHEMBIO 3OB3 - Structural Elucidation of Natural Products and Small Molecules
- CHEMBIO 3P03 - Biomolecular Interactions and Kinetics
- CHEMBIO 4Q03 - Peer Tutoring in Chemical Biology or Chemistry
- CHEMBIO 4A03 - Bio-Analytical Chemistry and Assay Development
- CHEMBIO 4OA3 - Natural Products
- CHEMBIO 4OB3 - Medicinal Chemistry: Drug Design and Development

Students will be able to select any of those courses as long as the corresponding pre-requisites are satisfied, as shown in the following map:



The Course List for Sustainable Chemistry includes:

- BIOLOGY 3ET3 - Ecotoxicology
- EARTHSCI 2GG3 - Natural Disasters
- EARTHSC 3CC3 - Earth's changing climate
- EARTHSC 4CC3 - Stable Isotopes in Earth and Environmental Systems
- ENVIRSC 2B03 - Soils and the Environment
- ENVIRSC 2C03 - Environment and Surface Climate Processes
- ENVIRSC 2Q03 - Introduction to Environmental Geochemistry
- ENVIRSC 2WW3 - Water and the Environment
- ENVIRSC 3O03 - Contaminants, Fate and Transport
- ENVIRSC 4EA3 – Environmental Assessment
- ENVIRSC 4N03 - Global Biogeochemical Cycles
- ENVSOCTY 2EI3 - Environmental Issues
- ENVSOCTY 3EC3 - Environmental Catastrophes
- ENVSOCTY 3ER3 - Sustainability and the Economy
- ENVSOCTY 3EE3 - Energy and Society
- ENVSOCTY 4HH3 - Environment and Health
- HTHSCI 4MS3 - Toxic Tales: The Social Lives of Molecules
- LIFESCI 2X03 – Environmental Change and Human Health
- POLSCI 3GC3 - Global Climate Change
- STATS 2B03 - Statistical Methods for Science
- SUSTAIN 2S03 - Evaluating Problems & Sustainable Solutions
- SUSTAIN 3S03 - Implementing Sustainable Change

As in the case of the current Chemistry and Chemical Biology undergraduate programs, there will be a co-op version of Sustainable Chemistry that will include four 16-week work terms. This addition will result in the academic work done during the last two years in the regular program being distributed in three years. The work terms will take place during the winter and summer of the third year, the summer of the fourth year and the fall of the fifth year. Anticipated enrolment for co-op is 10-15 students per year, a level that has been approved by Science Co-op Office.

The Sustainable Chemistry program will require 45 units of chemistry or chemical biology beyond level I but only three such courses will be fixed requirements. These will be the new courses (CHEM 2SC3, 3SC3, 4SC3) that will be established to achieve the learning outcomes specific to the sustainable chemistry program (details are provided in section 4.2). Six units per year will be reserved for a selection of highly relevant courses in sustainability (SUSTAIN), environmental science (ENVIRSC), geography (GEOG), Earth Science (EARTHSC), and Statistics (STATS) which are offered by other academic units within McMaster. Nine units per academic year will be set aside for elective courses. Compared to the Honours Chemistry program, Sustainable Chemistry offers significant flexibility in course selection and leaves plenty of room for studies in other disciplines allowing students to complete a minor if that is of their interest.

The current Honours Chemistry program requires 54-60 units of CHEM or CHEMBIO courses out of the total 90 units required over 3 years. By contrast, the proposed Sustainable Chemistry course will require 45 units of CHEM or CHEMBIO courses.

4.2 PROGRAM INNOVATION

The Department of Chemistry & Chemical Biology at McMaster is known across the country for its creativity in undergraduate education. Key features that make its current offerings stand out amongst the chemical programs available at Canadian post-secondary institutions are:

- A chemical biology undergraduate curriculum with courses specifically designed for this program.
- Sustained access to top-quality resources and modern instrumentation that is relevant to today's world of science.
- An innovative laboratory program featuring experiments that blur the distinctions between classical sub-disciplines and projects that, because of their complexity, must be executed in multiple consecutive sessions.
- Frequent experimentation with new teaching and evaluation methods.
- The widespread use of inquiry as a teaching method. Students in Chemistry and Chemical Biology have a dedicated inquiry course in the first semester of level II which will also be open to sustainable chemistry students.

Establishment of the sustainable chemistry program is the next step in the evolution of chemical undergraduate education at McMaster. A key feature of the curriculum are three new courses in sustainable chemistry, one to be taken each year.

CHEM 2SC3 - Sustainable Chemistry: Green Chemistry. This course will introduce the 12 principles of green chemistry, which provide guidelines for ways to 'reduce the harm' that chemical processes do the planet. Here students will develop a better appreciation of chemical methods used to generate useful molecules and the ways to practice them with more sustainable approaches, by increasing efficiency, using more sustainable starting materials, and forming fewer by-products. Consideration of those principles provides a forum for the discussion of the broader aspects of sustainability related to the introduction and life cycle analysis of chemical processes and products in academia and industry.

CHEM 3SC3 - Sustainable Chemistry: Natural Resources & Energy. Using examples and case studies, this course will apply the principles of green chemistry and sustainability to the life cycles of a major industrial chemical (hydrogen) and a heavily used natural resource (water). The third part of the course will discuss the challenges arising from the use of *endangered elements* (chemical elements projected to be in short supply in the near future, such as Helium and Lithium as well as many rare-earth elements essential for magnets, electric motors and other advanced technologies) in the development of materials for 'sustainable' energy solutions (wind turbines, solar cells, fuel cells, batteries, etc.).

CHEM 4SC3 - Sustainable Chemistry: Analysis and Regulation. This course will provide students with the skills necessary to work effectively in a *Quality System* environment. By the end of this course the student will be able to participate in the design, execution, and audit of processes compliant with regulatory frameworks such as those of the International Organization for Standardization (ISO), the International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH), and good manufacturing practice (GMP).

4.3 MODE(S) OF DELIVERY

While the traditional methods (lectures, tutorials) are still used in most courses offered by the Department, most employ multiple teaching methods, including inquiry, problem-based learning, and self-directed projects, methods enabled by modern electronic technologies (e.g. lecture capture, podcasting, etc.) have been implemented across the two currently offered programs. The

new courses in sustainable chemistry (CHEM 2SC3, 3SC3 and 4SC3) will emphasize active learning with specially designed exercises and cap-stone projects.

4.4 EXPERIENTIAL LEARNING

Chemistry is an eminently practical discipline. Experimental training in laboratory work is an essential component of any chemistry curriculum. However, there is a gap between such highly prescribed activities and actual professional practice. The Department offers an opportunity to engage in an experience related to careers in chemistry through the experiential placement course CHEM 3EP3. In this non-traditional course, there is no instructor or class meeting. Instead, the student identifies their own learning goals and spends the course time working 60 hours with a placement supervisor of record to achieve those goals. A McMaster faculty member acts as academic supervisor of record in order to assign a final grade. Placement for students in the proposed program must be relevant to sustainable chemistry.

The opportunities for experiential learning are broad and will likely be more attractive to students than co-op positions (although those will still be possible). Participants in our focus group composed of potential government and industry partners were enthusiastic about developing a "menu" of opportunities for such educational placements and a formal mechanism for connecting students with potential placement supervisors. Such pre-planned 3EP3 projects with these industrial and government partners who are already engaged in the new program will significantly ease the accessibility of this program for interested undergraduates.

4.5 ACCESSIBILITY

McMaster is committed to be fully compliant with the Accessibility for Ontarians with Disabilities Act (AODA) and Ontario Human Rights Code. Corresponding training is mandatory for all McMaster faculty, staff, student-staff, student leaders and volunteers. Additional Accessible Education training is strongly encouraged for all instructional staff. Students with disabilities who require academic accommodation are served by the office of Student Accessibility Services. Academic Accommodation is also possible for Religious, Indigenous or Spiritual Observances in the form of making alternative arrangements for classes, assignments, and tests. McMaster also provides students, staff and faculty access to SensusAccess, an online document conversion system supporting the transformation of text and image-based file types into different formats, including output in audio, Braille, or e-text formats. Renovations of the teaching laboratories included establishment of bench space for students with disabilities.

4.6 RESEARCH REQUIREMENTS (IF APPLICABLE)

Although it is not a requirement, students who are interested in acquiring experience in chemical research have access to three courses. The level-III research practicum in chemistry (CHEM 3RP3) will award 3 units of academic credit for research done for at least 120 h during one semester in an academic research laboratory; completion of the course requires the submission of a written report to the supervisor. In level IV, students can take a 240-h research project (CHEM 4RP6) or the senior thesis course (CHEM4G12). The latter takes a greater time commitment as it is worth 12 units of academic credit and requires the submission of a thesis and a seminar presentation to the Department.

5 ASSESSMENT OF LEARNING

5.1 METHODS FOR ASSESSING STUDENTS

Traditional evaluation methods such as written exams and assignments are the most frequently used in the Department of Chemistry and Chemical Biology. However, our courses emphasize application of knowledge and this typically is the focus of exams and assignments. Rote memorization is seldom enough to succeed in the courses. It is, of course, not possible to probe the full scope of a student's abilities with exams and assignments. Consequently, all courses include additional evaluation methods. Written reports and oral presentations serve not only as an evaluation method, but also as a means to develop communication skills.

In the research courses CHEM 3RP3, CHEM 4RP6 and CHEM 4G12 students conduct research under the supervision of faculty members. Written progress reports are submitted during the first semester; a full thesis report document and a 20-minute oral presentation are required at the end of the course. Evaluation in these courses includes components for the written reports, the oral presentation and experimental performance. Execution of such research projects requires students to apply all the background and skills developed throughout their undergraduate program. This is the prime opportunity for students to demonstrate and apply their breadth and depth of knowledge, familiarity with methodologies, communication skills, and awareness of the limits of their own knowledge and autonomy. It all sums up to a demonstration of their abilities as professionals of the chemical sciences, ready to pursue a career and/or further education.

For students who are unable to secure a position in a research group for the thesis courses, a selection of advanced courses provide alternative options for graduation. These courses provide a good alternative to the capstone experience provided by the thesis courses because they emphasize the application of knowledge to complex problems, in cutting-edge areas of the chemical sciences, usually require some independent research, and include the development of communication skills amongst their objectives.

5.2 CURRICULUM MAP

The following table provides a curriculum map for the sustainable chemistry program. The map demonstrates the alignment of the Learning Outcomes of individual courses with the departmental expectations specific to the proposed program (D.1-4, section 1.4). Naturally each course impacts only a subset of the Learning Outcomes, and to differing extents. The progression towards mastering the learning outcomes is apparent in the map.

Naturally, the specific learning outcomes addressed in the experiential and research courses (CHEM 3EP3, 3RP3, 4RP6, 4G12) will depend on the details of the tasks and research undertaken by the student. The Department will ensure that the activities of the students in sustainable chemistry are relevant to at least one of the learning outcomes of the new program.

Table 4. Curriculum Map

Course Code	Course Name	Sustainable Chemistry LOs			
		D.1	D.2	D.3	D.4
Required Courses					
CHEM 1AO3*	Introductory Chemistry I	I	I	I	
CHEM 1AA3*	Introductory Chemistry II	I	I	I	
CHEM 2SC3	Sustainable Chemistry - Green Chemistry	I	I	I	
CHEM 2A03	Quantitative Chemical Analysis	I	I	I	I
CHEM 20G3	Structure and Reactivity of Organic Molecules		I		
CHEM 2II3	Introductory Inorganic Chemistry	I	I	I	
CHEM 2P03	Physical Chemistry			I	
CHEM 2PC3	Mathematical Tools for Chemical Problems				
CHEM 2Q03	Inquiry for Chemistry	R	R	R	
CHEM2LB3	Tools for Chemical Discovery	R	R	R	
BIOCHEM 3G03	Proteins and Nucleic acids				
CHEM 2OD3	Synthesis and Function of Organic Molecules		R		
CHEM 3SC3	Sustainable Chemistry - Natural Resources and Energy	R	R	R	R
CHEM 3I03	Industrial Chemistry	R	R	R	
CHEM 3AA3	Instrumental Analysis	R	R	R	R
CHEM 3II3	Transition Metal Chemistry	R	R	R	
CHEM 3PA3	Quantum Mechanics and Spectroscopy			R	
CHEMBIO 3BM3	BioMaterials	R	R	R	R
CHEM 3EP3	Experiential Chemistry Placement	R [‡]	R [‡]	R [‡]	R [‡]
CHEM 3RP3	Research Practicum in Chemistry	R [‡]	R [‡]	R [‡]	R [‡]
CHEM 4RP6	Research Project in Chemistry	R [‡]	R [‡]	R [‡]	R [‡]
CHEM 4G12	Senior Thesis	R [‡]	R [‡]	R [‡]	R [‡]
CHEM 4SC3	Sustainable Chemistry - Analysis and Regulation	M	M	M	M

Course Code	Course Name	Sustainable Chemistry LOs			
		D.1	D.2	D.3	D.4
Course List 2					
BIOLOGY 3ET3	Ecotoxicology	R			
EARTHSCI 2GG3	Natural Disasters	R			
EARTHSCI 3CC3	Earth’s Changing Climate	R			
EARTHSCI 4CC3	Stable Isotopes in Earth and Environmental Systems	R			
ENVIRSC 2B03	Soils and the Environment	R			
ENVIRSC 2C03	Environment and Surface Climate Processes	R			
ENVIRSC 2Q03	Introduction to Environmental Geochemistry	R			
ENVIRSC 2WW3	Water and the Environment	R			
ENVIRSC 3O03	Contaminants, Fate and Transport	R		R	
ENVIRSC 4EA3	Environmental Assessment	R		R	R
ENVIRSC 4N03	Global Biogeochemical Cycles	R			
ENVSOCY 2EI3	Environmental Issues	R			
ENVSOCY 3EC3	Environmental Catastrophes	R			
ENVSOCY 3ER3	Sustainability and the Economy	R		R	
ENVSOCY 3EE3	Energy and Society	R	R	R	
ENVSOCY 4HH3	Environment and Health				
HTHSCI 4MS3	Toxic Tales: The Social Lives of Molecules	R			
LIFESCI 2X03	Environmental Change and Human Health	R			
POLSCI 3GC3	Global Climate Change	R			
STATS 2B03	Statistical Methods for Science	R			
SUSTAIN 2S03	Evaluating Problems & Sustainable Solutions	R		R	
SUSTAIN 3S03 -	Implementing Sustainable Change			R	

I: Introduced, R: Reinforced, M: Mastery * Required for admission. ‡ Depending on the specific project or placement.

5.3 DEMONSTRATING STUDENT ACHIEVEMENT

Definition of Success:

The program will be externally evaluated during cyclical reviews and assessed on an ongoing basis through indicators such as student grades and awards data. Success will be demonstrated by the reputation that the program establishes in education locally, nationally and globally. The ultimate goal is to be recognized as a leader in this field through a cutting-edge interdisciplinary approach that serves as a model for success in higher education. Based on this definition, student success will be determined by: 1) the level of achievement of its students, in-program and five years post-graduation, and 2) their degree of satisfaction with the program, in-program and five years post-graduation. Student achievement and satisfaction will be assessed both during the program as well as beyond graduation.

Documenting and Communicating Evidence of Student Achievement:

The key assessment pieces outlined above combined with the summative measures from all courses in the program will provide the necessary evidence demonstrating that students have met the program learning outcomes. This information will be maintained to provide information for cyclical IQAP reviews.

Determining Success beyond Graduation:

Beyond graduation, we will judge success by assessing the career success and satisfaction of our graduates and thus we will make every effort to maintain contact with our graduates to this end. University advancement maintains contact lists but the program will attempt to maintain a strong post-graduation community. Graduates will be invited to participate in both informal and in-class settings. The efforts to improve the program, whether in content or delivery, in response to the data/feedback will be routine and on-going.

6 RESOURCES

6.1 UNDERGRADUATE PROGRAMS

6.1.1 ADMINISTRATIVE, PHYSICAL AND FINANCIAL RESOURCES

The Department currently serves approximately 200-250 undergraduate students distributed in two programs, Honours Chemistry and Honours Chemical Biology, plus their respective co-op versions. There currently is capacity within existing departmental resources to administer the new program. The financial template submitted to McMaster reflects the true cost of the program (versus identifying incremental costs to the Faculty). We do not anticipate recruiting additional students into the Faculty of Science; instead it is expected that sustainable chemistry will attract students that otherwise would register for Honours Life Science.

The Department has a designated Associate Chair for Undergraduate Studies who oversees the academic administration of the programs, an Undergraduate Advisor that evaluates academic credentials and evaluates requests for academic permission, and an Undergraduate Administrative Assistant who also serves as Academic Program Advisor and is the primary contact for students in all matters related to this program. The proposed program will be served by the same team.

The total number of (3-unit) course sections that need to be filled annually currently sits at ca. 50-55, over all four levels of instruction. The “normal” teaching assignment for full-time faculty in the department is 2 course sections (6 units) of undergraduate and 1.5 units of graduate teaching per year. Our department’s faculty complement consists of 29 full-time faculty members. After reduced teaching responsibilities due to joint appointments with other academic units, administrative loads, research fellowships or chairs, or medical issues, and research leaves, the total number of course sections that can in principle be filled by full-time faculty members in a given year is 45-50. The resulting shortfall in assignable teaching units is filled by sessional instructors or (infrequently) by faculty teaching on overload. Currently the Department has initiated the search for three new faculty members, one would be a teaching-track appointment, the other two will be aregular tenure-track professors in Molecular Medicine and Environmental Chemistry. All three of these appointments will be beneficial to the new program.

Six technical staff members in the Department (two PhD- and the rest at the BSc level) focus all or part of their activities on undergraduate education, either as Instructional Assistants (2.0 FTEs) or Technicians (4.0 FTEs). The majority of the TAs employed in our department are Chemistry or Chemical Biology graduate students, supplemented by some level 4 Chemistry and Chemical Biology undergraduate students in the laboratory sections of the level-I courses (all three terms) and the level-II organic chemistry service courses CHEM 20A3 and 20B3 (summer term only). With the exception of the “peer mentors” who serve in CHEM/CHEMBIO 2Q03, the TAs for the courses in the Honours programs are Chemistry or Chemical Biology graduate students exclusively. The total number of 65-hour TA positions filled each year varies, but was ca. 302 in 2018-19 and ca. 284 in 2017-18. Roughly 75% of these positions are filled by graduate students while the remainder are filled by senior undergraduates from our Honours programs; the latter are

employed exclusively in the level-I laboratory programs. We consider the employment of our senior Honours students as TAs to be a very valuable and effective way of supplementing and reinforcing the training they receive in our programs. The three new sustainable-chemistry courses would require 6 TA units in total.

Pro-rated costs for all staff members, including the Chair have been included in the budget template. Undergraduate course offerings will be monitored over the next three to five years; unnecessary low-enrolment courses will be discontinued.

