December 14, 2016

TO: Members of the University Planning Committee

FROM: Mark Downard
Senior Governance Advisor and Associate University Secretary

I am writing to inform you that the next meeting of the University Planning Committee will be held on Wednesday, December 21, 2016 at 10:30 a.m. in the John Hodgins Engineering Building, Room A114.

If you are unable to attend this meeting, please contact the University Secretariat at telephone 905-525-9140, ext. 24337 or e-mail univsec@mcmaster.ca.
UNIVERSITY PLANNING COMMITTEE

Wednesday, December 21, 2016 at 10:30 a.m.
John Hodgins Engineering Building, Room A114

AGENDA

OPEN SESSION

I  MINUTES of the Open Session Meeting of November 16, 2016
   (attached – for approval)

II  BUSINESS ARISING

III CHAIR’S COMMENTS AND UPDATES

IV REPORT FROM UNDERGRADUATE COUNCIL
   (attached – for approval)
   i. Establishment of Combined Honours Bachelor of Arts
      and Science in Arts and Science and Indigenous Studies
      Program
   ii. Closure of Honours Bachelor of Engineering in Software
       Engineering – Embedded Systems
   iii. Closure of Honours Bachelor of Engineering in Electrical
       and Biomedical Engineering
   iv. Closure of Technology Diploma
   v. Closure of Technology Leadership Diploma
   vi. Closure of Honours Bachelor of Science in Medical
       Physics

V  REPORT FROM GRADUATE COUNCIL – NEW PROGRAM
   PROPOSAL FOR MASTER OF FINANCIAL
   MATHEMATICS (attached – for approval)

VI  STRATEGIC MANDATE AGREEMENT – REPORT
   (attached – for information)
CLOSED SESSION

VII MINUTES of the Closed Session meeting of November 16, 2016
(attached – for approval)

VIII BUSINESS ARISING

IX PROJECT STATUS REPORT (attached – for information)  Mr. E. Kamarah

X IT SERVICES REVIEW (attached – for information)  Dr. D. Wilkinson/Mr. R. Couldrey

XI OTHER BUSINESS
McMaster University

UNIVERSITY PLANNING COMMITTEE

Wednesday, November 16, 2016 at 10:30 a.m.
Council Room (Room 111), Gilmour Hall

PRESENT:  Dr. D. Wilkinson (Chair), Dr. R. Baker, Mr. R. Couldrey, Dr. W. D’Angelo, Dr. J, Daniel, Mr. R. Deshpande, Dr. S. Hanna, Dr. J. Hurley, Mr. A. Jacob, Dr. A. McQueen, Dr. T. Moffat, Ms L. Serviss, Dr. D. Welch, Ms H. Ayre (University Secretary), Mr. M. Downard (Senior Governance Advisor and Associate University Secretary)

OBSERVERS:  Mr. S. Van Koughnett

CONSULTANTS:  Ms L. Coslovi

INVITED:  Mr. G. Grunwald, Director, Athletics and Recreation
          Ms D. Marinoff-Shupe, Manager, Recreation Services
          Dr. I. Puri, Dean, Faculty of Engineering

REGRETS RECEIVED:  Dr. P. Deane, Dr. S. Denburg, Dr. J. Lee, Ms J. Pike, Dr. S. Searls Giroux, Ms M. Williams

I MINUTES

On a motion duly moved and seconded, the minutes of the meeting held on September 21, 2016 were Approved as circulated.

II BUSINESS ARISING

There was no business arising from the minutes of the previous meeting.

III CHAIR’S COMMENTS AND UPDATES

Dr. Wilkinson informed members that there is no new information on the funding formula and tuition framework. The Committee will be given an update as soon as more information is known. The Provost reported that the search for a Vice-Provost, Equity and Inclusion is set to begin. Its work will include putting together terms of reference for the position.

IV STRATEGIC MANDATE AGREEMENT - REPORT

The Committee was informed that the document is currently being finalized for submission to the provincial government. It is not yet complete and it will be placed on the agenda for the December meeting.
V

ESTABLISHMENT OF THE COMPUTING INFRASTRUCTURE RESEARCH CENTRE

Dr. Puri joined the meeting.

Dr. Baker provided the Committee with an overview of the proposal to establish the Computing Infrastructure Research Centre. It was noted that the Centre was vetted by the Committee on Research institutes and Centres and aims to leverage McMaster’s strength in research and experiential learning. Dr. Puri explained that the Centre is unique within North America and that there are a number of external bodies interested in research in this field.

A member commented that some pertinent financial information is absent from the business case. Dr. Puri noted that the material was streamlined for circulation to the Committee. A discussion ensued about finances supporting the Centre.

It was duly moved and seconded,

that the University Planning Committee approve, for recommendation to Senate, the establishment of the Computing Infrastructure Research Centre, as detailed in the attached report.

The motion was carried.

Dr. Puri withdrew from the meeting.

VI

ATHLETICS AND RECREATION COMPLEX

Mr. Van Koughnett discussed the circulated material, explaining that the proposed Athletics and Recreation Complex project has been planned in close consultation with the McMaster Students Union. Significant enrollment growth over the last number of years has led to less available non-academic space for students. The project provides several options, including 1.a. expansion of the fitness centre and 1.b. study space, meeting rooms, and lounges.

The project will be funded by student fees, conditional on the outcome of a student referendum in January.

It was duly moved and seconded,

that the University Planning Committee approve, for recommendation to the Board of Governors, components of the Athletics and Recreation Phase 1 Space Expansion, involving 1a) expansion to the Pulse and an additional gym (62,814 GSF of both new and renovated space), and 1b) additional student community space (an additional 40,000 GSF) totalling 102,814 GSF of both new and renovated space supported by an approved 40 year Central Bank Loan at the University’s weighted average cost of capital (currently 5.75%); for which the business case and Central Bank loan approvals are contingent upon a successful January 2017 student fees referendum supporting either the total project (both 1a and 1b) at a total project cost of $59.5 million, inclusive of net HST, or only the Pulse and additional gym (1a only) at a project cost of $33.7 million, inclusive of net HST.
A member asked if undergraduate students are bearing an overwhelming proportion of the costs. Mr. Van Koughnett explained that there will be several groups of users of the facility, but the largest group is undergraduate students. They have also been vocal about the project being a high priority.

A discussion ensued about ways McMaster employees can be considered within the project. It was noted that the health and well-being of staff and faculty is an important determinant of a positive workplace. Mr. Van Koughnett explained that McMaster currently offers great value for employees when compared with private facilities within the community. There are also tax implications if staff were to receive this benefit for no cost and it would have to be negotiated for unionized groups.

The motion was carried.

VII CAMPUS MASTER PLAN

Dr. Attalla joined the meeting.

The Committee was given a presentation on the Campus Master Plan.

A question was asked about parking on campus and if the University had specific plans to address issues in this area. Dr. Attalla provided an overview of initiatives McMaster is undertaking to reduce demand for parking including bike sharing and the forthcoming LRT. Currently, McMaster requires approximately 1100 additional parking spots to meet City by-law requirements. Mr. Couldrey noted that the administration is working to produce a parking strategy that will address these and other questions.

The Provost explained that the Campus Master Plan is a visionary document and complements work in the University’s Capital Plan, which contains more details about specific priority projects.

VIII OTHER BUSINESS

There was no other business in the open session of the meeting.
REPORT TO THE UNIVERSITY PLANNING COMMITTEE
FROM
UNDERGRADUATE COUNCIL

FOR APPROVAL

Establishment of New Programs

i. Establishment of Combined Honours Bachelor of Arts and Science in Arts and Science and Indigenous Studies Program (Attachment I)

At its meeting of December 6, 2016, the Undergraduate Council approved, for recommendation to Senate, a proposal to establish a Combined Honours Bachelor of Arts and Science in Arts and Science and Indigenous Studies program. The proposed program combines two existing programs to provide an additional combination of programs for Arts & Science program students.

The Undergraduate Council now recommends,

that the University Planning Committee approves the establishment of the Combined Honours Bachelor of Arts and Science in Arts and Science and Indigenous Studies program, for inclusion in the 2017-2018 Undergraduate Calendar, as outlined in Attachment I.

Program Closures

i. Honours Bachelor of Engineering in Software Engineering – Embedded Systems (Attachment II)

At the same meeting, Undergraduate Council approved a proposal to close the Honours Bachelor of Engineering in Software Engineering – Embedded Systems program. Enrolment in this stream is very low and there are very few differences between it and the Software Engineering program. The last entry into the existing program will be September 2017. All currently enrolled students and students entering into the program in September 2017 will be able to complete the program.

The Undergraduate Council now recommends,

that the University Planning Committee approves the closure of the Honours Bachelor of Engineering in Software Engineering – Embedded Systems program, effective September 2018, as outlined in Attachment II.

ii. Honours Bachelor of Engineering in Electrical and Biomedical Engineering (Attachment II)

Also at the same meeting, Undergraduate Council approved a proposal to close the Honours Bachelor of Engineering in Electrical and Biomedical Engineering program. The newly approved Integrated Biomedical Engineering and Health Sciences program will replace the existing Electrical and Biomedical Engineering program. The last entry into the existing program will be September 2017.

The Undergraduate Council now recommends,

that the University Planning Committee approves the closure of the Honours Bachelor of Engineering in Electrical and Biomedical Engineering program, effective September 2018, as outlined in Attachment II.
iii. Technology Diploma (Attachment III)

iv. Technology Leadership Diploma (Attachment III)

Also at the same meeting, Undergraduate Council approved a proposal to close the Technology Diploma and Technology Leadership Diploma offered through the Bachelor of Technology program. These two diploma programs have had consistently low enrolment and there are currently no students in either program.

The Undergraduate Council now recommends,

that the University Planning Committee approves the closure of the Technology Diploma and Technology Leadership Diploma programs, effective September 2017, as outlined in Attachment III.

v. Honours Bachelor of Science in Medical Physics (Attachment IV)

Also at the same meeting, Undergraduate Council approved a proposal to close the Honours Bachelor of Science in Medical Physics program. The program closure is in response to some of the changes outlined in the Faculty of Science 2014-2019 Academic Plan, released in October 2014. As part of that plan, the Department of Medical Physics and Applied Radiation Sciences was terminated and a review of the undergraduate Medical Physics programs was conducted. The recommendation of the review committee was to merge the Medical Physics program with the existing Honours Medical Physics and Biophysics program offered by the Department of Physics and Astronomy. The effective merger of the two programs involves the closure of Medical Physics and the modification (including a change of name) of the Medical Physics and Biophysics program and its corresponding Co-op program. The newly revised/merged programs will be called the Honours Medical and Biological Physics program and the Honours Medical and Biological Physics Co-op program.

The last intake into the Medical Physics program will be September 2017. However, students interested in this program will be advised that they may choose to enrol in the newly revised Medical and Biological Physics program instead.

The Undergraduate Council now recommends,

that the University Planning Committee approves the closure of the Honours Bachelor of Science in Medical Physics program, effective September 2018, as outlined in Attachment IV.

University Planning Committee
December 21, 2016
A new Combined Honours Program, Honours Arts & Science and Indigenous Studies, was presented first to the Undergraduate Council Curriculum and Admissions Committee (approved on 22 Nov. 2016) and subsequently to Undergraduate Council (approved on 6 Dec. 2016).

The Combined Honours Arts & Science and Indigenous Studies program is only new in the sense that it is an additional program option being made available to Arts & Science students. Arts & Science and Indigenous Studies are both well-established, and have calendar descriptions that articulate their objectives. Combined Honours Arts & Science and Another Subject is as long-standing as the Arts & Science Program itself.

Typically, new Arts & Science Combined Honours Programs (Arts & Science and Another Subject) are initiated in response to demonstrated student interest in using the units not allocated to the core Arts & Science requirements for the purpose of developing a second honours component. There are currently 32 such programs involving Arts & Science and Another Subject. Given the small size of the Arts & Science Program, there are only a few students enrolled in any given year in any of these combinations.

There are no resource implications associated with the articulation of these Combined Honours Programs; the addition of the new option is resource neutral.
MEMORANDUM

Date: November 22, 2016

To: Susan Searls Giroux, Associate Vice-President, Faculty
Cc: Joseph McDermid, Acting Associate Dean

From: Ishwar Puri, Dean and Professor

SUBJECT: Program Closure of Electrical and Biomedical Engineering & Software Engineering (Embedded Systems)

The Faculty of Engineering recommends that the Electrical and Biomedical Engineering and the Software Engineering (Embedded Systems) programs be phased out commencing 2017-18.

As a result of the introduction of the Integrated Biomedical Engineering Health Sciences program which will commence in September 2017, Electrical and Biomedical Engineering (B.Eng) will be phased out. This program is very similar to Electrical and Biomedical Engineering (B.Eng.BME). The last entry into this program will be September 2017. All current and new students entering in September 2017 will be able to complete all their program requirements.

Software Engineering (Embedded Systems) will also be phased out commencing September 2017. This program is almost identical to Software Engineering with the difference of a few courses. All current students will be able to complete their program requirements. The 30 Level II-designated spaces in this program will be added to the Software Engineering program.

These closures have been approved in each of the departments and the Faculty of Engineering Faculty Council.

The closure of these two programs has no resource implications.

Thank you.
October 5, 2016

To: Dr. Susan Searls Giroux, Associate Vice President Faculty

From: Dr. Joe McDermid, Acting Associate Dean (Academic)

Cc: Dr. Robin Cameron, Chair of Certificates & Diplomas Committee

Regarding: Closure of Technology Diplomas in
- Technology Diploma
- Technology Leadership Diploma

The Faculty of Engineering recommends that the above diplomas be phased out commencing 2016-17 academic year.

Both diplomas have very low enrolment. We will ensure that any students currently in the program will be able to complete all required courses. The closure of these two diplomas has no resources implications.

These closures have been approved by the following bodies:
- Bachelor Technology Curriculum Committee
- Faculty of Engineering Undergraduate Curriculum and Policy Committee
- Faculty of Engineering Faculty Council

Please note this is an amendment to the original memo submitted on January 26, 2016. In error the memo listed the closure of the Technology Certificate. This was only listed incorrectly in the memo. Technology Diplomas were listed in the submitted documents and approved in the above bodies.
November 14, 2016

TO: Dr. Susan Giroux, Associate Vice-President (Faculty)
Chair, Undergraduate Council

FROM: Dr. Bruce Milliken, Acting Dean, Faculty of Science

SUBJECT: Program Closure/Merger of Honours Medical Physics

In response to the Faculty of Science 2014-2019 Academic Plan (October, 2014), https://www.science.mcmaster.ca/images/documents/Faculty_of_Science_Academic_Plan_October_2014.pdf, the Department of Medical Physics & Applied Radiation Sciences was terminated. Subsequently, in November, 2015, Dean Robert Baker, announced the creation of a working group to review the undergraduate Medical Physics program offerings. This group made a recommendation to draw upon the teaching and research strengths of faculty members who support the offering of the existing Honours Medical Physics and Biophysics programs to develop a single/merged offering.

As per the proposed curriculum changes, the Faculty is pleased to announce the creation of Honours Medical and Biological Physics (also available as a Coop program). For details, see Major Modifications section below (3.3 and 3.4). The Faculty is proposing to do the following:

☐ Notify students that the existing Honours Medical Physics program will be phased out. Admission will be last available in September 2017. Students with an interest in this program will be given the choice of enrolling in it or the Honours Medical & Biological Physics program (offered by the Department of Physics & Astronomy). All currently enrolled students will be given the opportunity to complete their program requirements.

☐ Notify students that the Honours Biophysics program is no longer available, and direct Level I students who intended to register in Honours Biophysics to the merged Honours Medical and Biological Physics program. Admission requirements to the merged program will be the same as those required for Honours Biophysics.

Students have had appropriate representation on all committees and the broader student population has been made aware of these impending changes through email communications as well as information posted to the School of Interdisciplinary Science Website:

Honours B.Sc. in Medical Physics

The Faculty remains committed to continuing the Honours Medical Physics program until all current students have graduated. The closure of the Department of Medical Physics & Applied Radiation Sciences, effective December 31, 2015, will have no negative academic consequences for current
program registrants. Students will be able to complete their program requirements, as stated in the Undergraduate Calendar. The name of the degree on your diploma and transcript is linked to the program in which you are registered and for which you complete all of the degree requirements, and not the Department that administers that program. The recent changes will have no impact on your degree name.

Students entering McMaster in September 2016 will be eligible to apply for admission to Level II of the Medical Physics Program in September 2017. However, the content of the program is being reviewed and it is likely that components of it will be merged with the Biophysics program in the near future. As a result, it is expected that no students will be admitted to the existing Medical Physics Program after September 2017.

Faculty members have been made aware of these impending changes as per the Faculty of Science 2014-2019 Academic Plan, as well as representation on all appropriate committees, including the working group mentioned above, Academic Planning & Policy Committee, and General Faculty.

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

cc: Office of the Associate Dean (Academic), Faculty of Science
To: University Planning Committee

From: Christina Bryce
Assistant Graduate Secretary

At its meeting on November 15th Graduate Council approved the proposed Master of Financial Math.

The attached document, pertaining to the proposed Master of Financial Math Program, is now forwarded for approval to the University Planning Committee for its meeting on December 21st.
NEW PROGRAM PROPOSAL FOR MASTER OF FINANCIAL MATHEMATICS

Date: Sept. 26, 2016
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1.1 PROGRAM DESCRIPTION

This proposal for a 12 month coursework Master of Financial Mathematics (MFM) program offered by the Department of Mathematics and Statistics is the natural culmination of a sequence of program developments in this dynamic and important field that started with “PhiMac”, the Math department’s research group in financial mathematics, over eighteen years ago. The early vision of a professional coursework Masters degree at McMaster dating from May 2002 still captures the essence of the current proposal:

“Financial Mathematics is a thriving area of modern science. Since the pioneering days of Black, Scholes and Merton, this branch of applied mathematics has developed rapidly into a substantial body of knowledge with numerous applications in capital markets, pricing contracts, managing financial risk and optimizing asset portfolios. This body of knowledge is optimally taught within a mathematics and statistics department. The proposed program will provide a select group of incoming students with a broad range of quantitative problem solving skills which will lead to promising career paths in the finance industry. It will also provide them with an overview of corporate structure which will facilitate their career entry.”

In September 2007, the financial mathematics group at McMaster partly realized this vision in a non-professional program stream called MPhiMac, a twelve month stream within the M.Sc in Mathematics that delivers a specialization in applied financial mathematics, that has now been discontinued. For 9 consecutive years, MPhiMac has enabled quantitatively minded people to develop their institutional, scholarly and technical skills to the high level sufficient for entry as quantitative risk management specialists in the Canadian finance sector. While MPhiMac has a high reputation for its success in helping students with a diverse range of undergraduate and graduate degrees to move to careers in the finance industry, its future was not sustainable for several reasons. First, the MPhiMac cost of delivery, which is dominated by the number of specialized graduate courses it entails, is much higher than the revenue it brings. This economic consideration is the primary reason why the program has been discontinued while energies are focused on the development of the new sustainable MFM program. Second, applicants with an M.Sc. in mathematics from McMaster, people we should encourage to apply, are ineligible to register for a second M.Sc. in mathematics such as MPhiMac. Third, the MPhiMac tuition fee level was much lower than competitor programs, which possibly gave the false perception that being “too cheap” equates to “low quality”. Finally, only with positive revenue can the program offer improved professional development opportunities and grow beyond the MPhiMac enrolment level. To achieve consistency both with the vision expressed above and with McMaster’s Strategic Mandate, at the high quality level McMaster expects, it is necessary to replace the MPhiMac stream by a self-standing, revenue-positive professional program leading to the Master of Financial Mathematics (MFM) degree.