Physical Resources. The department uses a total of ca. 27,000 ft² of undergraduate laboratory space (see Section 5.3), of which 5850 ft² is used for level 1 chemistry (laboratories + level 1 Help Centre), 3600 ft² is used by the level 2 organic service courses, and ca. 9000 ft² is used by the two Honours programs (3284 ft² dedicated laboratory space / program + 4000 ft² of equipment or overflow space that is shared between the two). In addition to this, a 540 ft² room provides well-used study space for students in the two Honours programs. The level I program occupies the laboratories for 15 sessions / week and the level II service courses 6 sessions / week, whilst the space dedicated to the Honours programs is used for 3-5 sessions per week. The footprints and usage rates of the various laboratory spaces are a reflection of the types and amounts of glassware, small equipment, and instrumentation required by the various programs (high for the Honours programs; low for the level II service courses; very low for the level I courses) and the amount of effort required from our staff members to clean and refit or reconfigure the labs between sessions and/or courses. The Honours laboratories are used in a total of 6 different courses, each with unique materials and equipment requirements, while the levels I and II organic labs are used by a single course per term. Technical space exists on each floor of the undergraduate laboratory wing and in the basement of the building, and totals ca. 4800 ft² in combined area, divided roughly equally between equipment storage space and chemical storage and preparation space. Implementation of the proposed program can be achieved within the space currently available to the Department, thus no additional costs for space would be incurred.

6.1.2 LIBRARY, TECHNOLOGY, AND LABORATORY RESOURCES

Instrumental methods are essential to modern chemistry. Undergraduate chemistry and chemical biology students have access to an array of techniques that includes ultraviolet-visible, infrared, fluorescence, nuclear magnetic resonance and Raman spectroscopies, high performance and gas chromatography. The corresponding instrumentation has been acquired thanks to a combination of funds from the University, alumni donations and partnerships with corporations such as Varian Canada and Bruker Canada. That is on top of equipment for synthesis and characterization that includes facilities for handling very reactive materials under inert atmosphere using Schlenk lines and a glove box. The same equipment will be available to sustainable chemistry students. In this regard, no investment is envisioned for the new program beyond the current capital replacement plan. Recent donations to the Department may be utilized if necessary. For example, the Audrey Cameron Estate, which in first instance has been earmarked to support undergraduate research scholarships within the Department.

Operating Expenses. Annual expenditures on undergraduate laboratory supplies (i.e. consumables such as chemicals, etc., glassware, and small equipment) are in the range of ca. \$100K / year. Our laboratory coordinators are very conscientious – and quite creative – in finding ways to save money on expenses. For example, purchasing of chemicals, new glassware, and consumables for the laboratory programs is done through bulk orders placed once or twice a year through a competitive bidding process. Glassware accounts for the largest fraction of the supplies budget. We are as frugal as possible with glassware in the undergraduate laboratories, and charge students for the replacement of anything we can establish they had a hand in breaking, up to a limit of \$50/item.

When possible, broken glassware is sent for repairs to glassblowers at nearby institutions such as Brock and Western University.

The library resources available provide sufficient scholarly support for the teaching and research needs of the proposed undergraduate curriculum. McMaster University Library's holdings currently total more than 2.2 million volumes, with some 2 million distinct titles. Print books, print journals, and reference resources for students in the existing Chemistry and Chemical Biology programs are housed primarily in the H. G. Thode Library of Science and Engineering. Currently, the McMaster community has access to more than 1.1 million electronic resources, including approximately 90,000 electronic journals and more than 600,000 e-books. Additionally, the Library makes additional e-book titles available through a user-driven "purchase on demand" process. The Library welcomes input from faculty in the program regarding needed information resources and priority of acquisition within the established budget for Chemistry and Chemical Biology. The annual expenditure figures for the acquisition of library materials for Chemistry and Chemical Biology over recent fiscal years are listed in Table 5. In addition to those expenditures specific to the Department, the Library now spends in excess of \$6.8 million annually on electronic resources, many of which are multi-disciplinary.

Table 5. Library expenditures in support of Chemistry & Chemical Biology, 2014-2018

FISCAL YEAR	MONOGRAPH	SERIALS	TOTAL	ELECTRONIC RESOURCES
14/15	\$6,374	\$40,965	\$47,340	\$5,608,823
15/16	\$4,323	\$42,283	\$46,606	\$6,316,841
16/17	\$5,554	\$46,763	\$52,317	\$7,005,009
17/18	\$2,432	\$41,438	\$43,870	\$7,018,965
18/19	\$10,005	\$61,375	\$71,380	\$7,635,996

6.1.3 FACULTY

The department now consists of 29 full-time faculty members, including 2 teaching professors. Four of the faculty members hold joint appointments with the Department of Biochemistry & Biomedical Sciences. There are four Canada Research Chairs.

Table 6.

Name	Class of Appointment
Alex Adronov	Professor
Paul W. Ayers	Professor ^b
Paul J. Berti	Professor ^a
John D. Brennan	Professor ^b
Philip Britz-McKibbin	Professor
Michael A. Brook	Professor
David J.H. Emslie	Professor
Gillian R. Goward	Professor
Adam P. Hitchcock	Professor
William J. Leigh	Professor
Yingfu Li	Professor ^c
Jim McNulty	Professor
Giuseppe Melacini	Professor ^a
Yuriy Mozharivskyj	Professor ^d
Gary J. Schrobilgen	Professor
Harald D.H. Stöver	Professor
John F. Valliant	Professor
Alfredo Capretta	Associate Professor
Randall S. Dumont	Associate Professor
Paul H.M. Harrison	Associate Professor
Peter Kruse	Associate Professor
Pippa Lock	Associate Professor ^e
Nathan A. Magarvey	Associate Professor ^c
Jose M. Moran-Mirabal	Associate Professor ^d
Kalaichelvi Saravanamuttu	Associate Professor
Ignacio Vargas-Baca	Associate Professor
Anthony Chibba	Assistant Professor (CLA)
Sharonna Greenberg	Assistant Professor
Ryan Wylie	Assistant Professor

a) Joint appointment with Biochemistry & Biomedical Sciences, with primary undergraduate teaching in Chemistry & Chemical Biology

b) Canada Research Chair (Tier I)

c) Joint appointment with Biochemistry & Biomedical Sciences; no undergraduate teaching in Chemistry & Chemical Biology

d) Canada Research Chair (Tier II)

e) On leave

The standard teaching load in the Department is 7.5 units; i.e. two 1-semester undergraduate courses plus 1 graduate module. Two of the joint appointments carry out all their formal teaching in Biochemistry while the other two have 4.5-unit duties in our department. After teaching relief associated with major awards, and administrative positions is subtracted out, the total number of undergraduate teaching units available to the Department is 136-140. The number of teaching units that must be covered off in a given year to accommodate research leaves ranges from 6 to 18.

6.1.4 ANTICIPATED CLASS SIZE

The strongest indicator of potential enrollment in the new program is given by the number of students (27) already enrolled in CHEM2SC3. Once the program is established, this would likely scale up to 50 in each class.

6.1.5 PROGRAM IMPLEMENTATION

Although this proposal is being submitted to McMaster during the fall of 2019, as noted in 1.5, CHEM 2SC3 is already being offered under Dean's permission. Full approval of the program is expected by the summer of 2020 for the first class of Sustainable Chemistry to start in September 2020. The new courses CHEM 3SC3 and CHEM 4SC3 will be offered for the first time in 2020-2021 and 2021-2022. After that, there will be no need to open any new course for Sustainable Chemistry to be fully established.

7 QUALITY AND OTHER INDICATORS

7.1 ACADEMIC QUALITY OF THE PROGRAM

Evidence of Quality of the Faculty:

Faculty members are assessed based on their research performance through the quality of publications, research funding, supervision of graduate and undergraduate students, teaching evaluations and administrative service to the university or community.

Funding, Publications and Graduate Supervision:

Faculty from Chemistry and Chemical Biology are highly successful, well-funded and recognized in their respective fields. During the 2017 calendar year, the department held \$6.2M in research funding, and published 148 articles. Faculty within the program who are either tenured or tenure-track are highly involved in student supervision at all levels, including undergraduate, Master's, Doctoral and Post-Doctoral. In the 2017 time period, faculty supervision of graduate students totalled just under 80 students within Chemistry and Chemical Biology alone.

Undergraduate students in this program will work with graduate students work in state-of-the-art laboratory facilities that have the necessary equipment to conduct cutting-edge and innovative research, which is supported through the various research awards summarized above.

From the student perspective, academic quality will be monitored through means such as enrolment monitoring and student feedback. As indicated in section 5.3, academic success of the student body will be demonstrated through monitoring students throughout the program as well as after graduation. Academic quality and academic success will be monitored carefully throughout the program to ensure strong correlation of the two.

7.2 INTELLECTUAL QUALITY OF THE STUDENT EXPERIENCE

Students will experience a unique combination of rigorous training in chemistry, along with an additional sustainability component that is primarily, but not exclusively, focussed on the role that chemistry plays not just in creating unsustainable human processes, but in correcting them to make them greener. The strong chemistry core will allow students to follow a single sub-discipline of chemistry to the same depth as a student in the regular chemistry program, should they wish: no higher-level chemistry courses will be unavailable to students in this program. At the same time, less focus on other sub-disciplines releases elective space that can be used in each level to complete the core sustainability courses, CHEM 2SC3, 3SC3 and 4SC3, while still allowing space where students might choose a sustainability theme outside the world of chemistry. As such, we fully expect that students will benefit from the greater ability to make choices in their elective courses (a much sought attribute) without losing the rigour of a traditional science component.



SCIENCE

Report to Undergraduate Council for the 2020-2021 Undergraduate Calendar

Approved by the
General Faculty of the Faculty of Science

November 21, 2019

FACULTY OF SCIENCE

REPORT TO SENATE

SUMMARY OF MAJOR CURRICULUM CHANGES FOR 2020-2021

Following, is the summary of substantive curriculum changes being proposed by the Faculty of Science. For a complete review of all changes, refer to the November, 2019, Report of the Academic Planning and Policy Committee for changes to the 2019-2020 Undergraduate Calendar, found at:

<https://macdrive.mcmaster.ca/f/1a385ffc308e4ed0b457/?dl=1>

1.0 NEW PROGRAMS:

1.1 Honours Sustainable Chemistry (B.A.Sc.)

(The availability of this program is subject to Ministry approval.)

Admission Note:

Students intending to complete CHEM 3PA3 are required to complete one of PHYSICS 1A03 or 1C03 in Level I. Completion of PHYSICS 1AA3 or 1CC3 are recommended.

ADMISSION

Completion of any level I program with a Grade Point Average of at least 5.0 including:

6 units from the following courses, where an average of at least 6.0 (between courses) is required

- CHEM 1A03 – Introductory Chemistry I
- CHEM 1AA3 – Introductory Chemistry II
- CHEM 1E03 – General Chemistry for Engineering I

3 units from

- MATH 1A03 – Calculus for Science I
- MATH 1LS3 – Calculus for the Life Sciences I
- MATH 1M03 – Calculus for Business, Humanities and the Social Sciences
- MATH 1X03 – Calculus for Math and Stats I
- MATH 1ZA3 – Engineering Mathematics I

6 units from

- Science I Course List (See *Admission Note* above.)

Program Notes:

1. In some cases there are Level II and III prerequisites for Level III and IV courses. The prerequisites should be considered when choosing your Level II and III courses.
2. Students are encouraged to seek academic advising from the Departmental Undergraduate Advisor (email: advisor@chemistry.mcmaster.ca).
3. Certain Level IV courses are offered in alternate years. Students are advised to consider course offerings carefully in planning their course selection for Levels III and IV.

Course List 1:

- CHEM 2A03 - Quantitative Chemical Analysis
- CHEM 2II3 - Introductory Inorganic Chemistry: Structure and Bonding
- CHEM 2LB3 - Tools for Chemical Discovery

- CHEM 2OD3 - Synthesis and Function of Organic Molecules
- CHEM 2OG3 - Structure and Reactivity of Organic Molecules
- CHEM 2P03 - Applications of Physical Chemistry
- CHEM 2Q03 - Inquiry for Chemistry
- CHEM 3AA3 - Instrumental Analysis
- CHEM 3BC3 – Bad Chemistry
- CHEM 3EP3- Advanced Chemistry Placement
- CHEM 3II3 - Introduction to Transition Metal Chemistry
- CHEM 3LA3 - Strategies for Chemical Discovery
- CHEM 3I03 - Industrial Chemistry
- CHEM 3OA3 - Organic Synthesis
- CHEM 3PA3 - Quantum Mechanics and Spectroscopy
- CHEM 3PC3 - Mathematical Tools for Chemical Problems
- CHEM 3RC3 - Radioisotopes in Medicine
- CHEM 3RP3 - Research Practicum in Chemistry
- CHEM 4AA3 - Recent Advances in Analytical Chemistry
- CHEM 4D03 - Organic Structure and Synthesis
- CHEM 4G12 - Senior Thesis
- CHEM 4IA3 - Physical Methods of Inorganic Structure Determination
- CHEM 4IB3 -Bio-Inorganic Chemistry
- CHEM 4IC3 - Solid State Inorganic Materials: Structures, Properties, Characterization and Applications
- CHEM 4II3 - Transition Metal Organometallic Chemistry and Catalysis
- CHEM 4OA3 - Natural Products
- CHEM 4OB3 - Polymers and Organic Materials
- CHEM 4PB3 - Computational Models for Electronic Structure and Chemical Bonding
- CHEM 4RP6 - Research Project in Chemistry
- CHEM 4W03 - Natural and Synthetic Materials
- CHEMBIO 3BM3 - Implanted Biomaterials
- CHEMBIO 3OA3 - Organic Mechanistic Tools for Chemical Biology
- CHEMBIO 3OB3 - Structural Elucidation of Natural Products and Small Molecules
- CHEMBIO 3P03 - Biomolecular Interactions and Kinetics
- CHEMBIO 4Q03 - Peer Tutoring in Chemical Biology or Chemistry
- CHEMBIO 4A03 - Bio-Analytical Chemistry and Assay Development
- CHEMBIO 4OA3 - Natural Products
- CHEMBIO 4OB3 - Medicinal Chemistry: Drug Design and Development

Course List 2:

- BIOLOGY 3ET3 - Ecotoxicology
- EARTHSCI 2GG3 - Natural Disasters
- EARTHSC 3CC3 - Earth's changing climate
- EARTHSC 4CC3 - Stable Isotopes in Earth and Environmental Systems
- ENVIRSC 2B03 - Soils and the Environment
- ENVIRSC 2C03 - Environment and Surface Climate Processes
- ENVIRSC 2Q03 - Introduction to Environmental Geochemistry
- ENVIRSC 2WW3 - Water and the Environment
- ENVIRSC 3O03 - Contaminants, Fate and Transport
- ENVIRSC 4EA3 – Environmental Assessment
- ENVIRSC 4N03 - Global Biogeochemical Cycles
- ENVSOCTY 2EI3 - Environmental Issues
- ENVSOCTY 3EC3 - Environmental Catastrophes
- ENVSOCTY 3ER3 - Sustainability and the Economy
- ENVSOCTY 3EE3 - Energy and Society

- ENVSOCTY 4HH3 - Environment and Health
- HTHSCI 4MS3 - Toxic Tales: The Social Lives of Molecules
- LIFESCI 2X03 – Environmental Change and Human Health
- POLSCI 3GC3 - Global Climate Change
- STATS 2B03 - Statistical Methods for Science
- SUSTAIN 2S03 - Evaluating Problems & Sustainable Solutions
- SUSTAIN 3S03 - Implementing Sustainable Change

REQUIREMENTS

120 units total (Levels I-IV), of which no more than 48 units may be level I

Level I: 30 Units

30 Units

(See Admission above)

Level II: 30 Units

3 units

- Sustainable Chemistry - Green Chemistry

12 units from

- CHEM 2A03 - Quantitative Chemical Analysis
- CHEM 2II3 - Introductory Inorganic Chemistry: Structure and Bonding
- CHEM 2LB3 - Tools for Chemical Discovery
- CHEM 2OD3 - Synthesis and Function of Organic Molecules
- CHEM 2OG3 - Structure and Reactivity of Organic Molecules
- CHEM 2P03 - Applications of Physical Chemistry
- CHEM 2Q03 - Inquiry for Chemistry

6 units from

- Course List 2

9 units

- Electives

Level III: 30 units

3 units from

- CHEM 3SC3 - Sustainable Chemistry – Natural Resources and Energy
- CHEM 4SC3 - Sustainable Chemistry – Analysis and Regulation

12 units from

- Course List 1

6 units from

- Course List 2

9 units

- Electives

Level IV: 30 units

3 units from

- CHEM 3SC3 - Sustainable Chemistry – Natural Resources and Energy
- CHEM 4SC3 - Sustainable Chemistry – Analysis and Regulation

12 units from

- Course List 1

6 units from

- Course list 2

9 units

- Electives

1.2 Honours Sustainable Chemistry Co-op (B.A.Sc.)

(The availability of this program is subject to Ministry approval.)

ADMISSION

Enrolment in this program is limited. Selection is based on academic achievement and an interview but requires, as a minimum, submission of the on-line application by the stated deadline, and completion of Level II Honours Sustainable Chemistry with a Grade Point Average of at least 5.0 including:

Level II: 30 units

- CHEM 2SC3 - Sustainable Chemistry - Green Chemistry

12 units from

- CHEM 2A03 - Quantitative Chemical Analysis
- CHEM 2II3 - Introductory Inorganic Chemistry: Structure and Bonding
- CHEM 2LB3 - Tools for Chemical Discovery
- CHEM 2OD3 - Synthesis and Function of Organic Molecules
- CHEM 2OG3 - Structure and Reactivity of Organic Molecules
- CHEM 2P03 - Applications of Physical Chemistry
- CHEM 2Q03 - Inquiry for Chemistry

6 units from

- Course List 2

9 units

- Electives

Information about the program and the selection procedure may be obtained from Science Career and Cooperative Education.

Program Notes

1. This is a five-level (year) co-op program which includes two eight-month work terms that must be spent in appropriate chemistry-related placements.
2. Students must be registered full-time and take a full academic workload as prescribed by Level and by Term.
3. Students are required to complete SCIENCE 2C00 and SCIENCE 3C00 before the first work placement and are strongly recommended to complete SCIENCE 2C00 in Level II.
4. There are Level II and III prerequisites for many Level III and IV courses. The prerequisites should be considered when choosing your Level II and III courses.
5. Students considering postgraduate studies in Chemistry should note that 18 units of Level IV Chemistry or related subjects are required for consideration for admission at McMaster and most graduate schools in Canada.
6. CHEM 4RP6 A/B, 4G09 A/B or 4G12 A/B cannot be taken concurrently with CHEM 3LA3 or 3RP3.