The new MFM program will build on the strength, experience and reputation of MPhiMac. While keeping the core technical learning outcomes in place, it will also include a new focussed set of professional learning outcomes. These will guide students’ development of professional competencies through coursework, independent projects and opportunities outside the classroom, while remaining firmly based on a strong foundation of scholarly technical work in financial mathematics. It will emphasize broad awareness and appreciation of the state of current research in the field as well as specifics of finance and insurance industry practice. It is structured as an intensive 12 month program. It begins with two four-month terms focused on coursework and ends with a four month “major industrial project” whose requirements to learn industry practice by direct interaction with industry professionals may be completed in one of several different ways. The resulting credential, the MFM degree, will be valued and respected as a confirmation of both the high quality training and the integrity of the graduate.

Due to the strength of its financial mathematics research group, McMaster is uniquely positioned within Canada to offer a program that can fill a large fraction of the risk management expertise needs within the finance and insurance sector. Quantitative risk analysis (QRA) is a mission-critical component that has only...
in the last 15 years been implemented at every level within an industry sector that accounts for about 7% of Canada’s GDP. However, this statistic understates its impact: the lesson of the Crisis of 2007-08 is that the failure of risk management can lead to the collapse of whole economies. Since that dramatic time, the growth of QRA within such organizations has accelerated, to the extent there is a growing shortage of qualified personnel. The very nature of the subject is truly multi-disciplinary. QRA transcends its basis in mathematical analysis to accommodate potential risk types ranging from market risk, through credit risk, operational risk, systemic risk, and ultimately to “concentration risk”, that is the risk that our view is too narrow to foresee the next major meltdown.

1.2 PROPOSAL PREPARATION AND CONSULTATION PROCESS

This proposal is the result of the input and hard work of many people. Within the department, the core work has been done by the Master of Financial Mathematics Program Committee consisting of Tom Hurd, Matheus Grasselli, Petar Jevtic, David Lozinski, Traian Pirvu, plus Hans Boden and Nicholas Kevlahan during their terms as department chair. Further substantial helpful advice and comments have been offered by Julie Fogarty, Lori Goff, Stephanie Baschiera, Allison Sekular, Peter Sutherland, Kathleen Blackwood, Rob Baker, Doug Welch, Melec Zeadin, Bruce Milliken, Christina Bryce, and Bhagwati Gupta. In addition, members of the Finance Department, in particular Trevor Chamberlain and Narat Charupat, provided essential support and advice.

In developing the proposal, consultations were conducted over time with industry partners in the field. These include:

Dr. Niall Whelan, Vice-President, Market Risk Measurement, Scotiabank
Mr. Ray Westcott, Vice President, Capital Markets Risk Measurement & Reporting, CIBC
Dr. Alex Tcherni tszer, Managing Director, Risk Models, ERPM, BMO
Dr. Z. Sokolovic, Associate Vice President, Market Risk Control, Risk Management, TDBank
Dr. Greg Nudelman, Vice President, Head of Model Validation and Management, TDBank
Dr. Anthony Vaz, VP, Models, Methodology & Infrastructure, Market and Liquidity Risk Management, Manulife
Dr. Houben Huang, Vice President, Model Risk & Validation, BMO
Mr. Jason Drysdale, Senior Vice-President, Enterprise Risk, RBC
Dr. Alex Kreinin, Head of Quantitative ResearchRisk Analytics, IBM Risk Analytics
Dr. Oleksandr Romanko, Senior Research Analyst, Risk Analytics, IBM Risk Analytics
Dr. Mark Engel, Senior Vice President, Risk and Capital Analytics, Scotiabank
Dr. Dan Rosen, Managing Director, Risk and Analytics, S&P Capital IQ
Dr. Greg Frank, Director, Ontario Teachers Pension Plan

1.3 CONSISTENCY WITH MCMASTER’S MISSION AND ACADEMIC PLAN

1.3.1 McMaster’s Strategic Mandate Agreement:

To paraphrase the core message of President Patrick Deane’s Forward with Integrity letter, quantitative risk analysis (QRA) is essentially the radical questioning and critical evaluation of all finance and insurance practices, at all its levels from the trading desks to the entire financial system. Thus, it is no exaggeration to state that the MFM program naturally aligns itself with almost all aspects of McMaster’s Strategic Mandate Agreement, albeit with a unique emphasis on the use of quantitative methods.

Of the designated areas of McMaster’s institutional strength, the MFM program most directly addresses “Science and Discovery”, and secondarily “Business and economics” and “Digital economy”. Arguably it also has significant impact on the remaining areas. For example, “Policy and ethics in a globalized world”
are core issues underlying the role of QRA in our society because without ethics, the best risk management expert is a danger not a protector. Similarly, with little understanding of human behavior, culture and society, a risk manager will fail to identify where moral hazard and perverse incentives can lead to disastrous outcomes.

“Science and discovery” relates to the core technical development the program will instil in students, and represents the single most significant learning component within the program. At its foundation, QRA, like other areas of hard science, is based on methods of applied mathematics and quantitative analysis combined with lesser amounts of statistics, information technology and methods from engineering and physics. The discovery aspect arises from the need for professional risk managers to continuously expand their range of technical understanding and expertise to wider and wider categories of risk. Like an epidemiologist who needs to understand the latest threatening virus, the QRA specialist must continually adapt and upgrade their skills to a changing environment. For this reason, our students will apply their advanced research skills to assimilate the latest developments in the field.

QRA usually applies such scientific methods to problems of business and economics. Many students will enter the MFM program without a strong background in commerce and economics, and will be pushed hard to become conversant with and be able to critically evaluate the core issues in these subjects. For example, macroeconomic variables such as employment and interest rates are obviously critical drivers of finance risk that need to be well understood, while “disruptive” technologies such as Uber introduce new business risks that also impact the finance industry. The students’ major industrial project over the final 4 months will crystalize the methods of QRA within the context of a major financial institution.

Finance is now heavily constrained by aspects of “Big Data” and the digital economy, such that even routine computation of enterprise-wide measures of risk involves huge arrays of parallel processors and memory banks with thousands of Terabytes. Furthermore, issues such as cyber terrorism and breakdowns in IT systems such as stock exchanges and interbank payments are aspects of the digital economy that are increasingly recognized as critical sources of financial risk.

The MFM program will expand McMaster’s core growth areas most notably in “Science and Engineering” and will be an essential component of the suite of McMaster’s proposed professional Master programs. Indeed, QRA is a perfect example where science grads have such opportunities to transform their scientific background into skills that are scarce and highly valued by industry. A host of synergies will arise as separate programs with their diversity of backgrounds come together on common issues such as Big Data, entrepreneurship, the “internet of everything”, and sustainability. As a program anchored in the Faculty of Science, MFM will be strengthened through such synergies with Engineering, Business and Social Sciences. Since risk management expertise goes far beyond finance, MFM will in turn add strength to other programs.

1.3.2 McMaster’s current priorities:

The MFM program will address all four of McMaster’s identified priorities. It will create a high-quality student experience for a carefully selected constituency of students with a common facility for quantitative methods and an interest in industry careers and a diversity of other skills, talents and interests. Their experience will involve many elements that go beyond the traditional format of lectures, assignments and tests. Courses will feature frequent guest instructors who will share their front line knowledge and at the same time get to know the individual students. The course instructors will use new ways to stimulate discussion and disseminate knowledge within the student cohort, while promoting efficient mastery of technical methods through group work and sharing of expertise. There will be many trips, both inside and outside McMaster. Many potential employers are eager to offer site visits where students meet senior executives and experience the workplace of trading floors, quant desks and IT departments. Locally, the Allan Gould Trading Floor has its live data feeds and sophisticated software tools for trading and risk analysis. Finally, the 4 month major industrial project, typically sponsored by a major financial institution,
is the keystone to the MFM program. It will jumpstart their careers and provide a wealth of opportunities for cementing the abstraction of technical methods to the management of risks in the real world.

QRA careers are opportunities for our graduates to genuinely enhance the communal good. Like police and lawmakers, their primary role will be to anticipate and prevent dangerous outcomes in a critical industry exposed to breakdown, human failure and fraud. The MFM program will actively address this role with a year-long emphasis on ethics and integrity.

As a one-year professional coursework program, student research is a secondary aim needed to achieve a high level of competence in the methods and uses of QRA. It is important to point out that the MFM program will run in parallel with McMaster’s longstanding research group, called “PhiMac”, that consists of M.Sc. and Ph.D. students, plus a number of faculty members and postdoctoral fellows, all active in financial mathematics research. MFM students will enter with a high skill level in research and this skill will be in play throughout the program as they research the latest methodological innovations during team and individual projects. Such innovations generally appear in research journals in the area of mathematical and quantitative finance, and demand a high level of research understanding by students. Financial mathematics is a constantly evolving area of specialization and the latest research developments will be steadily added into the program.

Because QRA at its heart addresses the requirements of international banking regulation, the field has a global outlook that is attractive for students from all countries, especially motivated young permanent residents seeking to establish their careers. Understanding international economic development and regulation will be a team effort that is strengthened by the diversity of students’ backgrounds.

1.4 PROGRAM LEARNING OUTCOMES (PLOs)

The faculty in the program have identified 10 program learning outcomes (PLOs) that capture the key aspects that a successful graduate from the MFM program will take away. These PLO’s have been separated into 5 that concern technical knowledge and skills, and 5 that encompass professional competencies expected of someone entering the industry.