Course List 1:

- CHEM 2A03 - Quantitative Chemical Analysis
- CHEM 2II3 - Introductory Inorganic Chemistry: Structure and Bonding
- CHEM 2LB3 - Tools for Chemical Discovery
- CHEM 2OD3 - Synthesis and Function of Organic Molecules
- CHEM 2OG3 - Structure and Reactivity of Organic Molecules
- CHEM 2P03 - Applications of Physical Chemistry
- CHEM 2Q03 - Inquiry for Chemistry
- CHEM 3AA3 - Instrumental Analysis
- CHEM 3BC3 - Bad Chemistry
- CHEM 3EP3 - Advanced Chemistry Placement
- CHEM 3II3 - Introduction to Transition Metal Chemistry
- CHEM 3LA3 - Strategies for Chemical Discovery
- CHEM 3I03 - Industrial Chemistry
- CHEM 3OA3 - Organic Synthesis
- CHEM 3PA3 - Quantum Mechanics and Spectroscopy
- CHEM 3PC3 - Mathematical Tools for Chemical Problems
- CHEM 3RC3 - Radioisotopes in Medicine
- CHEM 3RP3 - Research Practicum in Chemistry
- CHEM 4AA3 - Recent Advances in Analytical Chemistry

- CHEM 4D03 - Organic Structure and Synthesis
- CHEM 4G12 - Senior Thesis
- CHEM 4IA3 - Physical Methods of Inorganic Structure Determination
- CHEM 4IB3 - Bio-Inorganic Chemistry
- CHEM 4IC3 - Solid State Inorganic Materials: Structures, Properties, Characterization and Applications
- CHEM 4II3 - Transition Metal Organometallic Chemistry and Catalysis
- CHEM 4OA3 - Natural Products
- CHEM 4OB3 - Polymers and Organic Materials
- CHEM 4PB3 - Computational Models for Electronic Structure and Chemical Bonding
- CHEM 4RP6- Research Project in Chemistry
- CHEM 4W03 - Natural and Synthetic Materials
- CHEMBIO 3BM3 - Implanted Biomaterials
- CHEMBIO 3OA3 - Organic Mechanistic Tools for Chemical Biology
- CHEMBIO 3OB3 - Structural Elucidation of Natural Products and Small Molecules
- CHEMBIO 3P03 - Biomolecular Interactions and Kinetics
- CHEMBIO 4Q03 - Peer Tutoring in Chemical Biology or Chemistry
- CHEMBIO 4A03 - Bio-Analytical Chemistry and Assay Development
- CHEMBIO 4OA3 - Natural Products
- CHEMBIO 4OB3 - Medicinal Chemistry: Drug Design and Development

Course List 2:

- BIOLOGY 3ET3 - Ecotoxicology
- EARTHSCI 2GG3 - Natural Disasters
- EARTHSC 3CC3 - Earth's changing climate
- EARTHSC 4CC3 - Stable Isotopes in Earth and Environmental Systems
- ENVIRSC 2B03 - Soils and the Environment
- ENVIRSC 2C03 - Environment and Surface Climate Processes
- ENVIRSC 2Q03 - Introduction to Environmental Geochemistry
- ENVIRSC 2WW3 - Water and the Environment
- ENVIRSC 3O03 - Contaminants, Fate and Transport
- ENVIRSC 4EA3 – Environmental Assessment
- ENVIRSC 4N03 - Global Biogeochemical Cycles
- ENVSOCTY 2EI3 - Environmental Issues
- ENVSOCTY 3EC3 - Environmental Catastrophes
- ENVSOCTY 3ER3 - Sustainability and the Economy
- ENVSOCTY 3EE3 - Energy and Society
- ENVSOCTY 4HH3 - Environment and Health
- HTHSCI 4MS3 - Toxic Tales: The Social Lives of Molecules
- LIFESCI 2X03 – Environmental Change and Human Health
- POLSCI 3GC3 - Global Climate Change
- STATS 2B03 - Statistical Methods for Science
- SUSTAIN 2S03 - Evaluating Problems & Sustainable Solutions
- SUSTAIN 3S03 - Implementing Sustainable Change

REQUIREMENTS

120 units total (Levels I to IV), of which no more than 48 units may be Level I

Level I: 30 Units

Completed prior to admission to the program

Level II: 30 Units

- Completion of any Level II Honours Sustainable Chemistry program

1 course

- SCIENCE 2C00 - Skills for Career Success in Science

Level III:

Consists of academic studies (Fall Term), Co-op Work Term (Winter Term), and Co-op Work Term (Spring/Summer Term)

Fall Term: 15 units:

6 units from

- Course List 1

3 units from

- Course List 2

6 units

- Electives

2 courses

- SCIENCE 2C00 - Skills for Career Success in Science (if not already completed)
- SCIENCE 3C00 - Advanced Job Search Skills For Science Co-op Students

Winter Term:

Work Term

1 course

- SCIENCE 3WT0 - Science Co-op Work Term

Spring/Summer Term:

Work Term

1 course

- SCIENCE 3WT0 - Science Co-op Work Term

Level IV

Consists of academic studies (Fall and Winter Terms) and Co-op Work Term (Spring/Summer Term)

Fall and Winter Terms: 30 units:

3 units from

- CHEM 3SC3 - Sustainable Chemistry – Natural Resources and Energy
- CHEM 4SC3 - Sustainable Chemistry – Analysis and Regulation

12 units from

- Course List 1

6 units from

- Course list 2

9 units

- Electives

Spring/Summer Term:

Work Term

1 course

- SCIENCE 4WT0 - Science Co-op Work Term

Level V

Consists of Co-op Work Term (Fall Term) and academic studies (Winter Term)

Fall Term:

Work Term

1 course

- SCIENCE 5WT0 - Science Co-op Work Term

Winter Term: 15 units:

3 units from

- CHEM 3SC3 - Sustainable Chemistry – Natural Resources and Energy
- CHEM 4SC3 - Sustainable Chemistry – Analysis and Regulation

6 units from

- Course List 1

3 units from

- Course list 2

3 units

- Electives

Co-op Program Chart

	FALL TERM (September to December)	WINTER TERM (January to April)	SPRING/SUMMER TERM (May to August)
Level III	15 units from Academic Level III + SCIENCE 2C00 (if not completed) and SCIENCE 3C00	Work Term SCIENCE 3WT0	Work Term SCIENCE 3WT0
Level IV	15 units from Academic Level III	15 units from Academic Level IV	Work Term SCIENCE 4WT0
Level V	Work Term SCIENCE 5WT0	15 units from Academic Level IV	

Justification (1.1 & 1.2):

To complement the Honours B.Sc in Chemistry and Chemical Biology programs – both providing an intense, focused curriculum designed to prepare students for graduate or professional school - the Department is introducing the Honours B.A.Sc. in Sustainable Chemistry. The flexible curriculum and interdisciplinary nature of this program will allow students to explore areas of study in greater breadth and focus on key interactions of chemistry with other disciplines and relevant to the private sector. As well, a suite of Sustainable Chemistry courses CHEM 2SC3, 3SC3, and 4SC3 form a cohesive core to the program. These offerings focus on environmental, regulatory and safety issues, matters that have a clear relationship to, but transcend, chemistry, and that are in heavy demand in the employment sector (e.g. government employment). A Co-op option is available and will have an enrolment limit. It is believed that Sustainable Chemistry students, especially those in the co-op option, will bring a unique and valuable skill set to employers.

New Undergraduate Program or Existing Program Undergoing Major Changes (more than 30%)
Details of Resource Implications and Financial Viability Faculty: Science
Program Name: Sustainable Chemistry

A. FINANCIAL SUSTAINABILITY OF PROGRAM

Complete New Undergraduate Program Budget template (appendix A1) which will populate table below:
 In the case of Interdisciplinary programs, also append the Draft MOU between faculties. (Appendix A2)
 In the case of Collaborative programs, also append the Draft MOU between institutions. (Appendix A3)

REVENUE	2020/21	2021/22	2022/23	2023/24	2024/25
Program Generated Gross Undergraduate Revenue - University	\$211,548	\$633,679	\$1,043,935	\$1,262,195	\$1,291,734
Less Tuition to Other Faculties for Service Teaching	-\$22,496	-\$66,407	-\$108,068	-\$128,314	-\$128,314
Add Residual Tuition Allocation to Lead Faculty (Estimated)	\$0	\$0	\$0	\$0	\$0
Less SAG Obligation Contribution	\$0	\$0	\$0	\$0	\$0
Tuition Revenue - Lead Faculty	\$189,053	\$567,272	\$935,867	\$1,133,881	\$1,163,419
Gross Grant Revenue - Lead Faculty	\$197,501	\$582,831	\$948,891	\$1,127,123	\$1,127,123
Other Revenue (Specify)	\$0	\$0	\$0	\$0	\$0
Total Gross Undergraduate Revenue to Lead Faculty	\$386,554	\$1,150,103	\$1,884,758	\$2,261,004	\$2,290,542
University Fund / Research Infrastructure Contribution	-\$28,599	-\$85,090	-\$139,444	-\$167,281	-\$169,466
Total Support Unit Allocations (Indirect Costs)	-\$342,740	-\$544,917	-\$737,101	-\$829,925	-\$829,087
Net Revenue	\$15,214	\$520,095	\$1,008,214	\$1,263,799	\$1,291,989
Total Teaching Costs	-\$368,832	-\$775,654	-\$1,224,969	-\$1,480,318	-\$1,494,491
Total Admin Salaries & Benefits	-\$63,350	-\$65,250	-\$67,208	-\$69,224	-\$71,301
Total Student Support (From operating)	\$0	\$0	\$0	\$0	\$0
Total Capital/Equipment Costs	-\$21,667	-\$22,750	-\$23,888	-\$25,082	-\$26,336
Total Other Direct Expenses - Supplies/Services/Travel etc	-\$14,700	-\$19,058	-\$21,233	-\$21,437	-\$21,646
Total Share of Faculty's Central Expenses	\$0	\$0	\$0	\$0	\$0
PROGRAM EXPENSES	-\$468,549	-\$882,712	-\$1,337,297	-\$1,596,061	-\$1,613,774

IN-YEAR (Surplus/ Deficit)	-\$453,334	-\$362,616	-\$329,083	-\$332,262	-\$321,784
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*Note: In assessing total revenue to the university, the "Tuition to other Faculties" line should be added back in to surplus/deficit line

If the program is showing an ongoing going deficit please indicate whether it is truly incremental to the current faculty financial position. Provide a rationale for proceeding with ongoing negative returns.

This template has been developed for the Sustainable Chemistry Program, which will be a stream of the current undergraduate Chemistry Program (i.e. content change is less than 30 percent). Enrolment in the Honours Chemistry Program has decreased, enabling the department to launch a new stream within current expenditures (i.e. no net new space, faculty, or staff will be required). This template has been developed to reflect the "true cost" of operating this program (vs incremental costs to the faculty). 312K support unit allocation costs already exists within Chemistry. Incremental costs to the Faculty includes the mounting of 3 new courses, the associated incremental teaching assistants (approx 6., during steady state), and some small operating costs (e.g. marketing)

B. NUMBER OF STUDENTS

	FT	PT		
Intended Steady-state annual intake	50		Year achieved:	2021
Intended Steady-state total enrolment	143		Year achieved:	2023
Number of International Students included in steady state	14.3	0		

Proposed number of additional students to University at steady state: (i.e. Are the program students additional (net new) or redistributed from other existing programs within the Faculty or in other Faculties.) 0

Will there be an impact to enrollments in Programs in other Faculties? No If yes, Please Describe:

Target audience is Faculty of Science Year 1 students

C. FORMAT OF INSTRUCTION

	Fall	Winter	Summer (May-June)	Summer (July-August)	Annual program units?
During which terms will the program run?	XX	XX			30
Is there a co-op or internship as part of the program?	Yes	Describe: Both options will be available to students			
What percentage of instruction will be online?	0%	What percentage of instruction will be off campus? 0%			

If either is greater than zero please provide information:

--

D1. PROPOSED TUITION FEEreference: http://www.mcmaster.ca/bms/student/pdf/fees_included.pdf

Is approval being sought for a Ministry-funded Program?

☐ Yes

Do Standard Tuition rates apply ? (If No, specify fees below)

☐ Yes**Proposed Tuition Fee:**

	Domestic		International	
	Full Time	Part Time	Full Time	Part Time
Per Year :				
Per Term (if applicable):				
Per Course (if applicable):				

Rational for proposed fees (describe or append results of market assessment) and describe how they adhere to MTCU policy if seeking ministry funding :

--

D2. SUPPLEMENTARY FEESreference: http://www.mcmaster.ca/bms/student/pdf/fees_included.pdf

Will regular Mandatory Supplementary Fees apply?

Full Time ☐ YesPart Time ☐ YesModified only ☐ No

If no, please contact Assistant Dean, Student Affairs x27633 for guidance and provide resulting proposed applicable fees and rationale:

--

Are there other mandatory costs for students? (Coop/Internship fees, supplies, books, uniform, equipment, field trips, professional exam fees, etc?)

☐ Yes

Describe & Approximate amounts:

Coop or Internship fees, if the students choose this option

E. EXTERNAL RESOURCES: donations, special grants, research overhead, endowment funds, Space, etc.

Please provide information about any external funds or resources that will be available to the program.

	Onetime	Ongoing	Value \$	Details
Donations		x	50K	Audrey Cameron Estate: offset instrumentation and scholarships available to Chem and ChemBio UG students

F. FACULTY RESOURCES - Please append evidence of endorsement from other faculties affected if necessary.

If courses are also being taught in other faculties, please list

Faculty: ☐ N/AFaculty: ☐ N/AFaculty: ☐ N/A

Incremental FTEs required:	Science	N/A	N/A	N/A	Comments
Faculty - Tenure Track					
Faculty - Sessional and CLAs					
Staff					
Teaching Assistants					Note: 6 half TA s will be required at steady state
Additional Non-salary costs in other Faculties					

Increases in FT faculty are for modeling purposes only and does not imply approval to hire. Normal approval processes apply.

G. OTHER RESOURCE IMPLICATIONS:

Unless otherwise defined in the categories below, please use these descriptions to define impact:

- No Impact:** Can be dealt with as part of normal, daily operations. No budgetary or resource impact.
- Minor:** Can be dealt with in a mutually agreed timeframe using existing personnel. Resources pre-approved or readily available. No disruption to other approved work priorities.
- Major:** Must be scheduled as a project (not able to deal with as part of regular operations). Budget not approved or readily available; source of funding to be determined. May require external resources. May require reprioritization of previously approved tasks.

1. PHYSICAL FACILITIES - Please contact Coordinator, Design and Space Management x23898 for assistance in determining additional resource costs if needed.

Please indicate the likely space resource implications of the proposal	Impact	New Sq Ft Required	Approx Existing Sq Ft required	Comments (include location and for new space, plans to fund and acquire space)	If major new central budget req'd, estimate \$
Faculty space- Offices, Labs, seminar rooms, student space, etc	None	-	619.0	A third UG instructional space, already existing	
Other space (excluding registrar controlled classrooms)	None				

Facilities

Facilities

2. TECHNOLOGY RESOURCES - Please contact UTS Director, Technology x21888 for assistance in determining impact if needed.

Please indicate the likely impact on central technology resources for the proposal	Impact	Are additional resources required to support this program? If so, please list.	If Major, estimate \$
UTS Computer Labs and Software	None		UTS
Network/Internet/Cloud services access & usage	None		UTS
Audio-Visual / Telecommunications	None		UTS
Wireless Connectivity	None		UTS
Other (Please specify)	None		UTS

3. LIBRARY SERVICES - Please contact Associate University Librarian, Collections x26557 for assistance in determining impact if needed.

Please indicate the likely Library resource implications of the proposal	Impact	Are additional resources required to support this program? If so, please list.	If Major, estimate \$
Staffing (Add'l service desk staff, add'l librarians, new staff with skills/knowledge not currently present)	None		Libraries
Collections, One Time Purchases (books, ebooks, purchased online resources)	Minor	May require some resources related to sustainable chemistry, to be explored	Libraries
Collections, Ongoing Subscriptions/licenses (print or online journals)	None		Libraries
Technology and Computing (new or add'l hardware/software, increased digital storage capacity)	None		Libraries
Library Spaces (study space, new or specialized user or collection spaces)	None		Libraries
Other (Please specify)	None		Libraries

4. OFFICE OF THE UNIVERSITY REGISTRAR - Please contact the Registrar for assistance in determining impact if needed.

Please indicate the likely resource implications of the proposal	Impact (Select)	Support required	Area Responsible	If Major, estimate \$
Admissions/Recruitment	None	Admission and recruiting services not required	Registrar	Registrar
Student Record Support (maintaining records, transcripts, grades, student card, etc)	None	No student record support required		Student Affairs
Class Scheduling Services	None	Managed by Dept/Faculty		Student Affairs
Classrooms	Minor	Requires less than Qty 5 classes of max 140 seats		Student Affairs

5. STUDENT SUPPORT - Please contact Assistant Dean, Student Services x27633 for assistance in determining impact if needed.

Please indicate any other possible resource impacts	Impact	Please Describe any impacts on the support areas	If Major, estimate \$
Student Services - International Student support	None		Student Affairs
Student Services - Athletics & Rec, Health/Counselling, Career	None		Student Affairs
Residences	None		Ancillaries
Scholarships/Bursaries* (Contact SFAS for more information)	None		Scholarships

*If you are anticipating OSAP funding for these students please contact SFAS to provide additional information to activate approval from MTCU

6. MIETL- Please contact Educational Consultant for assistance in determining impact if needed.

Please indicate any other possible resource impacts	Impact	Please Describe any impacts on the support areas	If Major, estimate \$
Re/Development of blended or online courses	None		MIETL
Learning Management System (Avenue to Learn)	None		MIETL
Training and development for TAs or faculty	None		MIETL
Research on teaching and learning initiatives	None		MIETL
Other (Please specify)	None		MIETL

7. OTHER

Please indicate any other possible resource impacts	Impact	Please Describe any impacts on the support areas	If Major, estimate \$
Financial Services	None		Financial Affairs
Human Resources	None		HR
Advancement	None		UA
Research Services Office	None		Research Support
Other (Please specify)	None		

Please provide names below and check box to verify that approval has been obtained by each:

Department Chair/ Area Director Alex Adronov, Interim Chair, Chemistry and Chemical Biology

Faculty Dean or Director of Administration Kathleen Blackwood, Director of Finance and Administration

Executive Director , Finance & Planning (Academic) Linda Coslovi, AVP Finance & Planning

Submitter Salina Jaffer, Administrator, Chemistry and Chemical Biology

Check box

X
X
X

DATE: January 8, 2020

TO: University Planning Committee

FROM: Karen Mossman, Acting Vice-President Research

RE: Establishment of "Guidelines for the Governance and Review of Core Research Platforms"



Research facilities and platforms are a pivotal part of the University's research infrastructure, providing resources that support and enhance ground-breaking research. Some of these are complex, highly technical and often expensive sets of specialized equipment and/or services that are shared by many researchers.

Pan-University consultation took place with the research community throughout 2019. Through this consultation phase input was sought broadly from McMaster's Associate Deans Research and from Directors, Managers and key personnel from many of McMaster's most complex research facilities. These discussions identified the need for guidelines for the governance and review of core research platforms critical to the University's mission and for a transparent mechanism for supporting research infrastructure. The guidelines which were developed will allow the University to be informed of the status, progress, and financial viability of these research organizations, leading to better decision making, including decisions regarding support and sustainability. In particular, the guidelines will help the university and research community to:

- Define and identify McMaster's "Core Research Platforms";
- Ensure appropriate governance for Platforms;
- Request University support for Platforms through a transparent process.

A University Research Infrastructure Oversight Board (the "Board") will be established to oversee effective acquisition, implementation, operation and maintenance of McMaster's research infrastructure. Terms of reference for the Board are attached for your information. Also attached for context is the draft companion document "*Applying and Reporting to the University Research Infrastructure Oversight Board*" which will be further refined following discussion by the Board.

The policy has been reviewed by the Provost and Vice-President Academic, Associate Vice-President Research, Deans and Associate Deans Research of McMaster's six Faculties and personnel from the University Secretariat.



Complete Policy Title:
**Guidelines for the Governance
and Review of Core Research
Platforms**

Policy Number (if applicable):

Approved by:
**University Planning Committee
Senate
Board of Governors**

Date of Most Recent Approval:

Date of Original Approval(s):

Supersedes/Amends Policy dated:

Responsible Executive:
Vice-President Research

Enquiries:
Office of the Vice President Research

DISCLAIMER: *If there is a Discrepancy between this electronic policy and the written copy held by the policy owner, the written copy prevails*

1. Preamble

Research facilities and platforms are a pivotal part of the University's research infrastructure, providing resources that support and enhance ground-breaking research. Some of these are complex, highly technical and often expensive sets of specialized equipment and/or services that are shared by many researchers. These Core Research Platforms provide all McMaster researchers access to the instrumentation and technical support to push forward discoveries that will shape the future of our nation and our world.

The University leadership, through the University Research Infrastructure Oversight Board, will encourage the development and use of Core Research Platforms by researchers throughout the University. The importance of the platforms will be evidenced by the identification and proposed use of Core Research Platforms in research grant requests submitted to granting agencies and foundations. The expectation is that, wherever possible, newly acquired research infrastructure will be placed within a Core Research Platform; justification for why such infrastructure should be located outside a platform must be made to the University Research Infrastructure Oversight Board. Core research platforms should, wherever appropriate, operate on a fee for service basis and be accessible by external entities.



Normally, Core Research Platforms will be housed within established Institutes, Centers or Groups, or within Departments or Faculties. Accordingly, the governance (described below) of such platforms will be similar to that of Institutes, Centers or Groups, where a Dean or coalition of Deans will provide appropriate oversight. Regardless of the unit in which a platform is housed, it will be available to any McMaster researcher. There is an expectation that platforms will cooperate with each other and, wherever possible, collaborate.

2. Definition of Core Research Platforms

Core Research Platforms are designed to:

- provide all McMaster researchers access to infrastructure, services and expertise needed to advance the University's research mission;
- provide researchers with opportunities to extend the breadth of their research programs and integrate this research across disciplines;
- ensure the development and sustainability of equipment, facilities and entities for the future.

Core research platforms are intended to provide state-of-the-art infrastructure, services and technical expertise and to encourage new avenues of revenue generation through use by external academic, government and private sector users. Access by any user must be compliant with the operational rules of the platform (e.g. access restricted to those with appropriate training, commitment to pay the user fees, and, for infrastructure funded by a granting agency, priority access for the research described in the funding proposal).

Described within this document are criteria for Core Research Platforms. Core Research Platforms may be eligible to receive support from the University as overseen by the University Research Infrastructure Oversight Board. It is recognized that not all infrastructure at McMaster will sit within a defined Core Research Platform.

Criteria for Recognition as a Core Research Platform:

It is recognized that many research facilities and platforms exist at McMaster University. Key criteria for recognition as a Core Research Platform are listed below.

- Must have multiple users;
- Must be accessible to all potential McMaster users, including on a fee-for-service basis, as appropriate for that facility;
- Must not have more than 80% usage arising from a single faculty member;
- Should be able to demonstrate how the platform supports the Research Strategic Plan;
- Should support both research and training of research personnel including students.

Proposals for recognition as a Core Research Platform will be submitted to the University Research Infrastructure Oversight Board by the appropriate Dean or coalition of Deans. For proposal detail please see companion document "*Applying and Reporting to the University Research Infrastructure Oversight Board*"



The University Research Infrastructure Oversight Board may from time to time determine that a facility no longer meets the criteria required to be a “core research platform”.

3. Governance and Review of Core Research Platforms:

The University must be informed of the status, progress, and financial viability of the research organizations which carry out its strategic interests. As such the University’s Core Research Platforms must adhere to general practices of good governance with reporting structures which ultimately inform the VPR, relevant Deans and Associate Deans Research and the University Planning Committee as to their activities and financial standing.

Each platform will require a Director to oversee the purpose and direction of the platform. The Director will be a McMaster faculty member who will establish an Advisory Committee to provide advice to the Director with regard to priorities and directions for the platform. The Director may decide to strike other committees such as a Users Group who could provide input on user’s needs.

Each platform will require an appropriately qualified Manager to oversee its day-to-day activity and management. The Manager will be a permanent or contract full time or regular part time employee of the University. In cases where the platform is small, the Director and Manager may be the same person.

Reporting requirements

Annual reporting will provide the University with information needed for strategic planning and decision making. The Director will provide a report to the appropriate Dean or coalition of Deans who, in turn, will provide the Director’s report, and the Dean’s response to the report, to the University Research Infrastructure Oversight Board. The Board will submit a summary of the reports, along with their comments, suggestions and decisions to the VPR who will report to the University Planning Committee for information. Reports will be provided, at minimum, annually. For reporting requirements please see companion document “*Applying and Reporting to the University Research Infrastructure Oversight Board*”

External funding sources such as research grants will continue to be the first option for funding research infrastructure and operations. Requests for new or additional central university funding in support of renewal of research equipment or certain operational needs such as technical support, where required, may be made as part of the annual reporting process to the University Research Infrastructure Oversight Board. The Board will make decisions on funding for renewal of research equipment or certain operational needs, where required.

4. Financial Matters

All Institutes, Centres and Groups are expected to adhere to the University’s financial policies and procedures as established or amended from time to time.



McMaster Research Infrastructure Oversight Board

DRAFT Terms of Reference

1. Purpose

The mandate of the McMaster Research Infrastructure Oversight Board (“the Board”) is to oversee effective acquisition, implementation, operation and maintenance of McMaster’s research infrastructure.

McMaster recognizes that access to specialized research equipment and technical expertise is essential to advancing basic research and competing on the world’s research stage. Across our campus—from department-based laboratories to suites of equipment housed within centres and institutes to state-of-the-art national research facilities—research infrastructure provides our researchers the cutting-edge methods and tools required to impact their fields of research and enhance Canada’s national research landscape. Suites of research infrastructure are often complex and highly technical sets of specialized equipment and/or services that are shared by many researchers. Increasingly these form “Core Research Platforms” which provide all McMaster researchers access to the instrumentation and technical support to push forward discoveries that will shape the future of our nation and our world.

The University leadership, through the University Research Infrastructure Oversight Board, will encourage the development and use of Core Research Platforms by researchers throughout the University. Core Research Platforms will be managed in accordance with the following principles:

- Funding of Core Research Platforms will be managed and adjudicated with clear and transparent processes to access funding;
- Requests for investments from the University should be tied to the University’s Research Strategic Plan;
- Management and reporting of the funds should be strategic and transparent;
- Support for Research Platforms should benefit all Faculties in a clear and equitable fashion and should be in accordance with need.

2. Membership

Official members of the Board will be;

- Vice-President, Research
- Associate Vice-President, Research
- Vice-Dean, Research

- Associate Dean Research or Associate Deans Graduate Studies and Research from each of McMaster's six Faculties.

The Chair of the Board shall be the Vice-President Research.

The Vice-Chair of the Board shall be the Associate Vice-President Research.

The Board will be supported by the Assistant Vice-President Research Administration and the Director, Research Platforms Support.

3. Meetings:

Meetings will be organized by the Office of the Vice-President, Research. It is anticipated that there will be two meetings/per year at minimum.

The Chair may invite guests to attend meetings as required. Members may recommend the invitation of guests to the Chair.

Any Member may propose an in-camera session of the Board.

Delegates are not permitted.

4. Responsibilities:

The primary responsibilities of the University Research Infrastructure Oversight Board are:

- (a) Receive applications for recognition of a research facility as a Core Research Platform; approve recognition for facilities meeting the criteria outlined in McMaster's **Guidelines for the Governance and Review of Core Research Platforms**;
- (b) Determine when, as appropriate, a facility no longer meets the criteria required to be a Core research Platform;
- (c) Participate in the process for requesting support from funding agencies for major research infrastructure acquisition, operations and maintenance;
- (d) Oversee, adjudicate and approve requests for university support for renewal of research equipment;
- (e) Oversee the process for allocating university resources, including CFI IOF funding, in support of operation and maintenance of research infrastructure;

- (f) Develop and regularly review guidelines on the nature of research structure expected to be housed in Core Research Platforms
- (g) Review and approve or deny requests to locate research infrastructure outside of a core research platform;
- (h) Review annual reports submitted by core research platforms. Submit a summary of reports, along with the Board's comments, suggestions and decisions to the Vice-President Research.

Members of the University Research Infrastructure Oversight Board shall:

- (a) attend and actively participate in the meetings;
- (b) transact such business as is placed on its agenda;
- (c) provide the agenda and the minutes of its meetings to key stakeholders, including Faculty Deans;
- (d) reinforce that external funding sources such as research grants will continue to be the first option for funding acquisition, operation and maintenance of research infrastructure.

Members of the Board shall expect:

- (a) that each member will be provided with complete, accurate and meaningful information in a timely manner;
- (b) to participate in open, honest and respectful discussions;
- (c) to be given reasonable time to discuss key items

5. Quorum

Five members of the Board shall constitute a quorum.

6. Decision Making

Members shall have voting rights. Each member shall be entitled to one (1) vote. The result of a vote shall be decided by a majority of votes of the members present at the meeting. Any motion resulting in a tie vote shall be deemed to have been defeated. Voting by proxy is not permissible.

7. Minutes

Minutes will be taken at each meeting and shall be approved at subsequent meetings.

Terms of reference for the University Research Infrastructure Oversight Board may be amended, varied or modified in writing after consultation and agreement by the members of the Board.

DRAFT - This document will be a companion to “Guidelines for the Governance and Review of Core Research Platforms” and will assist the research community in applying and reporting to the University Research Infrastructure Oversight Board, a new Board to be established in the new year. The Board will determine the needs for facilities applying to be recognized as a core research platform and for annual reporting. This document is DRAFT and is provided for context only. Templates to support applying and reporting will also be developed, in discussion by the Board.

Core Research Platforms

Applying and Reporting to the University Research Infrastructure Oversight Board

Purpose: The purpose of this document is to assist with the preparation of documentation for submission to the University Research Infrastructure Oversight Board. It acts as a companion to the “**Guidelines for the Governance and Review of Core Research Platforms**”

Seeking Recognition as a Core Research Platform:

Key criteria for recognition as a Core Research Platform are listed below.

- Must have multiple users;
- Must be accessible to all potential McMaster users, including on a fee-for-service basis, as appropriate for that facility;
- Must not have more than 80% usage arising from a single faculty member;
- Should be able to demonstrate how the platform supports the Research Strategic Plan;
- Should support both research and training of research personnel including students

Core Research Platforms may be eligible to receive support from the central University as overseen by the University Research Infrastructure Oversight Board.

A proposal for recognition as a Core Research Platform will be submitted to the University Research Infrastructure Oversight Board by the Dean or coalition of Deans who oversee the facility. The Proposal should be submitted using the *University’s Application for Recognition as a Core Research Platforms Template*. It is anticipated that requirements will include the following:

- The name and objectives of the facility;
- A list of users and their affiliations;
- Description of organizational structure;
- List of research equipment,
- Costs and resources for operating and maintaining the facility, including:
 - Warranties or service contracts



- Renewal of research equipment;
- Consumables and space;
- Software used for booking, billing and measurement of usage;
- Dedicated technical and administrative personnel
- Fee schedule (both internal and external) with explanation and rationale of how fees have been determined. Fees schedule should be comparable to other entities or facilities, the intention is not to undercut or damage operations of existing entities or facilities.
- Members of advisory committee;
- Metrics to measure usage and effectiveness of facility and a description of how they are collected, determined and analyzed.

Reporting Requirements:

The Director will provide a report to the appropriate Dean or coalition of Deans on an annual basis at minimum. Reports will be reviewed by the University Research Infrastructure Oversight Board.

External funding sources such as research grants will continue to be the first option for funding research infrastructure and certain operations. Requests for new or additional central university funding in support of renewal of research equipment or certain operational needs, where needed, may be made as part of the annual reporting process to the University Research Infrastructure Oversight Board. The Board will make decisions on funding for renewal of research equipment or certain operational needs, where required.

The Report should be submitted using the *University's Core Research Platforms Report Template*. It is anticipated that the report is likely to include:

- Demonstration that the entity met the needs of the research community at large as outlined in its annual plan.
- Summary report of meetings of the Advisory Committee and any resulting directions or plans.
- Annual report of metrics and achievements including any annual user surveys
- Up to date data base of users, income and expenditures
- Financial information for the current year with any explanation of significant variance, budget for upcoming year and quantification and plans for any reserves. Include both expenses and sources of funds.
- A three-year rolling plan that describes proposed changes to important operations, regulations and acquisition and disposal of equipment. Disposal of equipment will follow [McMaster's policy on Capital Assets \(Tracking and Disposition\)](#)
- Up to date fee schedule (internal and external) with explanation and rationale for both changes and maintenance of existing fees
- Objectives for the upcoming year
- Requests for university support for renewal of research equipment or certain operational needs, where required.

January 13, 2020

TO: University Planning Committee

FROM: Karen Mossman, Vice-President, Research (Acting)



RE: **Proposal for Centre for Clinical Neuroscience (CCN)**

The Committee on Research Institutes and Centres has reviewed the attached Proposal for Centre for Clinical Neuroscience (CCN), as per the policies and guidelines, and has been unanimously approved.

Please include this as an agenda item for the next University Planning Committee Meeting on January 22, 2020.

KM:jt

Attach.

cc: Susan Searls Giroux
Doug Welch
Andrea Thyret-Kidd
Paul O'Byrne

October 2019

Dr. Karen Mossman
Acting Vice-President, Research
Chair, Committee on Research Institutes
c/o Gilmour Hall, Room 208

Re: Proposed Centre – McMaster / St. Joseph's Centre for Clinical Neuroscience (CCN)

Dear Dr. Mossman,

On behalf of the Faculty of Health Sciences at McMaster and St. Joseph's Healthcare Hamilton, we would like to recommend the approval of a proposed new joint centre, the McMaster / St. Joseph's Centre for Clinical Neuroscience, as an official research centre at McMaster.

Please find a proposal for the Centre attached.

If you require further information, please do not hesitate to contact us.

Yours sincerely,



Dr. Paul O'Byrne
Dean and Vice-President
Faculty of Health Sciences
McMaster University



Ms. Melissa Farrell
President
St. Joseph's Healthcare Hamilton

cc: J. Bramson
J. Gauldie
N. Kates

Encl.

PO/MF:sm



PROPOSAL FOR A CENTRE FOR CLINICAL NEUROSCIENCES

Prepared by:

Flávio Kapczinski, MSc MD PhD FRCPC
Director, Neuroscience Graduate Program

Nick Kates, MB BS FRCPC MCFP(hon)
Chair, Department of Psychiatry & Behavioural Neurosciences

November 2019

1. Official Name: McMaster / St. Joseph's Centre for Clinical Neuroscience (CCN)

2. Goal:

Short term goal: To establish a Centre for Clinical Neuroscience research in the existing wet lab facilities at St. Joseph's Healthcare Hamilton's W. 5th. Campus that will provide the physical, computational and staff infrastructure to harness multimodal datasets for clinical neuroscience research with a core of Computation and Big Data Analytics.

Long term goal: Establish a Canadian Pasteur Institute with a focus on Clinical Neuroscience in partnership with McMaster University and St. Joseph's Healthcare within the next five years.

3. Background: Data from the Public Health Agency of Canada shows that approximately 2.68 million Canadians suffered from a psychiatric disorder in 2016. Psychiatric disorders have a profound negative impact on quality of life, functioning, overall health and life expectancy. In Ontario alone, mental illness and addictions lead to the loss of more than 600,000 health-adjusted life years. Importantly, most major severe mental illnesses are highly heritable, have strong genetic underpinnings, emerge in childhood and adolescence and run a lifelong chronic course. A better understanding and treatment of psychiatric disorders is a major unmet need and the Canadian government has identified mental health as a top strategic priority, highlighting mood disorders and addiction.

The most accepted contemporary model of psychiatric disorders that emerged from large longitudinal studies indicate that they reflect an interaction between genetic risk and the environment, including early life adversity/trauma, drug addiction, and negative life events. When psychopathology is persistent and particularly when chronic depression takes place, the interplay between genes and environment triggers a state of chronic immune activation that is a risk factor for early mortality, accelerated aging and cognitive decline that later on in life translates into higher rates of dementia. In brief, the biological model for that is described in Figure 1. The proposed centre for clinical neuroscience will **focus on the underlying biology of trajectories of chronicity and disability in psychiatric disorders (neuroprogression).**

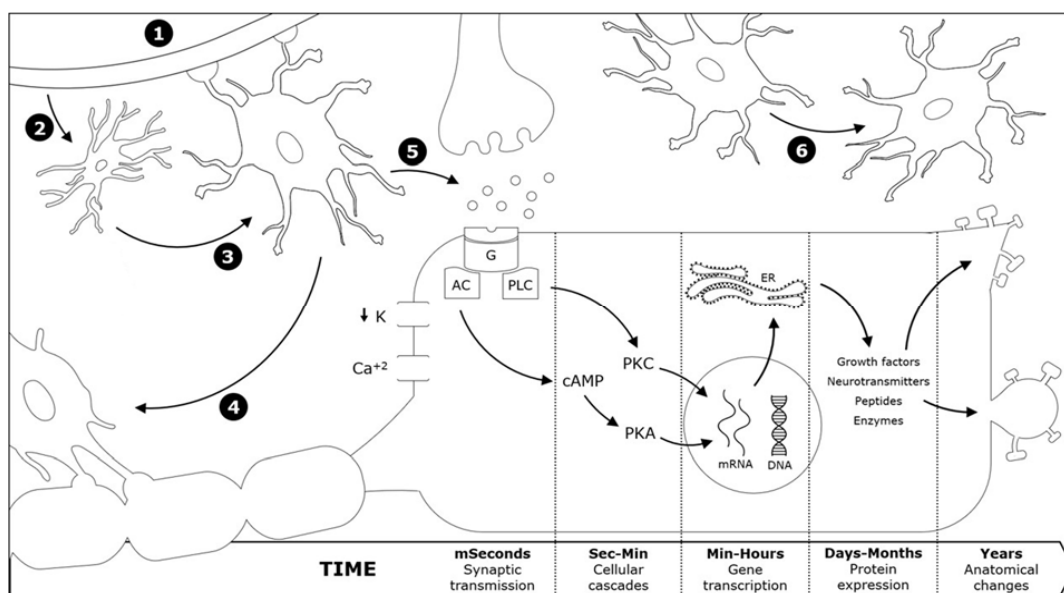


Figure 1. Cellular Components of Neuroprogression. 1) Chronic inflammation promotes change in blood-brain barrier that allows inflammatory cytokines as well as T cells to cross the blood-brain barrier. 2) Blood borne immune signals activate microglial cells. 3) Microglial cells activate astrocytes. 4) Activated astrocytes inhibit turnover of oligodendrocytes. 5) Activated astrocytes promote glutamatergic excitotoxicity. 6) Astrocyte calcium waves provide a specific form of excitability that involves the direct communication between the cytosol of two adjoining cells or the release of molecules that activates membrane receptors on neighboring cells. These alterations at molecular level, involving rapid changes in synaptic transmission, cellular cascades and gene transcription may promote more lasting changes in protein expression and ultimately would lead to long-term anatomical changes (neuroprogression).