1. Technical:
   - PLO-T1 – Industrial Knowledge;
   - PLO-T2 – Financial Mathematics;
   - PLO-T3 – Financial Risk Quantification;
   - PLO-T4 – Computational Analysis;
   - PLO-T5 – Statistical Analysis.

2. Professional:
   - PLO-P1 – Understanding Financial Institutions;
   - PLO-P2 – Interpretation of Technical Results;
   - PLO-P3 – Application of Technical Concepts;
   - PLO-P4 – Interpersonal and Communication Skills;
   - PLO-P5 – Professional Conduct.

In more detail:
Technical:
1. PLO-T1 – Industrial Knowledge: The student will understand the definitions and uses of key financial assets, including
   a. Forwards and futures
b. Swaps

c. Vanilla derivative securities

d. Exotic derivatives

e. Credit derivatives

f. Optimal portfolio selection

2. PLO-T2 – Financial Mathematics: The student will develop mastery of theoretical concepts and problem solving in applied mathematics and probability theory as they are applied to finance. This will include

a. Expertise in the stochastic mathematics used to model market instruments in the field

b. Stochastic calculus applied to the modeling and analysis of securities

c. Valuation of financial derivatives under the risk-neutral change in probability measure

d. Calculation of a dynamical hedge of a portfolio of exotic derivatives

e. Mathematics of portfolio optimization

3. PLO-T3 – Financial Risk Quantification: The student will develop the ability to measure risk on a portfolio of complex positions. This includes the following aspects:

a. Understanding and quantification of risks faced by banks and other financial institutions

b. Ability to measure risk on a portfolio of positions including complex derivative securities

c. Risk management goals and strategies

d. Mathematical approaches to decision making under uncertainty

4. PLO-T4 – Computational Analysis: The student will be able to think algorithmically and will be able to demonstrate the ability to use technology to analyze and problem solve. These tools include:

a. Computational methods for partial differential equations

b. Use of external software packages for calculations in financial mathematics

c. Numerical simulation for pricing and hedging derivative securities

d. Use of statistical software.

e. Programming with specific knowledge of Matlab, C++, and Excel

5. PLO-T5 – Statistical Analysis: The student will have acquired practical facility in financial statistics based on theoretical foundations. This will cover such areas as:

a. Statistical inference

b. Parameter estimation

c. Determination of Confidence intervals

Professional:

1. PLO-P1 – The student will understand the role, structure and regulation of financial institutions. This will include:

a. Insight into the operations and business of banks, particularly in the quantitative areas

b. Learning the role of an applied mathematician in financial institutions

c. Understanding the requirements for regulation of quantitative assessments in banks

2. PLO-P2 – Interpretation of Technical Results: The student will be able to perform critical analysis of benefits and shortfalls of models being developed and implemented. This will include:

a. Ability to read peer-reviewed mathematical papers and understand their theories and foundations

b. Critical analysis of benefits and shortcomings of financial mathematics models

c. Understanding of current developments and implementations in quantitative modeling in the finance industry

3. PLO-P3 – Application of Technical Concepts: The student will be able to communicate and apply mathematical modeling and analysis in a business context. This will be marked by:

a. Ability to implement research results in financial mathematics

b. Application of stochastic analysis, including appropriate continuous time modeling, in:

i. Equities

ii. Fixed Income

iii. Foreign Exchange

iv. Commodities

v. Credit Products
4. PLO-P4 – Interpersonal and Communication Skills: The successful student will have increased their facility in communicating in the professional realm. They will demonstrate
   a. Ability to explain and justify technical results in clear nontechnical language
   b. Critical thinking and logical argument
   c. Clarity in writing and speaking
   d. Development of presentation skills

5. PLO-P5 – Professional Conduct: The student will develop standards of professional conduct and skills for success in industry. Topics include
   a. Integrity
   b. Team work
   c. Individual responsibility
   d. Resume preparation
   E. Interviewing skills
### 1.5 CONSISTENCY WITH DEGREE LEVEL EXPECTATIONS

Graduate degree level expectations and their associated program learning outcomes are summarized in table form:

<table>
<thead>
<tr>
<th>Masters Degree Level Expectations</th>
<th>Associated Program Learning Outcomes: By the end of the program, graduates with an MFM degree will…</th>
</tr>
</thead>
</table>
| **1. Depth and Breadth of Knowledge** | . gain Industrial Knowledge of definitions and uses of key financial assets (T1)  
. develop skills in Financial Mathematics: mastery of theoretical concepts and problem solving in financial mathematics and probability theory (T2)  
. be adept at Financial Risk Quantification: ability to measure risk on a portfolio of complex positions (T3)  
. acquire ability in Computational Analysis: algorithmic thinking and the ability to use technology to analyze and problem solve (T4)  
. have foundations in Statistical Analysis: practical facility in financial statistics based on theoretical foundations (T5) |
| **2. Research and Scholarship** |  
2a (techniques of research and inquiry)  
2b (critical evaluation)  
2c (complex issues), including application and written argument  
. be able to interpret Technical Results: critical analysis of benefits and shortfalls of models being developed and implemented (P2)  
. apply Technical Concepts: the communication and application of mathematical modeling and analysis in a business context (P3) |
| **3. Level of Application of Knowledge** | . understand role, structure and regulation of financial institutions (P1)  
. be able to interpret Technical Results: critical analysis of benefits and shortfalls of models being developed and implemented (P2)  
. apply Technical Concepts: the communication and application of mathematical modeling and analysis in a business context (P3) |
| **4. Level of Communications Skills** | . expand Interpersonal and Communication Skills: facility in communicating in the professional realm (P4)  
. demonstrate Professionalism: developing skills in areas from seeking employment to professional conduct in the industry (P5) |
| **5. Awareness of Limits of Knowledge** | . be able to interpret Technical Results: critical analysis of benefits and shortfalls of models being developed and implemented (P2)  
. apply Technical Concepts: the communication and application of mathematical modeling and analysis in a business context (P3) |
| **6. Professional Capacity/autonomy** |  
6a, 6b, 6c, 6d  
. demonstrate Professionalism: developing skills in areas from seeking employment to professional conduct in the industry (P5) |
Details on graduate degree level expectations:

1. Depth and Breadth of Knowledge:
With seven specialized grad courses in the first eight months, followed by a major industrial project in the summer, the students will be well prepared in the most quantitative areas of financial risk management, derivative securities analysis and portfolio design. They will be ready to pursue many opportunities available to mathematicians in banking, insurance and the investment business. The essence of the program design is to provide both the systematic understanding of the foundations of financial mathematics, and the breadth to master the professional practice of quantitative finance. Three courses of seven can be seen to be foundational in nature, and develop financial modeling based on applied mathematics and stochastic calculus. Two more courses are breadth courses that introduce students to financial mathematics from a professional perspective, covering the major topic areas in pricing, hedging and risk management to provide a practical context for the theory. The remaining two courses are skills courses: a course in statistics in practice and a course in computational finance (spread over two terms). Although mathematical at its heart, the program is interdisciplinary: it draws from applied math areas of probability, differential equations and numerical analysis, and applies these to finance, economics and statistics. While a majority of students are expected to enter industry careers upon graduation, the program is sufficiently deep preparation for a small number who may decide instead to pursue a PhD in mathematics, economics or finance. Associated PLOs are T1 through T5.

2. Research and Scholarship:
As a course-based program, MFM emphasizes professional competence achieved through coursework and independent projects. It is based on a strong foundation of scholarly work in financial mathematics and a broad awareness and appreciation of the state of current research in this field. In-course projects and assignments stimulate students' creativity and at the same time help them master established techniques by practical implementation. Some course projects have a research inquiry component requiring students to evaluate current research and decide which part of it should and can be implemented. In such projects, complex issues appear and require judgments that students have to support by a sustained logical argument in written form. The typical major industrial project will explore a topic of current interest with guidance from an industry professional and will be completed either as a paid industrial internship or as a self-directed mentored project. The internships will tend to develop practical professional competence, whereas mentored projects will usually allow the student more freedom to explore a research question proposed by their industrial mentor. Associated PLOs are P2 and P3.

3. Application of Knowledge:
New questions arise all the time in the financial industry. The 4-month long major industrial project, completed at the end of the program with the submission of a paper and delivery of a presentation, will require students to apply existing knowledge combined with critical analysis to an important new problem or issue that arises from some part of the financial industry. Associated PLOs are P1 through P3.

4. Communication Skills:
This, the single most dominant request from industry partners to North American quantitative finance schools, is developed throughout the program through the use of oral presentations and exams, written projects and assignments, and workshops. Each program activity from lectures to field trips, will involve opportunities such as open discussions where all students express their views. Firms hire people, not bodies of elementary knowledge, and such people have to work with a team to learn, grow, and handle conflicts. They have to understand both technical and soft issues of their firm to work effectively within the corporate culture, and to be able to communicate and defend their work and the solutions they have prepared. In many cases, it is communication and interpersonal skills that separate successful job applicants from the rest. Team projects, workshops and oral exams will help students hone these skills.
Associated PLOs are P4 and P5.

5. Awareness of Limits of Knowledge:
The recent financial crisis underlines the importance of having humility that stems from an awareness of one’s personal limitations and the limitations of standard methodologies. This awareness is stressed in our program through the frequent discussion of model and regulatory shortcomings, the discussion of areas of current research and development, and discussion of topical issues from the daily media that highlight current limitations in the field. No student ever completes a Masters program knowing all that they should know: our students, with their complementary skill sets, become well aware of their personal strengths and weaknesses. While there is a base volume of knowledge that is expected of a successful graduate, the financial industry is continually evolving, growing and developing, and makes demands for new material to be taught and learned. One benefit of teamwork in a multidisciplinary program like ours is the revelation of the limits of one's personal competence. Another aspect of our program that will enhance the healthy self-critical awareness of one’s limits will be to have professionals from the financial industry visit to deliver modules in several courses.
Associated PLOs are P2 and P3.