4. Our Vision: A key feature of the CCN will be its ability to truly integrate the large amount of data from molecular genetics, neuroimaging, biological and clinical features using big data analytic approaches. Through this we will gain a better understanding of trajectories of disability and chronicity. We aim to predict clinical outcomes at the early stages and develop better personalized treatment plans for psychiatric patients. The close collaboration of the CCN with the Ontario Brain Institute (OBI) will allow for the development and testing of risk calculators for complex outcomes such as disability and risk of relapse into mood disorders and addictions.

The CCN will bring together key faculty from the Department of Psychiatry & Behavioral Neurosciences and St. Joseph's HealthCare Hamilton and other partners from McMaster University. It will take a societal as well as a clinical perspective and will emphasize the translation and application of new knowledge and discoveries to individual patient's organizations (improving treatment efficacy across a system) and communities (population focus).

The CCN will use in-house resources and expertise (rather than outsourcing) to curate, analyze and integrate existing datasets and will play an active role in gathering new datasets. Importantly, with the use of existing campus compute servers and resources the CCN will not require a major investment in infrastructure for the initial stages.

5. Specific Aims: At present, the neuroscientists in the Department of Psychiatry and Behavioural Neurosciences at SJHH/McMaster are working in relative isolation on individual programs of research, with limited opportunity to engage in shared projects or in more ambitious data analytic projects. The establishment of the Centre will bring faculty together within a shared research framework of pathways of chronicity and disability associated with severe psychiatric disorders. The research aims of the CCN will be achieved by:

- 1) Providing a focal point that will revitalize neuroscience research and advance the strategic directions of SJHH and McMaster.
- 2) Creating a physical space that will bring together faculty (and learners), who currently are scattered across multiple locations, sites and Faculties, to discuss and explore new possibilities for their research, address new questions that are beyond the scope of individuals working alone by pooling and optimizing their collective resources .
- 3) Developing a common agenda that will integrate the various groups interested in translational neuroscience research with a particular focus in the longitudinal course of mental illness and disability in the adult (neuroprogression).
- 4) Providing access to shared central resources, including research assistance and wet lab facilities.

6. Main research question: Assess the mechanisms associated with the progression of psychiatric disorders into trajectories of early disability and the propensity for developing dementia.

In recent years the literature on mood disorders, has shifted from control of symptoms to the management of long term trajectories (Duffy et al., 2016). Overall, the early and effective treatment of psychopathology is associated with optimal functioning and more favorable health outcomes. In contrast, the risk of recurrence increases with the number of acute episodes of disorders and untreated psychopathology. An increasing number of episodes is associated with: 1. Increasing risk of recurrence of episodes, 2. Increasing duration of episodes, 3. Increasing symptomatic severity of episodes, 4. Decreasing threshold for developing episodes, 5. Increasing risk of developing dementia. This increased severity over time is called clinical progression (Kessing and Andersen, 2017). Clinical progression happens in several psychiatric conditions such as addictions, PTSD, OCD, depression and bipolar disorder. The biological basis for clinical progression is called neuroprogression (Yatham et al., 2018). Our group helped developing the concept of neuroprogression and is a leading player in the field. We were among the first to describe how neuroinflammation plays a role in recurrent mood disorders (Kapczinski et al., 2015; Kapczinski et al., 2019). Microglial and astroglial activation (Rao et al., 2010) with consequent reduction in the turnover of oligodendrocytes (Vostrikov et al., 2007; Uranova et al., 2004) have been reported in post mortem studies in depression and bipolar disorder. Microglial cell activation has been shown in vivo in bipolar disorder (Haarman et al., 2014) and in major depression (Setiawan, et al. 2018). More recently our group discovered that such neuroinflammation is translating into in vivo reduced density of oligodendrocytes (Sehmbi et al., 2018, CIHR Catalyst Grant - active, Figure 3) and increased permeability at the blood-brain barrier level (Patel and Frey, 2015; PSI Foundation Operating Grant - active). In our journey describing neuroprogression in

chronic mood disorders we provided a framework for different groups interested in studying the pathways of chronicity and disability in psychiatry, involving 1. Early programming of psychiatric disorders in childhood and adolescence, 2. Synaptic modelling and psychiatric disorders in the youth and in the adult, 3. Pathophysiology of PTSD, 4. Pathophysiology of brain damage associated with addictions, 5. Pathophysiology of chronic anxiety disorders, 6. Differential illness trajectories in Autism, 7. Trajectories of healthy brain aging and 8. Chronic psychiatric disorders and accelerated brain aging as a risk factor for the development of dementia. This is aligned with the areas of expertise in clinical and basic neuroscience on campus and with the research interests and research network within the Department of Psychiatry and Behavioral Neurosciences (DPBN). The recurring theme that connects all these areas is the **field of adult neuroplasticity and neuroprogression in psychiatric disorders** (Sailor, Schinder and Lledo, 2017).

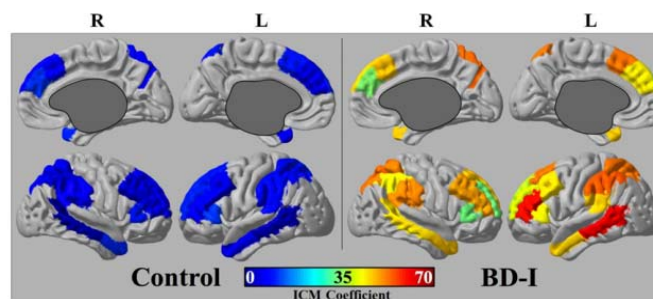


Figure 2. The slope of the linear relationship between intracortical myelin (ICM) and verbal memory performance in controls and bipolar disorder subjects. Each population was fitted individually to find the coefficient for the ICM term. On the left of the figure, the control population shows a globally blunted slope of verbal memory performance over ICM-related T1-weighted signal, with values ranging between 3.8 and 13.9. On the right, the bipolar disorder population displays values between 35.2 and 64.4, suggesting a much greater influence of ICM signal on verbal memory performance in bipolar disorder, in comparison with controls. L, left hemisphere; R, right hemisphere; BD, bipolar disorder.

7. Our unique strengths: Currently we are the second most cited group in psychology/psychiatry in Canada and among the 16 most cited among all areas at McMaster University (Clarivate Analytics 2018). Most of the research in the field of neuroprogression has been carried out by our own group in cooperation with partners included in the proposal and more recently with the partnership developed with the Pasteur Institute in France (Dargel et al., 2018 - see Appendix). We have a well-funded portfolio in the areas of addictions, mood disorders and adult neuroplasticity (Table 1). Our team has extensively documented expertise in all areas that we plan to develop at CCN. We were pioneers in the field of psychiatric genetics identifying a novel genetic variant in depression (Samaan et al. *Molecular Psychiatry*, 2013), micro-RNA markers of antidepressant response (Lopez et al, *Nature Communications*, 2017) and novel genetic variants responsible for impulsive behavior (Sanchez-Roige et al., 2017, *Nature Neuroscience*). Our CIHR-funded study on opioid use disorder is the largest cohort study investigating genetic, biological and social determinants of opioid addiction and treatment outcomes. The creation of the CCN will provide platform for expanding this area of research with **focus on trajectories of chronicity and disability in psychiatric disorders (neuroprogression)**.

Table 1. Current Funding from Main Investigators relevant to the work of the CCN.

Period	Grant	Title	Funding	Investigators
2018/4 2020/4	- CFI Canada Foundation for Innovation	The Biological Signatures of Clinical Progression in Bipolar Disorder.	\$140,000	Kapczinski, PI
2018/7 2020/6	- CIHR Catalyst Grant	Intracortical Myelin as a Mechanism for Sex Differences in Major Depressive Disorder	\$137,900	Frey, PI
2016/7 2020/6	- CIHR Project Grant	The Longitudinal Course of Intracortical Myelination and Cognitive Function in Bipolar	\$925,044	Frey, PI
2018/2 2020/2	- PSI Foundation Operating Grant	A Translational Study of Blood-Brain Barrier Disruption in Bipolar Disorder: Implications for a new pathway for drug development	\$187,000	Frey, PI
2014/4 2019/3	- Ontario Ministry of Research and Innovation	Predictors of Treatment Response in Individuals with Depression	\$150,000	Frey, PI
2013/7 2018/6	- CIHR Operating Grant	Predicting Antidepressant Treatment Response in Major Depressive Disorder: An Integrated Clinical and Neuroimaging Approach	\$893,950	Frey, Co-Inv
2013/4 2018/3	- Ontario Brain Institute Discovery Grant	Canadian Biomarker Integration Network for Depression (CAN-BIND)	\$18,000,000	Frey, Co-Inv
2018/4 2023/3	- CIHR Project Grant	Pharmacogenetics of Methadone Maintenance Treatment Response	\$1,116,900	Samaan, PI; MacKillop, Co-PI

2018/3- 2019/2	CIHR Catalyst Grant	Impact of cannabis legalization on cannabis use and outcomes in patients with opioid use disorder: a Canadian prospective cohort study	\$100,000	Samaan, PI; MacKillop, Co-Inv
2017/7 - 2018/6	CIHR Bridge Funding	Pharmacogenetics of Methadone Maintenance Treatment Response	\$100,000	MacKillop, PI; Samaan, Co-PI
2016/4 - 2018/11	HAHSO Grant	Health Innovation in Managing Opioid Addiction	\$191,758	Samaan, PI; MacKillop, Co-Inv
2016/10- 2017/12	St. Joseph's Healthcare Foundation	Genetics of Opioid Addiction	\$40,000	Samaan, PI

8. A unique opportunity: Our translational research in the field of mood disorders and addictions generated a stable flow of funding, innovation, publications and citations. Apart from the support received from the FHS and the St Joseph's Hospital, we have recently formalized an agreement for developing a joint research unit (Unite Mixte de Recherche) between clinical neuroscience at SJHH/McMaster and the Neuroscience Unit at the Pasteur Institute (please refer to the Director of International Affairs and Director of Neuroscience at Pasteur for further details). Our five years strategic plan (contingent on achieving milestones of excellence and funding) is to develop an Affiliated Pasteur Institute with a focus on Clinical Neuroscience at the West Fifth Campus. Our contribution to Pasteur's agenda is to add the clinical component and research on how chronic psychiatric disorders develop into vulnerability for dementia (neuroprogression). The study of **vulnerable populations with a clear focus on neuroprogression creates the unique opportunity of early interventions in populations at risk for developing dementia**, aligned with the new business plan of Pasteur Institute that included neurodegenerative diseases among their priorities.

9. Research Approach: We will establish a transformational pipeline of research on adult neuroplasticity and chronic psychiatric disorder - from the bench to the clinic. Our focus will be on the mechanisms whereby stress, addictions and mood episodes interact generating a malignant transformation of psychiatric disorders into chronic and debilitating conditions (Post, 2018). In this sense our research approach is a radical departure from a status quo where the specific mechanisms underlying discrete psychiatric entities are investigated. **Our focus is on the pathways of chronicity and disability in psychiatry (neuroprogression)**. The main components of our research will be (Figure 3). Please see Appendix 1.

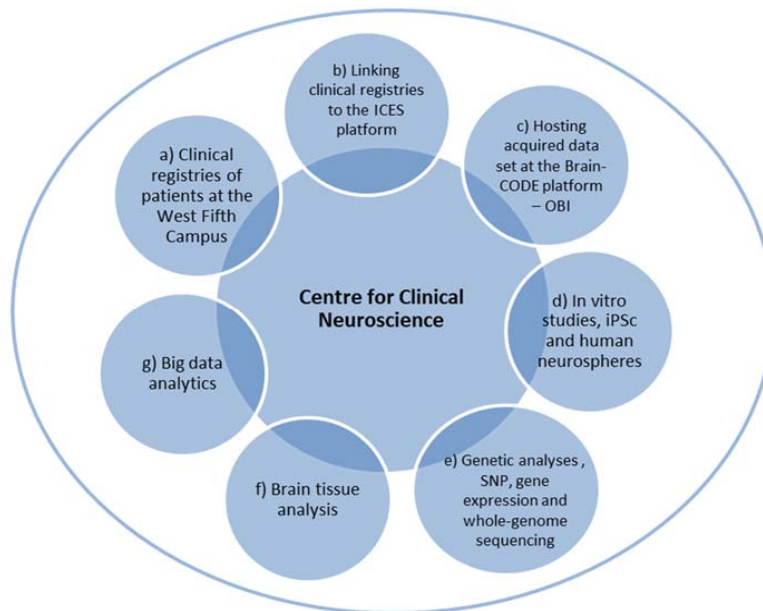


Figure 3. Centre for Clinical Neuroscience main components of research.

10. Membership: The CCN will be led by a core group of principal investigators (PIs) with extensive expertise in the neurobiology of mood disorders and addictions. A number of researchers from SJHH / Department of Psychiatry & Behavioral Neurosciences (DPBN) who work in related areas will join the CCN as associate members. Members of CCN will share the goal of advancing clinical neuroscience research, as aligned with the strategic directions of SJHH and DPBN.

10.1. Criteria for Membership

Members of CCN share the goal of advancing research on clinical neuroscience applied to the field of mental health. Core members will be SJHH/McMaster faculty members who identify CCN as their primary source for neuroscience research and big data analytics. Given the broad, translational scope of CCN, we will also welcome associate members who are engaged in other research institutes or centers at SJHH/McMaster.

10.2. Core Members

Initially, CCN will be based around researchers working in the Department of Psychiatry & Behavioral Neurosciences (PBN) and their current partners. Together, the core- and associate members of the CCN have published over 850 peer-reviewed articles in the last 5 years, with a total number of citations of 77,510 in the same period. It will gradually expand the scope of its activities as more collaborators and partners join the Centre. Core members will include:

Flavio Kapczinski, MSc, MD, PhD, FRCP(C)

Expert in molecular biomarkers in bipolar disorders and the second most cited Canadian researcher in the field of psychiatry/psychology in the last five years. His molecular studies were pioneer in

the understanding of the role of inflammation, oxidative stress and neurotrophic factors in the neurobiology of bipolar disorder.

Benicio Frey, MSc, MD, PhD

Expert in the neurobiology of bipolar and major depressive disorders. He is the site-PI of the largest study of biomarkers of antidepressant response in Canada (www.canbind.ca), which includes clinical, molecular genetics, neuroimaging and data science cores.

Zena Samaan, MBChB, DMMD, MSC, MRCPsych, PhD

Expert in psychiatric genetics research in depression and addictions. Dr. Samaan leads large CIHR projects in genetics in opioid addiction and international collaborations on genetics of depression. Her research on the genetics of depression is highly cited and has attracted significant media attention. She currently leads a large cohort study on opioid and cannabis investigating genetic variants as predictors of risk and markers of response to treatment as well as depression RCT where neurotransmitters' gene expression is being investigated as a marker of response to treatment.

James MacKillop, PhD

Expert in translational research on addictions. Dr. MacKillop is the Director of the Peter Boris Centre of Addiction Research and Director of the Michael G. DeGroote Centre for Medicinal Cannabis Research. He is currently leading CIHR- and NIH-funded projects investigating the genetic, environmental, and psychological determinants of addiction.

10.3. Associate Members

Faculty members that work in close association (IB, IP, JR, MA, NS, PM, LM, NB) with the core members (FK, BF, JM, ZS) or bring key expertise (PM, JR, NB) to achieve excellence in the different foci mentioned in Figure 4. Associate members will add granularity and different approaches to the questions addressed by the core members. In addition, associate members will broaden the basis of graduate students and clinical and research fellows to the CCN. All core members and associate member already work at the West Fifth Site in areas covered by the CCN with the exception of Jim Reilly and Paul McNicholas and Nick Bock, who will provide supervision to the work conducted at CCN in an intermittent basis.

Iris M. Balodis, PhD - Joint research with James MacKillop (core member0

Assistant Professor at DPBN, Dr. Balodis' research focuses on motivational processes influencing maladaptive decision-making; specifically, this entails examining arousal, emotion and anticipation that direct behaviour.

Ives Passos, MD, PhD - Joint research with Dr. Flavio Kapczinski (core member)

Collaborator of the DPBN, Dr. Passos' research focuses on mood disorders, suicide, and neuroinflammation, with the use of machine learning and big data analytic tools.

Jim Reilly, PhD - Joint research with Dr. Flavio Kapczinski and Ives Passos (core members)

Professor Emeritus at the Department of Electrical Engineering and Computing, Dr. Reilly's research focuses on the interface of machine learning and signal processing applied to health-related problems, particularly in neuroscience and psychiatry.

Luciano Minuzzi, MD, PhD

Assistant Professor at DPBN, Dr. Minuzzi's research focuses on brain imaging techniques and its clinical implications in mental health disorders, with special interest in neuroimaging core data analytics.

Michael Amlung, PhD - Join research with Dr MacKillop (core member)

Assistant Professor at the DPBN, Dr. Amlung's research seeks to understand the neurobiological and behavioural correlates of pathological decision-making and motivation, especially in the context of substance abuse and other unhealthy behaviors.

Nicholas Bock, PhD

Associate Professor at the Department of Psychology Neuroscience and Behavior, Dr. Bock's research investigates how the structure of the brain gives rise to function, with an emphasis on the cerebral cortex. His lab develops *in vivo* techniques for mapping the properties of the cortex using magnetic resonance imaging (MRI) and computational neuroimaging in humans and animals.

Noam Soreni, MD, FRCPC -

Associate Professor at the DPBN, Dr. Soreni's clinical and research work focuses on the biological and cognitive correlates of pediatric Hoarding, Obsessive Compulsive Disorder, and brain imaging.

Paul McNicholas, MA, MSc, PhD, P.Stat.

Professor and Canada Research Chair, Department of Mathematics and Statistics, Dr. McNicholas' research focus on computational statistics, especially identification of heterogeneity. Current research includes work on advanced analytics, non-Gaussian mixtures, pattern recognition, growth mixtures, matrix variate distributions, and real problems in big data analytics.

11. Graduate students and research fellows: Generally, members will bring along, on average, three graduate students or fellows to work in close association with the CCN. The CCN will not provide space for all faculty and students at all times, but will accommodate 20 graduate students and fellows as well as 2 supervising PIs that will alternate their presence in the space. An extended community of about 40 students and faculty will be housed at the research areas of the West Fifth Site and will interact closely with the personnel housed at CCN. Overall, we expect that the inner area of the CCN (Figure 1) will house about 22 staff in a permanent basis.

12. Location: The CCN will be physically housed within the state-of-the-art wet lab located at the SJHH West 5th Site (figure 4).