6. Autonomy and Professional Capacity:
An individual's professional capacity is based on a balance of autonomy and teamwork. MFM will recognize that both are important. Autonomy refers to the individual's initiative, personal responsibility, technical expertise and ability to make decisions in complex situations. Autonomy, fostered through independent work on assignments, individual projects and written exams, and finally the major industrial project, will help them succeed in the job interview process, and continue to give them the capacity for professional development through their future industrial careers.

On the other hand, since our students come from different backgrounds (math, stats, physics, computer science and engineering) with different skills (statistical, computational, mathematical), teamwork is the most important channel for sharing their skills during the program and in their future industry career. Furthermore it is through teamwork that the communication skills and personal bonds are developed that will be important in building the professional network that will support them throughout their careers. Teamwork is directly fostered by a number of team projects done within courses, and indirectly by the culture of collaboration we expect and encourage. We have a firm policy on collaborative work. For example, it is important that each student first make an individual effort on each of the homework exercises. Only after he or she has made an effort to solve the problem and not succeeded is a student expected to seek help from the instructor or fellow students. Since the program is intense and demanding in a number of distinct disciplines, we do expect that students, no matter how talented, will sometimes require some help to master new material. Ultimately, for individual work, all students must write up their work independently, with any work of others quoted and referenced properly.
Ethics are a critical issue in all professions that our program takes seriously. Risk management and investment are two areas of human society that depend on the highest standards of personal integrity, and we will take the time during the year to highlight the ethical standards coded in several professional organizations (e.g. PRMIA and GARP) and certifications such as CFA and RFM.
Associated PLOs include P5.

1.6 DEMAND FOR PROGRAM

I. Evidence of Societal/Labour Market Need
The financial industry in Canada, arguably the most important sector of our modern economy, is characterized by many distinct, complementary professions. MFM targets Quantitative Risk Analysis,
which is a somewhat narrow specialization where mathematicians and other scientists have been successful, and demand continues to be very strong.

The primary rationale for the MFM program, and its competitors, is to enable talented individuals to gain the technical expertise needed to fulfill professional roles in quantitative risk management and analysis. This wide-ranging profession, at the heart of modern banking and insurance, serves to monitor and adapt the behavior and methods of financial institutions. It is crucial to our financial system, and the economy as a whole, that risk professionals be people of integrity who are well trained in the use of quantitative methods in finance. One industry partner at a Canadian bank has told us that the work demanded of this area has grown so much that what was covered by a team of 6 people less than 20 years ago, now employs over 150 financial mathematicians, and that the demand and workload only continues to grow.

The success of MPhiMac demonstrates clearly the uniqueness of and need for the proposed MFM program. MPhiMac differentiated itself from other career targeted finance programs in Ontario in being based strongly on mathematical and statistical foundations. These skills are most needed for success in the targeted quantitative finance (QF) positions, primarily in risk management but also in trading methodology, with titles such as Quantitative Modeling Associate, Senior Analyst, Quantitative Analyst, Model Vetting and Validation Manager, and Model Risk Specialist. The graduates of the program develop and implement quantitative models used in the major banks and insurance companies, major pension funds, the financial regulator, and the software firms that support the quantitative aspects of the financial industry. Such skills have been consistently in demand in the Canadian banking industry over the past decade, a situation one expects will continue in the foreseeable future. The special preparation we will instill in our graduates will give them a competitive advantage in this important sector of the economy. These claims are validated by the record of 9 years of MPhiMac: at least 85% of all our graduates so far have been successful in establishing themselves in a career in an area of financial mathematics.

The Ontario Ministry of Training, Colleges and Universities identifies several employment areas that would provide opportunities for graduates from an MFM program. All these sectors are at the managerial or Skill A level, have grown by 50% or more since 2001 and currently show “above average” employment prospects:
- Banking, credit and other investment managers (0122)
- Financial and investment analysts (1112)
- Insurance, real estate and financial brokerage managers (0121)
- Securities agents, investment dealers and traders (1113)
- Other financial officers (1114)

While financial mathematics is a relatively new and specialized area within any of these broader areas, the need for scarce mathematical skills and risk management expertise ensures that such roles will continue to experience employment prospects that are well above average. Much of the growth in risk management requirements in the banking system is driven by continuing international regulatory reforms. For instance, in January of 2016, the Bank for International Settlements (the organization of international banking regulators that sets regulatory rules, including the Basel Accord requirements for risk management in banks globally) released the new Fundamental Review of the Trading Book, radically altering the way banks are to compute risk numbers for the trading book. This drives a continuing need for still more work in financial mathematics to meet those requirements. As risk management practices continue to expand in the banking system, they also move steadily into other finance institutions and supporting firms, including insurance companies, pension plans, investment firms and hedge funds, as well as the supporting software, data, and technology firms.

**II. Evidence of Student Demand**

The MFM program, with its focus on career outcomes, is extremely attractive to qualified applicants, both domestic and visa. The difficulty is that the pool of qualified domestic applicants (for example those holding honours mathematics or statistics degrees) is quite small. This means extensive marketing efforts will be
needed to make sure high quality domestic applicants are aware and apply. We have found that the MPhiMac program has had a high success rate in attracting top domestic applicants to accept our admission offers. We also expect a number of very promising applicants holding research degrees as high as PhD level, sometimes even with postdoctoral experience. People at this stage often experience roadblocks to academic careers, and look for high-skill positions in industry as an alternative.

It seems likely that even without a concerted marketing effort, the pool of visa applicants will be deeper and stronger than the domestic applicant pool. Our intention is to maintain a careful balance between visa and domestic students. For this, it will likely be necessary to limit visa offers to those with very good to excellent “soft skills” and whose technical skills are at the high end of the range. Such students will tend to raise the performance level of the overall cohort, and will enhance the MFM program’s reputation.

Of direct consequence for the MFM program is the recent creation of the Actuarial and Financial Mathematics (AFM) program at McMaster University. This new undergraduate mathematics program develops students for jobs in the actuarial and financial industries. While the AFM program provides a solid introduction to financial mathematics, an undergraduate degree is usually perceived by the finance industry as insufficient for careers in quantitative risk analytics (QRA), for which more intensive preparation is needed. AFM graduates wanting to work in QRA will find it almost imperative to have a further postgraduate level qualification such the MFM degree. With the launch of the AFM program in 2013, data showed a simultaneous 50% increase in the number of applicants to first year undergraduate mathematics and statistics at McMaster. Taking this as an indication of the numbers of students expected to come through the undergraduate AFM program, there will be additional demand for students looking to complete their development with a Masters degree in financial mathematics at McMaster.

Even prior to the Actuarial and Financial Mathematics program graduating additional students, demand for the MPhiMac program was strong. The number of applicants to the program has increased steadily since it has been offered. In September 2015, there were 17 successful applicants who started the MPhiMac program, drawn from a pool of approximately 110 applications.

III. Justifiable Duplication

Because the finance industry is so diverse and sophisticated, there currently exist several graduate programs in Ontario that target different flavours of finance. For example, the University of Toronto alone has five distinct Masters programs that specialize in some area of finance. The following table gives a summary of the existing Masters programs in Ontario that should be compared directly to MFM:

<table>
<thead>
<tr>
<th>School</th>
<th>Degree</th>
<th>Focus of the program</th>
<th>Current enrolment</th>
<th>Program Length</th>
<th>Tuition and Fees (2015-16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>McMaster University (DeGroote School of Business)</td>
<td>Master of Finance</td>
<td>Specialized finance education</td>
<td>50-60</td>
<td>12 Months</td>
<td>$39690/$39690</td>
</tr>
<tr>
<td>University of Toronto (Department of Mathematics)</td>
<td>Master of Mathematical Finance</td>
<td>Mathematical finance</td>
<td>30</td>
<td>12 Months</td>
<td>$46,311/$46,311</td>
</tr>
<tr>
<td>University of Toronto (Department of Statistical Sciences)</td>
<td>Master of Financial Insurance</td>
<td>Mathematical finance</td>
<td>10-30</td>
<td>12 Months</td>
<td>$27,000/$45,000</td>
</tr>
</tbody>
</table>
One unique distinguishing characteristic of the MFM program is its close parallel relation to PhiMac, McMaster’s longstanding research group working in financial mathematics. These sibling activities will have substantial and continual opportunities for an additional cross-fertilization between theoretical and applied aspects of QRA.

The design of McMaster’s MFM and the Master of Finance (MFIN) program delivered by the DeGroote School of Business, have been carefully considered in order to enhance their complementary natures, and to reduce duplication. In practice, the two programs draw applicants from separate populations. The MFIN program targets a much wider range of applicants and prepares them for a greater diversity of careers in finance than the MFM program. MFM will take in applicants from STEM disciplines and develop their skills for roles in core quantitative work constructing and implementing the mathematical models used by finance practitioners. MFM graduates are, in a sense, tool makers, producing mathematical models from their foundations in stochastic calculus, implementing the calculations and algorithms, calibrating the parameter sets to incomplete market data, and vetting and validating their use in the financial systems. At least at the outset of their career, our graduates will only rarely meet a client, study a balance sheet, or develop particular financial solutions for a firm. Instead, their roles are typically in areas situated in head offices of the major banks, insurance companies and other sophisticated financial institutions, where an understanding of stochastic calculus is a common requirement for entry. MFM graduates will compete in this job market with PhD holders from fields such as physics, engineering and mathematics, rather than with business and finance graduates. It is anticipated that graduates from MFIN and MFM will likely work in complementary industry roles alongside one another.