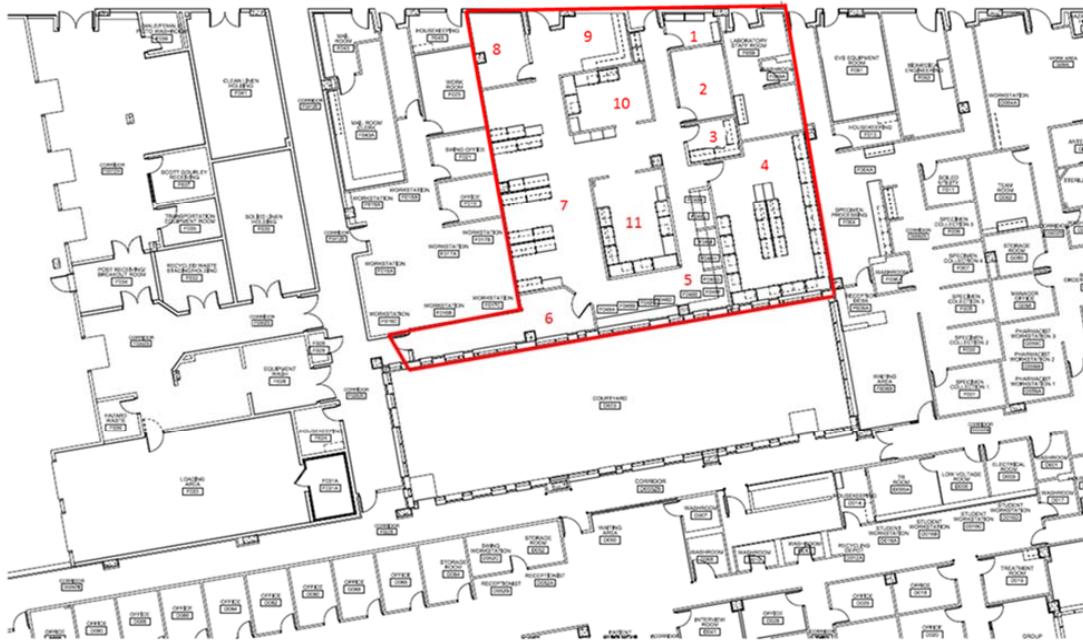


Figure 4. Floor plan of the basement in the West Fifth Site at SJHH. 1. Storage room; 2. Conference room; 3. Microscopy Analysis; 4. Lab work area; 5. 12 workstations for data processing; 6. Waste collection; 7. Bench work area; 8. Brain Tissue Storage; 9. Sample preparation; 10. Cell culture room; 11. Molecular and Protein analysis. All required equipment to run a state-of-the-art translational neuroscience laboratory are already in place. The remaining pieces of equipment will be purchased with SJHH Foundation and CFI grants - active.

St. Joe's will cover the ongoing costs attributed to this space.

13. Staff Resources

Initially, the Centre for Clinical Neuroscience (CCN) will require 5 personnel. These will be:

- A part-time Administrative Assistant
- A part-time Laboratory Technician
- A full-time Research Laboratory Manager
- A part-time Research Scientist Manager
- A part-time Research Analyst Manager

Administrative Assistant (part-time)

The administrative assistant will be responsible for the smooth day to day running of the CCN, the integration of the activities of its members, maintaining linkages between partners, preparing relevant documentation and reports and providing administrative support to Centre members.

Laboratory Technician (part-time)

The laboratory technician will process biological samples and prepare reagents as required for the analysis in accordance with documented procedures; retrieves and archives biological samples for storage and disposal. In addition, the laboratory technician will conduct general lab duties including material handling, cleaning of dishes and equipment, and other lab tasks and research as required. The laboratory technician will identify and communicate procedural non-conformances to supervisors. This person must have the ability to think analytically and to comply with Personal Protective Equipment (PPE) requirements and standard operating procedure (SOP) instructions; and must be self-motivated to work independently and thrive in a collaborative team environment.

Research Laboratory Manager (full time)

The research laboratory manager will be the contact person for the logistics of the laboratory, will be the site manager on an ongoing basis and will be the person through whom all issues related to the lab and its logistics will flow. In addition, the laboratory manager will be responsible for conducting biomarkers analysis and for performing molecular and protein techniques. This person will supervise students and follow up on work results. The laboratory manager will have a high level of knowledge of lab management, decision-making, and analytical skills; strong verbal, written, and interpersonal communication skills; and ability to work collaboratively with a research group or team. Also, will maintain professional and technical knowledge by attending educational workshops; reviewing professional publications; establishing personal networks; participating in professional societies.

Research Scientist Manager (part-time)

The research scientist manager will be responsible for coordinating, implementing and conducting scientific research involving complex cell culture approaches and analysis following established protocols in the assigned wet lab research area. The research scientist manager will implement cell culture experiments and perform cellular analysis in the CCN, besides training of new laboratory personnel in these methods. For this role, it is essential expertise on in vitro models and ability to run complex techniques requiring advanced specialized training, and ability to troubleshoot issues. In addition, this member will write technical protocols, reports and publications; organize and conceptualize ideas leading to new projects; participate in weekly laboratory meetings, and supervise students.

Research Analyst Manager (part-time)

A research analyst manager will oversee the conduction of clinical research, performing data management and statistical analysis, interpretation of the results, and writing reports presenting data related to clinical neuroscience. The research analyst manager needs to have expertise in the conduction of large epidemiological studies and managing large datasets. Activities will include the management, analysis, and interpretation of clinical and biological data.

14. Budget: At the present moment, all core-members, associate members, graduate students and administrative support personnel are covered by existing grants (Table 1). As previously described, the CCN will use in-house resources to curate and analyze existing datasets, and campus servers that are already in place, which will not require an initial major investment in infrastructure. The Faculty of Health Sciences, St. Joseph's Healthcare Hamilton Foundation and McMaster's Department of Psychiatry and Behavioural Neurosciences have all agreed to contribute \$70,000 a

year for three years, to support the Centre Manager, Data Curator and Data Analyst as well as a small amount for operating expenses during this period, by which time it is anticipated that the Centre will be self-supporting, based on grants obtained. All other costs will be borne through the individual research programs of the members. (see Appendix 2)

The Faculty of Health Sciences has introduced a new policy regarding research overhead for institutes and centres that automatically directs a portion of overhead from all core members to a dedicated operating account for the institute/centre and no longer requires separate Dean/Chair approval. The Vice-Dean (Research) in FHS has reviewed the proposal as it related to funding and had no issues.

All core members of this Centre are based in FHS. Any central University policies with regard to overhead distribution will remain in force.

15. Organizational Structure

15.1. Leadership of the Centre

The Director will set the research and academic direction of the CCN in consultation with the Governing Board and Scientific Advisory Committee. The Director will articulate the leadership of the Centre, set milestones and provide the business plan. The Director will report annually to the Governing Board.

The Director will be appointed for a 5-year renewable term.

Pending approval by the University's governing bodies, Dr. Flavio Kapczinski is to be put forward for appointment as the inaugural holder of this position. Dr. Kapczinski is a leader in the field of research in mental disorders and currently serves as Director of the Neuroscience graduate program at McMaster.

An Associate Director with complementary skills will also be appointed in the future, also serving for a 5-year renewable term.

15.2. Proposed Governing Board

The Governing Board (GB) will evaluate the performance of the CCN considering its progress, the status of its members and its financial viability in accordance with McMaster's Guidelines for the Governance and Review of Research Institutes, Centres and Groups. According to our standard practice for joint institutes and centres, the GB will be co-chaired by the Dean and Vice-President of the Faculty of Health Sciences and the President of St. Joseph's Healthcare Hamilton. The remaining membership will be comprised, at minimum, of:

- Vice-Dean Research, Faculty of Health Sciences
- Vice-President (Research), St. Joseph's Healthcare Hamilton
- Chair, Department of Psychiatry and Behavioural Neurosciences
- Chair, Department of Psychology, Neuroscience and Behaviour
- Chief of Psychiatry, St. Joseph's Healthcare Hamilton
- Executive Director, Research Administration, St. Joseph's Healthcare Hamilton

The CCN Directors will report to the GB on an annual basis.

15.3. Proposed International Scientific Advisory Board

The Scientific Advisory Board (SAB) will provide advice to the Director(s) with regard to scientific or scholarly priorities and the direction for the Centre. The SAB is chosen by the Director(s) and is consulted at least every two years, or more frequently at the discretion of the Director. Potential members could include (none have yet been contacted)

- Professor Hugh MacKinnon (Board Chair of the Ontario Brain Institute)
- Professor Eduard Vieta (Professor of Psychiatry at the University of Barcelona and Chair of the Department of Psychiatry and Psychology at the Hospital Clinic. Director of the Bipolar Research Program at the Spanish Research Network on Mental Diseases - CIBERSAM)
- Dr. Pierre-Marie Lledo (Director of the Neuroscience Program at Pasteur Institute).

16. Operational Review

16.1. Annual Review

The Director of the CCN will send reports annually to the Governing Board chaired by the Faculty Dean or designate that will monitor the status, progress and plans of the centre. The reports will include updates on administration, objectives for the next year, financial status, research productivity, grants, educational initiatives, external collaborations and any other research activities involving the centre.

16.2. Periodic Review

According to the University's Guidelines for the Governance and Review of Research Institutes, Centres and Groups, the CCN will undergo an external review every five years in keeping with University guidelines and at the discretion of the Governing Board (GB). The composition of the External Review Board (ERB) will be determined by the GB, as co-chaired by the Dean and Vice-President of the Faculty of Health Sciences and the President of St. Joseph's Healthcare Hamilton.

The composition of the ERB will be determined by the GB and should take into account the aspirations of the Centre and the availability of funds to support the review. The ERB would normally comprise three high-calibre scholars with an international perspective, who must be arms-length from the Centre. The ERB will assess the performance of the Centre's Director and its scientific program. The ERB will be furnished with documents describing the University's policy on Research Institutes and will be asked whether performance is compatible with expectations described in the policy.

The ERB is expected to use accepted measures of performance such as publication number and impact to assess the Centre's contributions in comparison with those of (a) the Centre during the preceding 5 years and/or (b) with the performance of Centre's of similar size in the same field of research.

The recommendations of the ERB will include the renewal of the Director, and whether the Centre's performance is consistent with that of a joint Centre. Their report will be submitted in confidence to the GB via the Dean and Vice-President of the Faculty of Health Sciences and the

President of St. Joseph's Healthcare Hamilton. Normally, the Governing Board chair would share the ERB's report or major recommendations from the ERB's report with either the current Director, or the successor to the current Director, so that the leadership of the Centre benefits from the perspective of the ERB.

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Appendix 1. Research Approach.

The main components of our research will be:

- a. Clinical registries of patients followed at the West Fifth Campus: we have ongoing and long-term funded projects in the area of mood disorders, opiate addictions, early programming of mental disorders, autism, cannabis and alcohol use disorders, anxiety disorders, youth mental health and the Cleghorn centre for early intervention in Psychosis.
- b. Data from the clinical registries will be linked to the ICES platform using the resources and collaboration of Dr Benicio Frey and Dr. Flavio Kapczinski and the McMaster ICES team - Dr. Richard Perez and Lindsay Favotto (Figure 1).

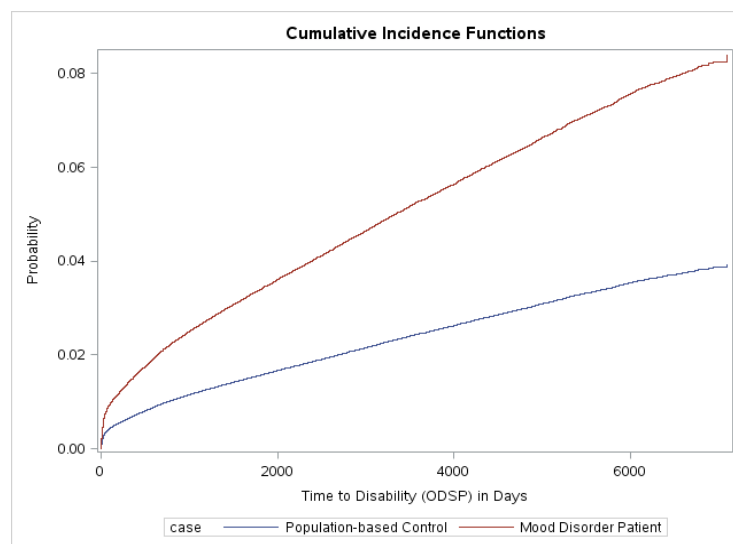


Figure 1. Cumulative incidence function of Ontario Disability Support Program (ODSP) among the specific mood disorder patients compared to birth and sex matched population-based controls, in Ontario between October 1, 1997 and March 31st, 2007 (N=139,148). Probability= probability of developing disability (ODSP). Preliminary data on file.

- c. Host and support the merger and multimodal analyses across different registries in the neuroinformatics platform Brain-CODE (www.braincode.ca), developed by Ontario Brain Institute (OBI) and the Indoc Consortium. Brain-CODE will provide data management systems and support to capture, monitor and curate multi-modal clinical, imaging and molecular data, and systems for harmonization, integration, query, and analysis across modalities. Raw and curated datasets, including metadata, from clinical and neuropsychiatric assessments, MRI sessions and biomarker assays will be periodically uploaded by trained personnel to REDCap (Harris et al, 2009), XNAT (Marcus et al, 2007), and LabKey (Nelson et al., 2011) systems, respectively, through a secure data portal hosted

on Brain-CODE. A standard fMRI QA process supported by Brain-CODE will be used based on the fBIRN phantom and pipeline software. Each imaging center will scan the phantom on a monthly basis and upload the raw data to XNAT. The fBIRN QA pipeline will process these data within 24 hours of upload, and generate a full QA report stored within the session. The phantom and QA procedures are more formally described in Friedman & Glover (2006), and Glover et al., (2012). Permission-controlled access to all data will allow investigators to work collaboratively to aggregate and prepare datasets for machine learning analyses and to share results. Brain-CODE will also enable future release of de-identified datasets to the broader scientific community.

- d. Implement in vitro studies with neuronal cellular models, such as induced pluripotent stem cells (iPSc), and human neurospheres (mini-brains) obtained from patients' cells to study, in a longitudinal way, biological pathways related to mental illnesses and screening for compounds that have potential therapeutic applications - in collaboration with Dr. Karun Singh, FHS. In addition, implement brain donation of patients followed at the West Fifth Campus in order to create a brain bank in CCN, as a long-term goal.
- e. Genetic analyses such as single nucleotide polymorphisms (SNPs), gene expression and whole-genome sequencing in samples from patients enrolled in funded longitudinal studies will be analyzed in order to identify molecular mechanisms potentially associated with psychiatric disorders. In this sense, we have investigated the transcriptional regulation in the brain using big data from gene expression datasets and applying gene network-based approaches by innovative bioinformatics analysis. We have shown that the regulatory unit of early growth response gene 3 (EGR3) is repressed in post-mortem prefrontal cortex of BD patients (Pfaffenseller et al., 2016; Figure 2). Considering that EGR3 is an immediate early gene that responds very rapidly to stress with the potential to translate environmental stimuli into long-term changes in brain, *a disruption in this biological pathway may impair neuronal plasticity, and ultimately the brain's ability to adapt to stress and new experiences, influencing the risk for mental disorders*. After identifying this network as a potential key target in psychiatry, our group has performed a follow-up experimental evaluation to understand the potential molecular players involved in the reduced neurobiological resilience seen in psychiatric patients.

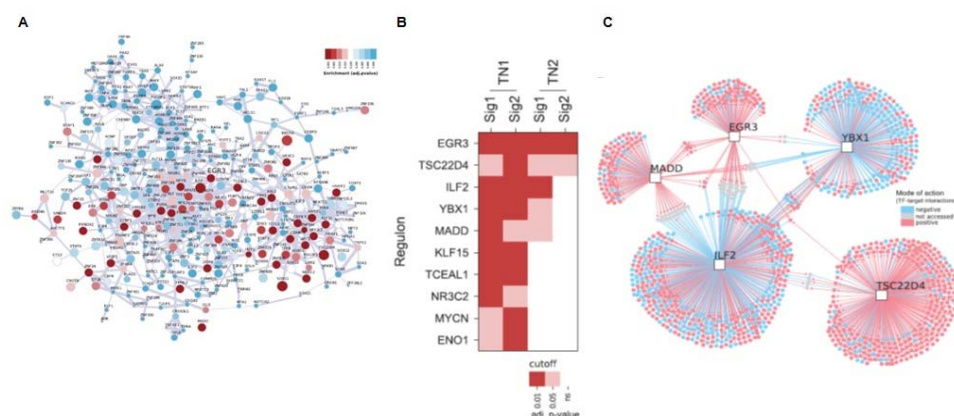


Figure 2. (A) A systems model of the human prefrontal transcriptional network, and the enrichment analysis using gene expression signature showing the distribution of the bipolar phenotype. (B) Consensus regulatory units (regulons) consistently enriched for two bipolar disorder signatures (Sig 1 and Sig 2). (C) Regulons associated with bipolar disorder. The regulatory network shows the transcription factor (square nodes) and its inferred targets (round nodes).

- f. The CCN will also enable protein analysis and analysis of samples of cellular/animal models for the assessment of molecular mechanisms underlying mental disorders and addictions. In this sense, the CCN will investigate neuropathological changes in brain tissue from human post-mortem samples collected in collaboration with the Department of Pathology and Molecular Medicine at General Hamilton Hospital; and in brain tissue from animal models assessed at the Central of Animal Facility at McMaster University. Moreover, in order to further understand the brain structure and function in patients with psychiatric disorders and addictions, the CCN will integrate biological data with neuroimaging and electroencephalogram (EEG) by means of big data analytics.
- g. Big datasets gathered at CCN (genetics, biomarkers, neuroimaging, and data from animal and cellular models) will be integrated and analysed using machine learning approaches, and risk calculators for unfavorable outcomes will be developed to help in clinical decision-making. In the past decade, there has been an explosion of computational and statistical techniques for analyzing multimodal data related to mental health disorders. That includes clinical, neuropsychological, neuroimaging, 'omics' and EEG. Consequently, a focus on the computational integration and analysis of complex sets of data is a key component in modern clinical neuroscience research. In this sense, recent cross-sectional studies from our group have shown that machine learning algorithms coupled with clinical data can predict key clinical outcomes in mental illness, at an individual level. We recently showed that the risk of suicide attempts can be predicted using clinical variables (Passos et al., 2016 - Figure 3), while data from our research network suggests that clinical variables can estimate functional impairment in psychiatric disorders with high accuracy (Pinto et al., in prep - Figure 4). We also showed that a model using brain imaging, support vector machine

and feature selection routines can potentially estimate functioning among psychiatric patients (Kapczinski et al, in prep). Using machine learning algorithms coupled with whole-brain scans, our group has also shown that psychiatric patients and controls can be differentiated (Mwangi et al., 2016 - Figure 5).