The other within-province professional QF programs that are direct competitors to MFM are the MMF (Master of Mathematical Finance) at the University of Toronto and the MQF (Master of Quantitative Finance) at the University of Waterloo. The former, MMF, is a 13 month program that has been in existence since 2000. Each year it has approximately 30 students. It does not rest within a single department, and focuses relatively more heavily on training for industry practice than MFM. Waterloo’s 16-20 month MQF program was founded in 1995 and currently accepts about 15 students each year. The extra months of MQF are devoted to the writing of either a major project (4 months) or a thesis (8 months). While it is similar to MFM in that it places most of its graduates in quantitative finance careers, its longer duration could make it less efficient in achieving students’ primary aims.

Other quantitative finance Masters in the province, notably those at Ryerson, Western, York and Queen’s, are research focused and take longer to complete than MFM. Typically, these programs are undertaken by students inclined to pursue a PhD.

### 1.7 DEGREE NOMENCLATURE

MFM is a perfect example of a post-graduate program that allows students with non-career oriented
undergraduate backgrounds to efficiently upgrade their skills to industry standard, thereby gaining rapid entry to high level positions in industry. As such it fits the usual meaning of the designation “professional coursework Masters” as exemplified by the MBA, MPA, MArch, etc. As a Master program, the most appropriate name for the degree earned is a Masters of Financial Mathematics (MFM) since it emphasizes that this is a first and foremost a mathematics degree rather than a finance degree.

ADMISSION & ENROLMENT

2.1 ADMISSION REQUIREMENTS

Summary of Admission Requirements:

• an Honours Bachelor degree in a quantitative subject, such as mathematics, statistics, physics, computer science, or engineering;
• interest in a career in finance;
• for graduates of mathematics or statistics, a minimum B+ average across their level 3 and undergraduate mathematics and statistics courses, or the equivalent standard from another university. Mathematics graduates are expected to have taken real analysis at level 3 or higher. For other graduates, comparable results in level 2, 3 and 4 quantitative courses plus complementary achievement in their chosen specialization. For instance, engineering candidates are expected to have studied PDEs and/or a course with notable theoretical mathematics. Physicists are expected to have taken courses where they have studied stochastic processes. All applicants must meet the Level 4 requirements of the School of Graduate Studies.
• for non-native English speakers, evidence of fluency from either TOEFL or IELTS. For TOEFL, a minimum score of 92 (iBT), 580 (paper), or 237 (computer test) is required. For IELTS the requirement is a minimum overall score of 6.5 and a minimum of 5.5 in each section of the Academic test.
• two letters of reference from academic mentors;
• evidence of communication and interpersonal skills, and the ability to work effectively in the North American business culture; other evidence of leadership, analytical expertise, industry experience, or other marketable job skills.

Rationale: MFM aims to distinguish itself in Ontario amongst coursework quantitative finance masters programs for its emphasis on mathematical foundations, and the primary goal of our admissions requirements is to ensure each student will achieve success in this aspect. Therefore, the primary requirement for admission is proven success in mathematics and statistics courses at the 3rd and 4th year undergraduate level, or over comparable quantitative subjects in other disciplines. Among courses in mathematics, or courses with a strong mathematical component, topics of particular interest include intermediate probability theory, partial and ordinary differential equations, numerical analysis and real analysis. These courses are important not only for their content, but also as evidence that the applicant has successfully demonstrated the required level of mathematical sophistication and maturity. Because of these technical demands, it is anticipated that most appropriate candidates will come from mathematics, statistics, computer science, physics, or engineering.

Another key admission requirement will be at least two letters of recommendation that provide a positive endorsement for the student, commenting with reliable authority on the candidate’s ability to succeed in a Masters in mathematics program. Such letters are best written by academic mentors rather than employers or job supervisors.

A third requirement for admission is good communication skills, especially fluency in written and spoken English. Non-native English speakers must exceed the University requirements on the basis of either TOEFL or IELTS. As noted below, such international students would also have to satisfy the Academic Committee during their interview that they can work effectively in an English language environment and
While no business background is required of applicants, a sincere desire for a career in the finance industry is a requirement. The Fall term courses of the program assume no prior finance knowledge. However, some prior finance knowledge will be given additional positive consideration. We expect some of the best successes in the program will come from young students fresh from a technically-oriented undergraduate degree. Another indicator of likely success is a recent postgraduate degree in a quantitative subject. On the other hand, candidates who have been too long out of a demanding university program will likely find the program challenges very difficult.

Before final approval for admission is given, one or more Academic Committee members will conduct an in-depth in-person or phone interview with the applicant to evaluate their technical and communication skills. This will also be used to probe for evidence of leadership skills, interpersonal skills, computer programming skills and other qualities sought by hiring managers in the financial industry. All students, regardless of background, are required to have the necessary communication and interpersonal skills for high-level employment in the North American financial industry.

2.2 ENROLMENT PLANNING AND ALLOCATIONS

The following table shows the projected enrolment over the first 5 years of the MFM program.

<table>
<thead>
<tr>
<th>Year</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
</tbody>
</table>

Over a longer term, we expect the sustainable enrolment size to grow more slowly beyond 20 students, a number which is limited by several factors: (i) a sense of the availability of suitable career placements within the Canadian financial industry, (ii) teaching considerations of the optimal class size, (iii) the need for faculty to provide required in-depth personal student references.

The proposed enrolment growth in this professional Masters program, while modest in absolute numbers, is absolutely essential in providing a new category of high-level outcomes for graduate students in the Faculty of Science.

2.3 ALTERNATIVE REQUIREMENTS

Admission to graduate studies for a student with related work experience and/or course work beyond the Bachelor’s degree will be based on the following modified criteria:

- References from reliable sources, which specifically identify the applicant’s aptitude for quantitative methods.
- University 4-year undergraduate degree or equivalent, in a quantitative subject, completed more than 4 years ago, together with additional course work taken since that time.
- Significant record of relevant workplace experience.

STRUCTURE

3.1 ADMINISTRATIVE, GOVERNANCE AND COMMUNICATION
The MFM program’s administration, governance and communication responsibilities will be shared by the Program Director, the Academic Committee and the Program Coordinator.

The primary responsibilities of the MFM Program Director will be:
• To ensure that the program’s admission criteria are properly implemented;
• To ensure that all academic regulations governing the program and its students are properly applied;
• To oversee student recruitment and marketing of the program;
• To advise and counsel students during the program;
• To build and maintain interpersonal links with industry partners.

The Program Director will report to the Chair of the Department of Mathematics and Statistics. The department Chair will appoint the Program Director for a three year term.
• The Program Director will work with appropriate offices and individuals to ensure delivery of the program requirements, as well as student recruitment, academic advisement, curriculum planning and implementation, instructional support, and student career preparation.

The program will be overseen by the MFM Academic Committee composed of 4 or 5 faculty members from the Department of Mathematics and Statistics, including the Program Director. The committee membership will be by appointment by the departmental chair. The committee’s primary roles will be: (i) implementation of the annual admissions process; (ii) to monitor and assess students’ progress and when necessary to make the decision to fail a student; (iii) to provide academic direction and guidance to the Program Director; (iv) to develop and update the curriculum; (v) to oversee supervision of the major industry projects.

The initial composition of the governance structure will be:

Program Director:
Dr. Thomas Hurd
MFM Academic Committee:
Dr. Matheus Grasselli
Dr. David Lozinski
Dr. Traian Pirvu
Associate Graduate Chair (from Mathematics and Statistics)

The MFM Program Coordinator will be 60%, rising to 80%, of a new full time staff position reporting to the Program Director with responsibility for administrative support. This will require financial support from the Faculty of Science. The ideal person will be someone with an understanding of financial mathematics and strong interpersonal skills. When necessary, this position may be divided between two or more people.

The primary responsibilities of the Program Coordinator are:
• Marketing and Outreach (15% FTE): to oversee design and dissemination of marketing materials; to conduct program admissions events; to oversee the Program website; to oversee donor campaign targeting alumni and partner institutions.
• Industry liaison (20% FTE): to maintain and communicate with industry contacts; to compile and distribute student resumes; to coordinate on-campus and off-campus recruitment activities; to facilitate job opportunities for students upon graduation; to maintain and develop alumni contacts electronically and through social events.
• Major Industrial Project (25% FTE): to coordinate mentored projects and internships and to ensure appropriate industrial and academic supervision; to maintain opportunities for major industrial projects and joint research initiatives (such as Mitacs Accelerate grants).
• Instructional (20% FTE): to coordinate weekly sessions on current industry events that allow students to develop communication and interpersonal skills; to advise on job and interview preparation.
A 25% time secretarial staff position will have responsibilities including: (i) maintaining application files; (ii) correspondence; (iii) timetabling; (iv) logistics of industry partners and guest lecturers; (v) communicating with and assisting prospective applicants; (vi) monitoring and communicating with students while they are in the program.

The Program Director, working with the Program Coordinator, will be responsible for ensuring that all communications related to the program are directed to the appropriate individuals and University bodies. The Program Director will report to the Chair of the Department of Mathematics and Statistics.

### 3.2 STRUCTURE AND REGULATION

The total number of courses is 8: 3.5 in Term 1, 3.5 in Term 2 and one in Term 3. Courses have been designed by the Academic Committee in order to best achieve PLO and DLE deliverables. The Academic Committee will review course content and program structure annually to ensure appropriate and effective delivery of key expectations.

MFM, with its requirement of the equivalent of 8 courses at the 700 level, including the major industrial project course, exceeds the project option Masters degree expectations within the Department of Mathematics and Statistics which consists of 7 courses including the project course Math 797. This single additional course requirement over the departmental minimum is justified by the need to meet a challenging range of technical and professional program learning outcomes.