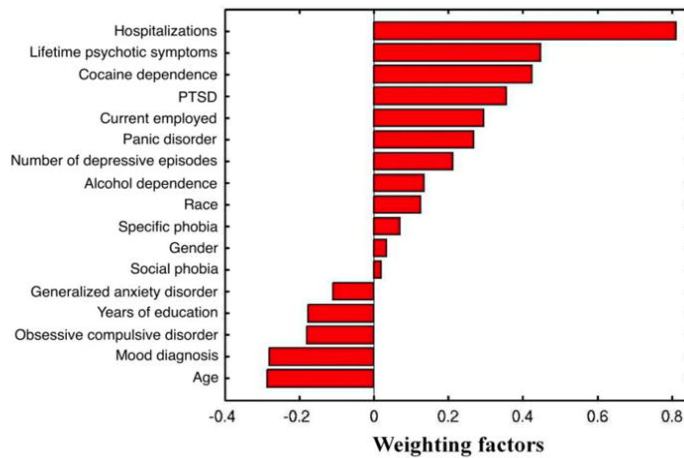


Figure 3. Bar graph showing weighting factors assigned to each clinical variable by relevance vector machine based on their relevance in distinguishing suicide attempters from non-attempters. Clinical variables which increase the probability of an individual patient being a suicide attempter were assigned positive weighting factors whilst those that decrease the probability of a patient being a suicide attempter were assigned negative weighting factors. PTSD= posttraumatic stress disorder.

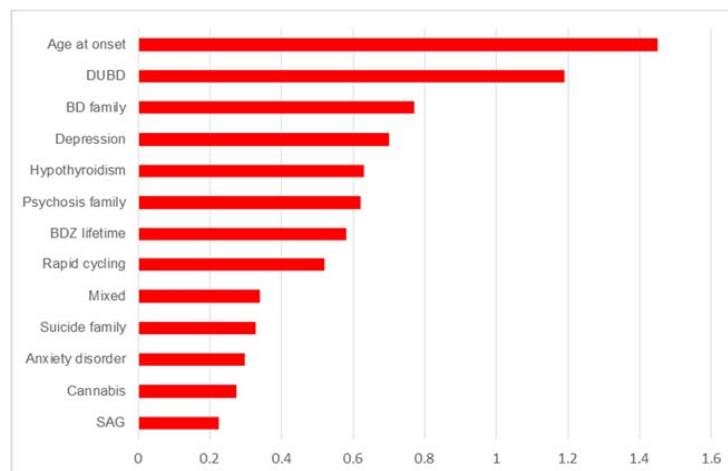


Figure 4. Bar graph showing factors based on their importance in differentiating patients with functional impairment from those without functional impairment. Anxiety: lifetime comorbid anxiety disorder; BD family: first-degree family history bipolar disorder; BZD lifetime: lifetime use of benzodiazepines; Cannabis: lifetime abuse or dependence of cannabis; Depression: type of first mood episode (depression); DUBD: duration of untreated bipolar disorder; hypothyroidism: lifetime hypothyroidism; mixed: type of first mood episode (mixed); Psychosis family: first-

degree family history psychotic disorder; Rapid cycling: presence of rapid cycling; SAH: systemic arterial hypertension; Suicide family: first-degree family history suicide attempts.

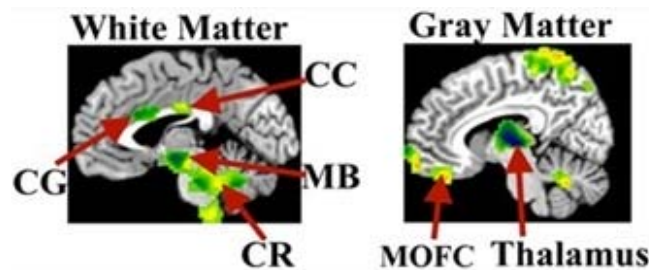


Figure 5. White matter brain regions identified during feature selection as most relevant in distinguishing patients with bipolar disorder from healthy control subjects. Gray matter regions most relevant in identifying patients with bipolar disorder from healthy control subjects. Green indicates anatomic regions with reduced gray/white matter density in patients with bipolar disorder compared with healthy control subjects. The cerebellum was used for post hoc tests because it reported the largest cluster size (391 voxels). White matter brain regions include cingulate gyrus (CG), corpus callosum (CC), midbrain (MB), and cerebellum (CR). Gray matter brain regions include medial orbitofrontal cortex (MOFC) and thalamus.

Appendix 2 - Budget

FHS, the Department of Psychiatry and to St. Joseph's Foundation / Research Institute have agreed to share these costs for the first three years, following which the Centre will be self-sustaining.

		Year 1	Year 2	Year 3	Year 4	Year 5	Total	\$ Secured	\$ Anticipated
OPENING BALANCE/CARRY FORWARD		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
REVENUE - indicate secured or anticipated		Year 1	Year 2	Year 3	Year 4	Year 5	Total	\$ Secured	\$ Anticipated
<i>Please ensure that any anticipated revenue from grant funding will only support costs eligible for that grant and note funding available for indirect or general operations.</i>									
St. Joseph's Healthcare Hamilton Foundation (SJHF)		\$ 35,000	\$ 70,000	\$ 70,000	\$ 35,000	\$ -	\$ 210,000	\$ 210,000	
Faculty of Health Sciences		\$ 35,000	\$ 70,000	\$ 70,000	\$ 35,000	\$ -	\$ 210,000	\$ 210,000	
Dept of Psychiatry		\$ 35,000	\$ 70,000	\$ 70,000	\$ 35,000	\$ -	\$ 210,000	\$ 210,000	
Research Grants					\$ 105,000	\$ 210,000	\$ 315,000		\$ 315,000
TOTAL REVENUE		\$ 105,000	\$ 210,000	\$ 210,000	\$ 210,000	\$ 210,000	\$ 945,000	\$ 630,000	\$ 315,000
EXPENSES		Year 1	Year 2	Year 3	Year 4	Year 5	Total		
Administrative Expenses: (add rows as required)									
Personnel (costs include benefits);	% FTE (yr 2)							\$ -	
Admin Assistant/Coordinator	0.5	\$ 16,750	\$ 33,500	\$ 33,500	\$ 33,500	\$ 33,500	\$ 150,750		
Lab Technician	0.5	\$ 10,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 90,000		
Research Laboratory Manager	1	\$ 35,000	\$ 70,000	\$ 70,000	\$ 70,000	\$ 70,000	\$ 315,000		
Research Scientist Manager	0.5	\$ 20,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 180,000		
Research Analyst Manager	0.5	\$ 20,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 180,000		
Equipment: Licensing/Software		\$ 2,500	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 22,500		
Data Archiving: Brain-CODE provided by the Ontario Brain Inst (OBI)		\$ 750	\$ 1,500	\$ 1,500	\$ 1,500	\$ 1,500	\$ 6,750		
Ongoing costs for space to be provided by St. Joseph's Health Care Hamilton							\$ -		
Total Administrative Expenses		\$ 105,000	\$ 210,000	\$ 210,000	\$ 210,000	\$ 210,000	\$ 945,000		
<i>All other costs will be borne through the individual research programs of the members</i>									
TOTAL EXPENSES		\$ 105,000	\$ 210,000	\$ 210,000	\$ 210,000	\$ 210,000	\$ 945,000		
IN-YEAR (Surplus/ Deficit)		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		

APPENDIX 2

McMaster/St. Joseph's Centre for Clinical Neuroscience

		Year 1	Year 2	Year 3	Year 4	Year 5	Total	\$ Secured	\$ Anticipated
OPENING BALANCE/CARRY FORWARD		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		
REVENUE - indicate secured or anticipated		Year 1	Year 2	Year 3	Year 4	Year 5	Total	\$ Secured	\$ Anticipated
<i>Please ensure that any anticipated revenue from grant funding will only support costs eligible for that grant and note funding available for indirect or general operations.</i>									
St. Joseph's Healthcare Hamilton Foundation (SJHF)		\$ 35,000	\$ 70,000	\$ 70,000	\$ 35,000	\$ -	\$ 210,000	\$ 210,000	
Faculty of Health Sciences		\$ 35,000	\$ 70,000	\$ 70,000	\$ 35,000	\$ -	\$ 210,000	\$ 210,000	
Dept of Psychiatry		\$ 35,000	\$ 70,000	\$ 70,000	\$ 35,000	\$ -	\$ 210,000	\$ 210,000	
Research Grants					\$ 105,000	\$ 210,000	\$ 315,000		\$ 315,000
TOTAL REVENUE		\$ 105,000	\$ 210,000	\$ 210,000	\$ 210,000	\$ 210,000	\$ 945,000	\$ 630,000	\$ 315,000
EXPENSES		Year 1	Year 2	Year 3	Year 4	Year 5	Total		
Administrative Expenses: (add rows as required)									
Personnel (costs include benefits);	% FTE (yr 2)						\$ -		
Admin Assistant/Coordinator	0.5	\$ 16,750	\$ 33,500	\$ 33,500	\$ 33,500	\$ 33,500	\$ 150,750		
Lab Technician	0.5	\$ 10,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 90,000		
Research Laboratory Manager	1	\$ 35,000	\$ 70,000	\$ 70,000	\$ 70,000	\$ 70,000	\$ 315,000		
Research Scientist Manager	0.5	\$ 20,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 180,000		
Research Analyst Manager	0.5	\$ 20,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 180,000		
Equipment: Licensing/Software		\$ 2,500	\$ 5,000	\$ 5,000	\$ 5,000	\$ 5,000	\$ 22,500		
Data Archiving: Brain-CODE provided by the Ontario Brain Inst (OBI)		\$ 750	\$ 1,500	\$ 1,500	\$ 1,500	\$ 1,500	\$ 6,750		
							\$ -		
Ongoing costs for space to be provided by St. Joseph's Health Care Hamilton							\$ -		
Total Administrative Expenses		\$ 105,000	\$ 210,000	\$ 210,000	\$ 210,000	\$ 210,000	\$ 945,000		
All other costs will be borne through the individual research programs of the members									
TOTAL EXPENSES		\$ 105,000	\$ 210,000	\$ 210,000	\$ 210,000	\$ 210,000	\$ 945,000		
IN-YEAR (Surplus/ Deficit)		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -		

REPORT TO THE SENATE
FROM THE
COMMITTEE ON APPOINTMENTS
Open Session (Regular)

At its meeting on January 20, 2020, the Committee on Appointments approved the following recommendations and now recommends them to Senate for approval:

1. Establishment of the BRIGHT Run Breast Cancer Learning Health System Chair

On January 20, 2020, the Senate Committee on Appointments approved the establishment of the BRIGHT Run Breast Cancer Learning Health System Chair and now recommends it to Senate for approval:

It is now recommended,

That Senate approve the establishment of the BRIGHT Run Breast Cancer Learning Health System Chair.

2. Establishment of the McMaster University/Hamilton Health Sciences Chair in Perioperative Care

On January 20, 2020, the Senate Committee on Appointments approved the establishment of the McMaster University/Hamilton Health Sciences Chair in Perioperative Care and now recommends it to Senate for approval:

It is now recommended,

That Senate approve the establishment of the McMaster University/Hamilton Health Sciences Chair in Perioperative Care.

3. Name Change – PHRI Chair in Cardiology Research

On January 20, 2020, the Senate Committee on Appointments approved the name change of the PHRI Chair in Cardiology Research and now recommends it to Senate for approval:

It is now recommended,

That Senate approve the name of the PHRI Chair in Cardiology Research be changed to the Stuart Connolly-PHRI Chair in Cardiovascular Research.

SENATE: FOR APPROVAL
February 12, 2020

January 9, 2020

Senate Committee on Appointments
c/o University Secretariat
Gilmour Hall, Room 210

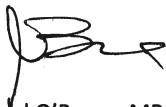
Re: Establishment of the BRIGHT Run Breast Cancer Learning Health System Chair

On behalf of the Faculty of Health Sciences, I would like to recommend the establishment of the BRIGHT Run Breast Cancer Learning Health System Chair.

The Hamilton Health Sciences Foundation, via funds raised from the BRIGHT Run, has generously made a commitment to permanently fund a Chair at McMaster University through an endowment held at the Foundation. This commitment is being supplemented with matching funds from both the central University and the Faculty of Health Sciences. The Chair will provide resources to support innovative research in the use of digital health in breast cancer and oncology.

The terms of reference for the Chair are attached.

Yours sincerely,



Paul O'Byrne, MB, FRCP(C), FRSC
Dean and Vice-President
Faculty of Health Sciences

Encl.

PO/sm

TERMS OF REFERENCE

BRIGHT Run Breast Cancer Learning Health System Chair

GENERAL

Hamilton Health Sciences Foundation has made a commitment to permanently fund a Chair at McMaster University. This funding has been directed to the Faculty of Health Sciences to provide support for the *BRIGHT Run Breast Cancer Learning Health System Chair*.

The incumbent will have demonstrated excellence in the area of digital health and/or data and analytics in breast cancer and oncology.

DETAILS AND DUTIES

The holder of the Chair shall be an individual with sufficient research and education experience.

Specifically, the Chairholder will:

- Hold appointments in the Department of Oncology in the Faculty of Health Sciences at McMaster University and the Escarpment Cancer Research Institute;
- Be an integral part of both institutional visions toward establishing and maintaining a world class program in digital health and/or data and analytics in breast cancer and oncology which exemplifies the central values of the University, the Department of Oncology and Hamilton Health Sciences;
- Contribute significantly to the body of scholarship in the area of digital health and/or data and analytics in breast cancer and oncology through teaching and research at McMaster University and Hamilton Health Sciences;
- Act as a nidus to attract local researchers in oncology who are interested in digital health and/or data and analytics research and to build an effective team of investigators;
- Develop personal research projects and promote research in the area of digital health in breast cancer and oncology;
- Conduct research that focuses on the use, integration and evaluation of digital health and/or data and analytics to improve patient-centred care and enhance the connection between patient and provider;
- Serve as a role model through continued excellence in academic pursuits;
- Provide mentoring and leadership to future generations of academic health researchers in the Faculty of Health Sciences and at Hamilton Health Sciences;
- Undertake the normal duties of a faculty member in the Faculty of Health Sciences including participation in the education programs of the Department.

NOMINATION AND DESIGNATION OF THE CHAIRHOLDER:

The selection and designation of the Chairholder will be determined as follows:

- The Dean and Vice-President of the Faculty of Health Sciences will appoint an appropriate ad-hoc selection committee, which shall include, at minimum, the Vice-Dean, Research and the Chair of the Department of Oncology and Scientific Director of the Escarpment Research Institute.
- The selection committee will invite and receive nominations for the newly created Chair and make recommendations for the appointment to the Dean and Vice-President of the Faculty of Health Sciences.
- The Dean and Vice-President will forward the ad hoc selection committee's recommendation to the Senate Committee on Appointments.

TERM:

An appointment to the BRIGHT Run Breast Cancer Learning Health System Chair shall be for up to five (5) years, with the understanding that renewal for additional terms is possible based on satisfactory reviews.

ACKNOWLEDGEMENT

The incumbent will acknowledge that she/he holds the “*BRIGHT Run Breast Cancer Learning Health System Chair*” in all publications, lectures and any other activities supported through the fund.

August 2019

January 9, 2020

Senate Committee on Appointments
c/o University Secretariat
Gilmour Hall, Room 210

Re: Establishment of the McMaster University / Hamilton Health Sciences Chair in Perioperative Care

On behalf of the Faculty of Health Sciences, I would like to recommend the establishment of the McMaster University / Hamilton Health Sciences Chair in Perioperative Care.

Hamilton Health Sciences Corporation has generously made a commitment to permanently fund a Chair at McMaster University through an endowment held by Hamilton Health Sciences Research Institute. This commitment is being supplemented with matching funds from the Faculty of Health Sciences. The Chair will provide additional resources to strengthen the University's research in the field of perioperative care.

The terms of reference for the Chair are attached.

Yours sincerely,



Paul O'Byrne, MB, FRCP(C), FRSC
Dean and Vice-President
Faculty of Health Sciences

Encl.

PO/sm

TERMS OF REFERENCE

McMaster University / Hamilton Health Sciences Chair in Perioperative Care

GENERAL

Hamilton Health Sciences has generously made a commitment to perpetually fund a Chair at McMaster University. This funding has been directed to the Faculty of Health Sciences to provide support for the *McMaster University / Hamilton Health Sciences Chair in Perioperative Care*.

This Chair will be directly associated with, and its tenure run concurrent with, an appointment to the position of Director, Division of Perioperative Care, Department of Health Research Methods, Evidence and Impact, McMaster University.

The incumbent will have demonstrated excellence in the area of perioperative medicine.

DETAILS AND DUTIES

The holder of the Chair shall be an individual with sufficient research, education and/or clinical experience.

Specifically, the Chairholder will:

- Be an active faculty member in the Faculty of Health Sciences at McMaster University;
- Be an integral part of the institutional vision towards establishing and maintaining a world class program in perioperative care which exemplifies the central values of the University, the Faculty of Health Sciences and HHSC;
- Contribute significantly to the body of scholarship in the area of perioperative care through teaching, research and/or clinical work at McMaster University and HHSC;
- Participate in the development of an educational curricula in perioperative care for undergraduate, graduate and/or postgraduate students of the Faculty of Health Sciences;
- Develop personal research projects and promote research in the area of perioperative care;
- Serve as a role model through continued excellence in patient care and academic pursuits;
- Provide mentoring and leadership to future generations of academic physicians in the Faculty of Health Sciences and at HHSC;
- Undertake the normal duties of a faculty member in the Faculty of Health Sciences including participation in the education programs of the Department.

NOMINATION AND DESIGNATION OF THE CLINICAL RESEARCH CHAIRHOLDER:

The selection and designation of the Chairholder will be determined as follows:

- The Dean and Vice-President of the Faculty of Health Sciences will appoint an appropriate ad-hoc selection committee, which shall include, at minimum, the Vice-Dean, Research and the Chair of the Department of Health Research Methods, Evidence and Impact.

- The selection committee will invite and receive nominations for the Chair and make recommendations for the appointment to the Dean and Vice-President of the Faculty of Health Sciences.
- The Dean and Vice-President will forward the ad hoc selection committee's recommendation to the Senate Committee on Appointments.

TERM:

An appointment to the McMaster University / Hamilton Health Sciences Chair in Perioperative Care shall be for up to five (5) years, with the understanding that renewal for additional terms is possible based on satisfactory reviews.

ACKNOWLEDGEMENT

The incumbent will acknowledge that she/he holds the "*McMaster University / Hamilton Health Sciences Chair in Perioperative Care*" in all publications, lectures and any other activities supported through the fund.

July 2019

January 9, 2020

Senate Committee on Appointments
c/o University Secretariat
Gilmour Hall, Room 210

Re: Name Change for the PHRI Chair in Cardiology Research

On behalf of the Faculty of Health Sciences, I would like to recommend the name of the PHRI Chair in Cardiology Research be changed to the **Stuart Connolly-PHRI Chair in Cardiovascular Research**.

The Chair is being re-named in honour of Dr. Stuart Connolly's international leadership in the evaluation of treatments for heart rhythm disorders, particularly by means of randomized controlled clinical trials.

The current holder of the Chair, Dr. Jeff Healey, will continue to hold this position after this change. His current term is scheduled to end on June 30, 2021.

Thank you for considering this recommendation. Enclosed please find a copy of the original and revised terms of reference.

Yours sincerely,



Paul O'Byrne, MB, FRCP(C), FRSC
Dean & Vice-President
Faculty of Health Sciences

Encl.