In most circumstances, all courses are required and not elective. Electives, when allowed in the MPhiMac program, have often been found by students to be a distraction and to undermine the coherence of the program. The most frequent exception where an elective is granted will likely occur when a student with sufficient statistics is allowed a different course to substitute for Stats 721.

Regulation of the program will follow standard procedures outlined in the Graduate Calendar and overseen by the School of Graduate Studies. In addition to monitoring the standard milestones for Master students, the Academic Committee will implement a procedure designed to determine when a student is at risk of failure. At the end of the first two terms, the Committee will communicate to each student an overall assessment of their progress and level of achievement. Where the Committee finds a student has not met the minimal program expectations, the student will be failed from the program. Where there are circumstances mitigating the failure, options such as repeating a course or retaking an exam, will be explored. If necessary, additional tuition fees will be required.

Course List and Calendar Descriptions:

**TERM 1**

MFM 701: Foundations of Financial Mathematics

- Probability foundations; Brownian motion and stochastic calculus; martingales and the No-arbitrage Principle; Black-Scholes equation; pricing and hedging derivative securities; fundamental theorems of asset pricing; Change of measure Theorem; models of equity and fixed income markets; pricing and hedging American, Asian and barrier options.

MFM 702: Financial Markets

- Mathematical modelling and analysis of equity, fixed income and FX markets; discrete and continuous time stochastic processes for asset prices; pricing of vanilla and exotic derivatives; volatility; market and credit risk, Value-at-Risk, CAPM models; capital calculations.
MFM 708*: Applied Computational Finance I

Introduction to scientific computing: floating-point arithmetic, error analysis. Lattice methods for differential equations: binomial trees; numerical methods of parabolic PDEs; applications to option pricing.

Stats 721: Statistical Modeling in Practice

Sampling distributions, point estimation, interval estimation, linear regression, time series, model fitting and validity, multivariate models and dependence structures.

TERM 2

MFM 703: Portfolio Theory and Incomplete Markets

The continuous time portfolio problem; portfolio problems with constraints, optimal trading strategies in the presence of transaction costs; risk measures; optimal cash management in equity index tracking with transaction costs.

MFM 704: Interest Rates and Credit Risk

Bonds and interest rates; credit spreads and corporate bond prices; default events and stopping times; firm value models; intensity based models; loss-given-default; credit rating models; default dependence; credit derivatives; basket credit products; collateralized debt obligations.

MFM 705: Topics in Quantitative Finance

Credit risk capital, counterparty risk, Credit Value Adjustment; risk in retail portfolios; financial time series; GARCH models; additional topical issues of capital and risk management.

MFM 709*: Applied Computational Finance II

Monte Carlo methods, quasirandom numbers, simulation of stochastic processes, variance reduction techniques; applications to option pricing and portfolio risk management.

TERM 3

MFM 797: Major Industrial Project

Completion of a project of industrial interest. Students will work together with a mentor from a financial institution, or alternatively, may complete the project while working as an intern in the financial industry. Students deliver a paper and an oral presentation at the end of August to complete their degree requirements.

Remarks:
- All courses are required.
- MFM 708* and 709* combined have the weight of one course.
- A few entering students will have sufficient background in statistics in their academic transcript and will be expected to substitute one elective in place of Stats 721, at the 600 or higher level, and approved by the Program Director.

3.3 PROGRAM LENGTH & PROGRESSION

The duration of the program is 12 months. Students will be engaged full-time in course work for the first 8 months (beginning of September to end of April). There is no possibility to be a part-time student for this period. The final 4 months of the program (beginning of May to end of August) will be spent on the major industrial project. The major industrial project is an individual project that can be completed in one of several possible ways: (i) paid industry internship; (ii) self-directed mentored research project; or (iii) other
project as approved by the Academic Committee. The major industrial project will ideally involve both an industry mentor and a faculty supervisor drawn from the Faculty List.

The 12 month duration of the MFM program is carefully chosen to optimally balance between the need to attain sufficient professional competence and the desire to avoid excessive time which will be expensive both to students, who are anxious to avoid additional costs and wish to enter the job market quickly, and to the University. The experience of MPhiMac has shown that the appropriate learning outcomes can be successfully achieved in this period. We also believe that the 4 month major industrial project would not fit as well within a 16 month program like Waterloo's MQF. In that program, students are required to return to the university for an additional 4 months after their internship, likely sometimes foregoing a desirable permanent job offer and possibly sapped of some of their enthusiasm and motivation.

Achieving the required professional competence in 12 months requires that the program material be delivered with a high intensity during the first 8 months. By design, this intensity is somewhat higher than is typical in a research Masters program in Mathematics. The justification for this high intensity is clear: (i) it is necessary for the students to ramp up their professional competence quickly; (ii) the high intensity speeds up the learning process; (iii) the intensity reflects the reality of careers in the finance industry; (iv) the pressure of the heavy work load naturally leads to the development of camaraderie amongst the students, and will build a strong network of peers that will be valuable throughout their careers.

Although intense, the course content has been gauged to ensure that the program objectives can reasonably be met within the specified time frame. In order to deliver material at a balanced pace, students take three and one half courses in both Terms 1 and 2, which is the rationale for breaking the computational course into two half courses. These half courses also offer the opportunity to adjust timing to better balance the students’ total workload during the term.

CURRICULUM AND TEACHING

4.1 PROGRAM CONTENT

The eight courses listed in Section 3.2 provide the comprehensive body of knowledge and understanding that will be the crucial bridge allowing the motivated student to transfer their high quantitative skills to the setting of an entry-level QRA position in industry. The MFM program recognizes that much of this body of knowledge changes year by year, and that the curriculum must evolve continually to reflect these changes. Moreover, much of the important advanced knowledge is not readily available in textbooks. For these two reasons, the core lecture material and assignments used in several MFM courses will be based on custom courseware notes developed by the instructors and updated regularly. By allowing time for in-class discussion, current finance and economic events can be understood and assimilated into their knowledge base, underlining the lessons and principles being learned. Finally, there will be individual and group projects within several courses that broaden the scope of the lectures, and promote autonomous study and teamwork.

4.2 PROGRAM INNOVATION

As some of our industry partners have attested, MPhiMac has developed into a nearly professional financial mathematics program that offers a unique balance of rigorous academic development and very practical experiential knowledge. Rather than carving a middle road that is not really one or the other, the MFM program will continue to be essentially two-pronged: at its core it has three courses of intense mathematical rigour and two courses where material is taught from the perspective of practical business issues. The two remaining courses are skills courses in statistics and computational methods.
Feedback from consultations with industrial partners and alumni has shown that this two-pronged approach to the teaching of the material yields an excellent blend for the development of high quality industry professionals. Recent MPhiMac graduates have come away from their program with a thorough academic mathematical development for QRA, while having learned of the very practical issues currently engaging professional financial mathematicians.

Another unique element in the proposed curriculum is the form of the major industrial project at the conclusion of the program. It has been designed to provide a choice between taking a traditional internship, working on a “self-directed mentored project”, or further possibilities.

Self-directed mentored projects place responsibility on the students to complete their development in the way that best suits their objectives and interests, with oversight by an industry mentor. While this option is not paid, some students will appreciate the opportunity it provides to work on more interesting topics than would generally be available as an industry intern. The topic will often be proposed by the mentor, leading to an exploration of interesting innovations and ideas that may otherwise be difficult for the business to justify budgeting.

Internships are typically well paid temporary positions in quantitative risk analysis at a major financial firm. Having their industry placement at the end of the program gives students the flexibility to continue beyond the term to complete their industrial work.

In all cases, completion of the MFM program will require a paper and presentation at the end of August. We expect that in some cases, students’ engagement with their employers can be extended beyond that date by means of a contract or even full time employment. This suits employers for whom a project won’t necessarily fit precisely into a 4 month period, and suits students aiming for continued employment. Based on trials implemented in the MPhiMac program, we have also found that a day for the major project presentations at the end of August provides a perfect opportunity for the incoming student cohort to meet and learn from the outgoing cohort.

4.3 MODE(S) OF DELIVERY

MFM courses will for the most part be delivered in the form of lectures and tutorials, which is the most efficient way to transmit the required material. Because of the small class sizes, the mode will be extended beyond traditional lectures to include student-directed activities such as current event analysis. Since the courses will be delivered in classrooms equipped with projectors and blackboards, delivery can be any combination of computer presentation and blackboard writing. In addition, several courses will include modules taught by industry practitioners, overseen by the course instructor. Problem-solving tutorials delivered by research students in financial mathematics will be offered in at least the 3 foundation courses, and will provide students with feedback on their technical problem solving techniques. Close supervision of all students by instructors and the Program Director, together with one to one faculty-student meetings, will contribute to the learning process.

Selected courses (such as MFM 702 and MFM 705) will include additional elements to develop professional competencies in communications and other interpersonal skills. For example, students may be chosen at random to recap the previous class’s material. Oral examinations that supplement written ones will ask questions similar to those faced in industry. Students will provide oral answers in front of classmates and receive peer feedback and support. Project results can be presented before the class for discussion.

Students in the program will be required to attend additional weekly meetings outside of class. These regular weekly meetings will consist of three elements. Students will work through material on communication skills, taking turns to run a brief session on communication skills for their peers. The second element involves discussion, training and feedback on professional development in regard to future and past industry experiences with guest lecturers, or more commonly, industrial events. The final element of the meetings
is the sharing and discussion of current events read in the press about events relevant to QRA. Industrial events will include open houses at financial institutions, visits to professional practitioners on site at the big 5 Canadian banks, as well as insurance companies, pension plans, and supporting software firms. These can be followed by gatherings with alumni, allowing students in the program to interact with past graduates and understand better the professional work being done. Both the industrial events and the alumni gatherings will provide highly valuable context and motivation for the students’ academic studies, as well as support for the development of professional competencies. The importance of developing professional competencies is sometimes overlooked by students with a more quantitative background, so having their importance communicated by successful professionals is very valuable.