PO/sm

EXHIBIT A - TERMS OF REFERENCE

Stuart Connolly-PHRI Chair in Cardiovascular Research

GENERAL

A transfer of funds has been directed to the Faculty of Health Sciences to provide support for the *Stuart Connolly-PHRI Chair in Cardiovascular Research*. This Clinical Research Chair is created to support the research activity of an individual who has already achieved or has the potential to achieve within 5 years, international leadership in the relevant area of research. This chair in cardiology is intended to strengthen the continued development of the program of research in cardiovascular disease at PHRI. The incumbent will have demonstrated excellence in the field of cardiology research.

DETAILS AND DUTIES

The holder of the Chair shall be an individual with sufficient research, education and/or clinical experience to lead and develop a clinical research program in the area of cardiology. Specifically, the chair holder will:

- Be an active faculty member in the Department of Medicine in the Faculty of Health Sciences at McMaster University and a researcher at PHRI at the designation of Scientist or higher. The Chair holder will spend at least 50% of his or her time in research;
- Participate as an integral part of the institutional vision towards establishing and maintaining a world-class program in cardiology which exemplifies the central values of the University, the Department of Medicine and the PHRI;
- Contribute significantly to the body of scholarship in the area of cardiology, through research at McMaster University and the PHRI;
- Mentor junior scientists, faculty and fellows and build capacity for research in the relevant area of the Department of Medicine and the PHRI;
- Undertake the normal duties of a faculty member in the Faculty of Health Sciences and the Department of Medicine, including participation in the education programs of the Department.

NOMINATION AND DESIGNATION OF THE CLINICAL RESEARCH CHAIRHOLDER:

The selection and designation of the chair holder will be determined as follows:

- The Dean and Vice-President of the Faculty of Health Sciences will appoint an appropriate ad-hoc selection committee, with recommendations sought from the Executive Committee of the PHRI.
- The Selection Committee shall include, at a minimum, the Chair of the Department of Medicine, the Director of the Division of Cardiology and the Executive Director of the PHRI.
- The selection committee will invite and receive nominations for the newly created chair and make recommendations for the appointment to the Dean and Vice-President of the Faculty of Health Sciences.
- The Dean and Vice-President will forward the ad hoc committee's recommendation to the Senate Committee on Appointments.

CHAIR-HOLDER ELIGIBILITY:

- Hold an appointment in the Department of Medicine in the Faculty of Health Sciences at McMaster University;
- Hold a Scientist or higher designation at PHRI while the Clinical Research Chair designation is in effect.
- Hold at least two grants (at least one of which is a peer review grant)
- Have a sustained record of high levels of publication in high impact journals
- Have supervised and/or mentored PhD or Master's level research students or junior faculty.

TERM

An appointment to the Stuart Connolly-PHRI Chair in Cardiovascular Research shall be for up to five (5) years, with the understanding that renewal for additional terms is possible based on satisfactory reviews.

REPORTING, EVALUATION AND RENEWAL OF RESEARCH CHAIRS:

Annual reporting and formal 5 year reviews are required of all PHRI Research Chairs. The PHRI Executive Committee and the Chair of the Dept. of Medicine will establish a committee to review the renewal and submit a recommendation for renewal to the Dean and Vice-President of the Faculty of Health Sciences.

ACKNOWLEDGEMENT

The incumbent will acknowledge that she/he holds the "*Stuart Connolly-PHRI Chair in Cardiovascular Research*" in all publications, lectures and any other activities supported through the fund.

January 2020

EXHIBIT A - TERMS OF REFERENCE

PHRI Chair in Cardiology Research

GENERAL

A transfer of funds has been directed to the Faculty of Health Sciences to provide support for the *PHRI Chair in Cardiology Research*. This Clinical Research Chair is created to support the research activity of an individual who has already achieved or has the potential to achieve within 5 years, international leadership in the relevant area of research. This chair in cardiology is intended to strengthen the continued development of the program of research in cardiovascular disease at PHRI. This chair is to be named the “-PHRI Chair in Cardiology Research.” The incumbent will have demonstrated excellence in the field of cardiology research.

DETAILS AND DUTIES

The holder of the Chair shall be an individual with sufficient research, education and/or clinical experience to lead and develop a clinical research program in the area of cardiology. Specifically, the chair holder will:

- Be an active faculty member in the Department of Medicine in the Faculty of Health Sciences at McMaster University and a researcher at PHRI at the designation of Scientist or higher. The Chair holder will spend at least 50% of his or her time in research;
- Participate as an integral part of the institutional vision towards establishing and maintaining a world-class program in cardiology which exemplifies the central values of the University, the Department of Medicine and the PHRI;
- Contribute significantly to the body of scholarship in the area of cardiology, through research at McMaster University and the PHRI;
- Mentor junior scientists, faculty and fellows and build capacity for research in the relevant area of the Department of Medicine and the PHRI;
- Undertake the normal duties of a faculty member in the Faculty of Health Sciences and the Department of Medicine, including participation in the education programs of the Department.

NOMINATION AND DESIGNATION OF THE CLINICAL RESEARCH CHAIRHOLDER:

The selection and designation of the chair holder will be determined as follows:

- The Dean and Vice-President of the Faculty of Health Sciences will appoint an appropriate ad-hoc selection committee, with recommendations sought from the Executive Committee of the PHRI.
- The Selection Committee shall include, at a minimum, the Chair of the Department of Medicine, the Director of the Division of Cardiology and the Executive Director of the PHRI.
- The selection committee will invite and receive nominations for the newly created chair and make recommendations for the appointment to the Dean and Vice-President of the Faculty of Health Sciences.
- The Dean and Vice-President will forward the ad hoc committee's recommendation to the Senate Committee on Appointments.

CHAIR-HOLDER ELIGIBILITY:

- Hold an appointment in the Department of Medicine in the Faculty of Health Sciences at McMaster University;
- Hold a Scientist or higher designation at PHRI while the Clinical Research Chair designation is in effect.
- Hold at least two grants (at least one of which is a peer review grant)
- Have a sustained record of high levels of publication in high impact journals
- Have supervised and/or mentored PhD or Master's level research students or junior faculty.

TERM

An appointment to the PHRI Chair in Cardiology Research shall be for up to five (5) years, with the understanding that renewal for additional terms is possible based on satisfactory reviews.

REPORTING, EVALUATION AND RENEWAL OF RESEARCH CHAIRS:

Annual reporting and formal 5 year reviews are required of all PHRI Research Chairs. The PHRI Executive Committee and the Chair of the Dept. of Medicine will establish a committee to review the renewal and submit a recommendation for renewal to the Dean and Vice-President of the Faculty of Health Sciences.

ACKNOWLEDGEMENT

The incumbent will acknowledge that she/he holds the "*PHRI Chair in Cardiology Research*" in all publications, lectures and any other activities supported through the fund.

July 2016

REPORT TO THE SENATE

from the

COMMITTEE ON UNIVERSITY CEREMONIALS AND INSIGNIA

1. Terms of Reference

At its meeting on January 29, 2020 the Committee on University Ceremonials and Insignia approved, for recommendation to Senate, an amendment to the Terms of Reference.

In the Terms of Reference for the committee, it states that the University Registrar and the Calendar and Convocation Co-ordinator shall be consultants to the Committee. The title of Calendar and Convocation Co-ordinator was recently updated to Convocation & Curriculum Officer. The Committee would like to amend the Terms of Reference to reflect the updated title.

It is now recommended,

That Senate approve, in principle, the amendment to the Terms of Reference for the Committee on University Ceremonials and Insignia and refer the amendment to the By-Laws Committee for Review.

2. McMaster University Coat of Arms and the McMaster University Seal

At its meeting on January 29, 2020 the Committee on University Ceremonials and Insignia agreed to adopt a new university coat of arms and university seal.

It is now recommended,

That Senate approve the recommendation from the Committee on University Ceremonials and Insignia to adopt a new university coat of arms and university seal.

**For Approval
Senate: February 12, 2020**

To the University Senate

30 January 2020

From: Dr. Martin Horn, Chair, Senate Committee on Ceremonials and Insignia

Re: McMaster University Coat of Arms and the McMaster University Seal

At the committee meeting of 29 January 2020, members were informed of a recent request from a student to have printed a parchment attesting to their attainment of a university degree without the crest and university seal printed on it. The request was made on the grounds that the student was not Christian in belief and objected to the Christian symbolism integral to both the crest and the seal. The request could not be fulfilled due to the difficulty of producing a custom parchment.

The request raised the broader issue of the suitability of the existing university coat of arms and university seal. The university coat of arms was fashioned in 1930 when McMaster was a sectarian institution. The McMaster of 2020 is not the McMaster of 1930. In considering what might be done, the Committee explored three options:

1. Retain the status quo.
2. Modify or revise the university coat of arms and university seal.
3. Adopt a new university coat of arms and university seal. It is possible that some elements of the previous coat of arms and seal would be retained in a new design.

The committee was unanimous in rejecting option 1. The coat of arms and seal should reflect the sweeping changes to the university since 1930.

Contemplating options 2 and 3, the committee decided unanimously to recommend to the Senate adoption of option 3 – the creation of a new university coat of arms and new university seal for the McMaster of the 21st century.

We believe that enthusiasm for a new coat of arms and new seal will engage the energies of the university community in a positive discussion on the designs.

To: Senate Committee on University Ceremonials & Insignia
From: University Secretariat
Re: McMaster Coat of Arms

The Arms of McMaster University were granted on October 20, 1930 by the Lord Lyon King of Arms, in Edinburgh. The Coat of Arms consists of an escutcheon or shield, a crest, and a motto, together with a helmet, mantling hanging from the helmet, and a wreath binding the crest to the helmet.

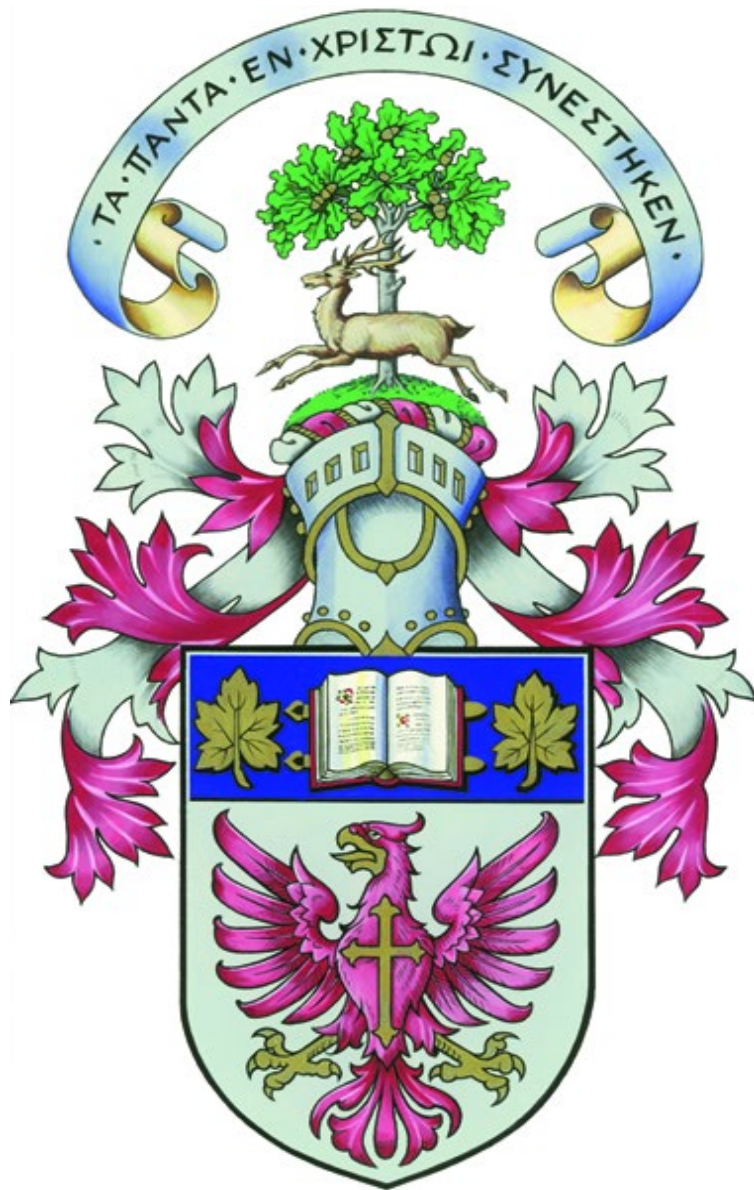
The Meaning

- In the shield, the eagle is symbolic of the heavenly vision, being able to supposedly to gaze directly into the blazing mid-day sun
- The cross on the eagle's breast identifies this vision as Christian in inspiration
- The open book is a common symbol of learning
- The maple leaves signify that McMaster's Charter was granted by the Province of Ontario
- The crest of the University Arms consists of the stag and tree device that was the emblem of Senator McMaster. It identifies and recognizes the founder of the University, and also recalls a precursor institution, the emblem.
- The mantling represents the cloak worn over a knight's armour, thought to have been adopted during the Crusades to protect him from being broiled by the eastern sun
- The helmet, with the visor open and facing front, accords with the custom for the Arms of universities
- The motto "Ta panta en Christoi synesteken"- "In Christ all things hold together" or "All things cohere in Christ"
- It has been said that "McMaster's founders evidently desired to go back to the Middle Ages to the earliest days of Christian faith, and therefore used the Greek form"

Locations of public exhibitions

- Stone carving above the entrance to University Hall – 1930
- Doorway to Hamilton Hall – carvings of the eagle and a beehive
- Used in Calendars, on the Library bookplate

The use of the shield, crest, and escrol together, with or without the helmet and mantling, is reserved to the University itself, with the allowed exception of reproduction in the Marmor yearbook. The shield may be used by student organizations and on a variety of items in the University Bookstore. To protect the Arms, they have been registered under the Trade Marks Act, and the Senate has promulgated guidelines for the development and use within the University community of emblems derived from the Arms.



Unarmed no longer

The McMaster University arms have been registered under the Trade Marks Act, Mr. J. P. Evans, Associate Vice-President, (University Services) has announced.

Mr. Evans said the step was taken in order to protect the University from unauthorized use of the arms on or off the campus.

The McMaster arms were granted in 1930 by the Lord Lyon in Edinburgh, giving the University its first registered and official arms. Heraldic carvings were at that time planned for the buildings in Hamilton being erected for McMaster's move from Toronto.

As often has been the case with many cities and colleges, the shield then in use at McMaster had some heraldic grammatical faults besides being artistically and symbolically thin, according to a description written in 1960 by then-President and Vice-Chancellor Dr. G. P. Gilmour.

Design changes suggested by a university committee in 1929-30 were accepted by the College of Heralds.

Official mark

The McMaster arms have been used as an identifying mark on official University publications and documents either in their entirety or through use of the escutcheon or shield only.

Since 1930 the custom has been that the full arms would be used by the University officially and that student and other publications would use only the escutcheon, or shield, so that these might not be mistaken for official University matters.

Many university arms consist only of an escutcheon or shield, Dr. Gilmour pointed out in his description, giving Oxford and Cambridge as examples.



The McMaster escutcheon consists of a red eagle "displayed" and on its breast is a gold Latin cross with arms ending in fleurs-de-lis. Dr. Gilmour stated that the eagle has no historical or family origin. It was taken over from ecclesiastical use, the eagle being the symbol of heavenly vision as it was supposedly able to fly directly into the eye of the sun.

The use of the cross designated the vision as Christian because of McMaster's ecclesiastical origins and also had the effect of removing any suggestion of the eagle as a bird of prey.

Symbol of learning

The shield, Dr. Gilmour stated, bears "in chief" an open book, a common symbol of learning. Two maple leaves flank the book, as the University's charter of 1887 was granted by the provincial legislature and maple leaves are used in the arms of Ontario.

On the full coat of arms the helmet and mantling are the distinguishing marks of a knight, the original user of a coat of arms for identification purposes.

The crest is the emblem tied to the helmet as a favour or further means of identification, according to Dr. Gilmour.

He noted that many people often mistakenly refer to an escutcheon as a crest. The crest is bound to the helmet by a wreath made up of silk matching the mantling or cloak, the convention being to use six or eight divisions of a twisted wreath, three or four of each colour.

Above the McMaster crest is the stag and tree device used by Senator McMaster, which refers directly to the founder of the University. It has no other symbolism. The motto, inscribed on an escrol or ribbon, is placed above rather than below the arms, which is customary in arms granted by the Lord Lyon, whereas the English heralds usually place the motto below the escutcheon.

The motto is in Greek, adapted from Colossians 1:17, "In Christ all things hold together". It is unusual to have a university motto in Greek, Dr. Gilmour observed. Usually they use Latin, since they are descended from mediaeval institutions in which Latin was more prominent than Greek.

church-affiliated colleges (the University of Sudbury, Thorneloe University, and Huntington University) that federated to create the new non-denominational university in 1960.

Crest

The pine tree is a reference to the region. The yellow base is taken from a more recent emblem used by the university. The blue and yellow colours are those of the university.

Supporters

The eagles, using a design by the Anishinaabe artist and Laurentian University alumnus Leland Bell, are a sacred creature for the First Nations and thus refer to the university's important relationship with the Native community.

Motto

Meaning "Send out light and truth", the motto refers to the task of the university and to the symbolism of the sun in the arms. It is based on **Psalms 43:3**.

<https://reg.gg.ca/heraldry/pub-reg/project.asp?lang=e&ProjectID=2021&ShowAll=1>

McMaster University

Degree



Coat of Arms appears on the degree and part of the coat of arms also appears in the embossed seal.

Coat of Arms



The Coat of Arms consists of an escutcheon or shield, a crest, and a motto, together with a helmet.

The Shield

In the shield, the eagle is symbolic of the heavenly vision, being able supposedly to gaze directly into the blazing mid-day sun. The cross on its breast **"identifies this vision as Christian in inspiration"**. The open book is a common symbol of learning, and the maple leaves signify that McMaster's Charter was granted by the Province of Ontario.

The Stag and Tree

In mediaeval times a crest was oftentimes tied by a wreath to a knight's helmet; this may have been a means of identification supplementing the charges on his shield. Without an emblematic shield or crest a knight encased in helmet and armour was unrecognizable.

The crest of the University Arms consists of the stag and tree device that was the emblem of Senator McMaster. It identifies and recognizes the founder of the University, and also recalls a precursor institution, the emblem of Toronto Baptist College, 1881-87.

The Mantling

The mantling represents the cloak worn over a knight's armour, thought to have been adopted during the Crusades to protect him from being broiled by the eastern sun.

The helmet, with visor open and facing front, is the type used by universities (and baronets). The helmet and mantling are usually reproduced in carvings and for elaborate ceremonial illustration.

The Motto

The motto "Ta panta en Christoi synesteken" ("**In Christ all things hold together**" or "All things cohere in Christ"), adopted in 1888, was adapted from Colossians 1:17. One may suppose that the motto and book were intended to express the concept, espoused in the Will of Senator McMaster, of "**a Christian school of learning**".

The motto is unusual in being in Greek; when not in English, university mottoes are usually in Latin, reflecting the origin of universities in mediaeval institutions in which Latin was more prominent than Greek. It has been said that "McMaster's founders evidently desired to go back to the Middle Ages to the earliest days of the Christian faith, and therefore used the Greek form".

<https://www.mcmaster.ca/coat/>

Nipissing University

Degree



Coat of Arms appears on the degree and is in the embossed seal.