In addition to the 8 months of coursework, students must complete a major industrial project during the summer term, typically in one of two modes: (i) as a paid intern or (ii) as a self-directed mentored student. Interns will spend most of the 4 summer months working daily in a financial institution, usually within risk-management or model-vetting groups. Self-directed projects will be based at McMaster with periodic visits to the sponsoring institution. In all but exceptional cases, students will have both an industrial mentor and an academic supervisor overseeing their major industrial project. One unique strength of the MFM proposal is the preexisting network that includes and extends beyond the listed Industry Partners, of individuals that have experience mentoring MPhimac students and have expressed eagerness to continue in this role. The requirement of a paper and presentation to complete the project is an important exercise in research and communication that provides faculty with a substantial opportunity to assess each student’s level of competence in those areas.

4.4 EXPERIENTIAL LEARNING

During Terms 1 and 2, much of students’ regular activity will involve direct experiential learning. For example, typical assignment work will involve the acquisition and manipulation of data from on-line sources, much as would be done in the real world. Similarly, the main analytical software used for assignments, in particular MATLAB and R, are standard tools used in the finance industry. On several occasions during the program, MFM students will be expected to familiarize themselves with the Allen Gould Trading Floor, which offers a full suite of real-time financial datastreams and the appropriate industry standard software analytics, including Bloomberg terminals and the Thomson-Reuters data service. While such tools for asset trading are not a prime focus of QRA, students find that developing direct skills in this area is an essential enhancement to the classroom experience.

Throughout the program, field trips will be arranged to visit the headquarters of most major Canadian financial institutions. These group trips introduce students to a large number of potential employers in their workplace, which provides both tangible and intangible benefits. Professional contacts will be initiated leading to the discovery of internship opportunities.

Modules and single lectures by guest speakers from industry provide another avenue for experiential learning. In addition to presenting their unique industry expertise, we find that non-academic speakers adopt different modes of communication that are important for students to experience. For example, they often deliver material at a rapid pace not typically found in academic settings, and learning to assimilate their messages efficiently is an essential workplace skill.

The major industrial project completed in Term 3 is of course 100% about experiential learning. Since they will soon be employees working for a single firm, MFM students may never again have a better opportunity to directly compare the styles and methods of different institutions. MFM students often have no prior experience working in the finance industry, so these extended industry focused projects are an essential step in their formation, and probably the most important single factor underlying their long-term success.
4.5 ACCESSIBILITY
There are no impediments to accommodations in the MFM program that come within McMaster’s policy and recommendations found at http://accessibility.mcmaster.ca/. This policy states that accommodations are a shared responsibility between the individuals requesting and providing the accommodation and that the nature of an accommodation is specific to the individual and should be determined on a case-by-case basis. For example, the classrooms and workspaces at McMaster that will be used every day of the program all meet high standards of accessibility. For occasional field trips on or off campus, accessible transport will be arranged where needed. Academic accommodations such as special conditions for exams and assignments will also be arranged on a case-by-case basis.

4.6 RESEARCH REQUIREMENTS
As a professional program, MFM does not aim to be research-focused. Nonetheless, the program emphasizes the need for continuing mastery of the latest research developments in QRA, through the reading of research papers and implementation of their methodologies. Moreover, the major industrial project, particularly when taken as a mentored project, provides the opportunity for graduate research that could well lead to the pursuit of a PhD in mathematics, statistics, operations research, economics or finance. Since the project choice can be made relatively late in the program, the student who develops a strong interest in research aspects of financial mathematics during the MFM program may treat their mentored project as an exploration of a potential PhD project to be pursued after completion.

ASSESSMENT OF LEARNING
5.1 METHODS FOR ASSESSING STUDENTS
Evaluation in each Term 1 and 2 course will be based on all of the following criteria: attendance and class participation, individual and group assignments, midterm test, and a final examination. At least 50% by weight of the final examination in each course must be written and invigilated to validate the individual’s personal achievement. The remainder of the final examination may be an oral or take-home written exam. In addition to these required criteria, some courses may additionally involve a presentation or project. Where appropriate, such as for a presentation, an peer evaluation component will also be considered. Course grades are assessed by the instructor assigned to the course, sometimes with T.A. support.

Evaluation of the major industrial project in Term 3 will be based in roughly equal measures on three criteria: the report of the Mentor, the individual paper and presentation. Each criterion will consider a multiplicity of factors that measure the program learning outcomes in all the categories, including communication skills, plus technical and professional competence. The final grade on the major industrial project will be judged and assigned by the Academic Committee.

Some of the professional competencies (“soft skills”) are assessed informally through interactions at industrial events and other interactions (weekly meetings, group activities). These do not fold into course grades, but are nonetheless used in mentoring and guiding students in their professional development in one-on-one meetings.

5.2 CURRICULUM MAP
A chart mapping program learning outcomes to degree level expectations, teaching activities and assessments is provided here.
<table>
<thead>
<tr>
<th>Program Learning Outcomes: By the end of the program, graduates with an MFM degree will...</th>
<th>Masters Degree Level Expectations</th>
<th>Teaching Activities and Learning Opportunities</th>
<th>Assessment and Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>..gain Industrial Knowledge of definitions and uses of key financial assets (T1)</td>
<td>1. Depth and Breadth of Knowledge</td>
<td>All courses Group activities Guest speakers Industrial events</td>
<td>Graded assessments of in-course requirements: written and oral exams, projects, assignments</td>
</tr>
<tr>
<td>..develop skills in Financial Mathematics: mastery of theoretical concepts and problem solving in financial mathematics and probability theory (T2)</td>
<td>1. Depth and Breadth of Knowledge 3. Level of Application of Knowledge</td>
<td>All courses Assignments, projects, and examinations</td>
<td>Graded assessments of in-course requirements written and oral exams, projects, assignments</td>
</tr>
<tr>
<td>..be adept at Financial Risk Quantification: ability to measure risk on a portfolio of complex positions (T3)</td>
<td>1. Depth and Breadth of Knowledge 3. Level of Application of Knowledge</td>
<td>Courses MFM702, MFM703, MFM705 Assignments and projects</td>
<td>Graded assessments of in-course requirements written and oral exams, projects, assignments</td>
</tr>
<tr>
<td>..acquire ability in Computational Analysis: algorithmic thinking and the ability to use technology to analyze and problem solve (T4)</td>
<td>1. Depth and Breadth of Knowledge 3. Level of Application of Knowledge</td>
<td>Predominantly courses MFM708*, MFM709*, Stats721, but technology opportunities are provided in all courses. C++ seminars and Visual Basic workshop Projects, assignments</td>
<td>Graded assessments of in-course requirements written tests and exams, projects, assignments</td>
</tr>
<tr>
<td>..have foundations in Statistical Analysis: practical facility in financial statistics based on theoretical foundations (T5)</td>
<td>1. Depth and Breadth of Knowledge 3. Level of Application of Knowledge</td>
<td>Predominantly Stats721, but is incorporated in other courses as well</td>
<td>Graded assessments of in-course requirements written tests and exams, assignments</td>
</tr>
<tr>
<td>..understand role, structure and regulation of financial institutions (P1)</td>
<td>3. Level of Application of Knowledge</td>
<td>MFM701, MFM702, MFM704, MFM705 Group activities Guest speakers Industrial events Alumni interaction</td>
<td>Oral examinations and in-class discussion and presentations. Discussions in group activities, industrial and alumni events</td>
</tr>
</tbody>
</table>
For each learning outcome, multiple avenues for providing assessment are identified. Assessment of the technical learning outcomes is achieved through the normal grading of class participation, tests, assignments, projects, and final exam. The professional learning outcomes are likewise measurable through similar course evaluation, but with an important additional assessment from the student’s industry mentor. Outcomes such as P1-Understanding financial institutions, P2-Interpretation of Technical Results, and P3-Application of Technical concepts will also be assessed on tests and exams through problems that require critical analysis as well as computation. The use of oral exams is a key element for assessing these same competencies, as well as P4-Interpersonal and Communication Skills. Likewise the use of in-class presentations, projects, and discussions, incorporate this assessment into the student’s grade, even if just a “class participation” component. The last outcome, P5-Ethics and Professionalism is assessed indirectly throughout the program. Students are coached, watched, and provided feedback on their exercise of these qualities. The failure of a student to conduct themselves to the required level of academic integrity results in failing grades on tainted work, possibly leading to suspension from the program while the student undertakes remedial work in learning ethics and professionalism. Notwithstanding this, professionalism in particular is more often and more effectively assessed informally through group events, and feedback from peers and industry professionals, with the student’s level of success communicated through one-on-one interaction during their time in the program.
5.3 DEMONSTRATING STUDENT ACHIEVEMENT

For in-course assessment, the primary demonstration of student achievement will be through the work submitted for grading, midterms and exams. Tests and exams primarily assess the technical program outcomes (PLO T1 through T5). However, there are opportunities in the tests for demonstrating achievement in the professional competencies as well, through the use of synthesis and analysis test questions. Student achievement in the professional competencies (PLO P1 through P5) will be assessed in oral examinations, class presentations and discussions, and through group activities. The latter includes professional development sessions of the cohort, external visits to industry partners, and interactions with alumni at program events.

Student achievement is also demonstrated by success in finding placements for the major industrial project. While the program anticipates having up to 25% of the students completing the major project through a self-directed mentored project, students generally prefer the option of having a paid internship. Because of that, the level to which students successfully land paid opportunities for the major industrial project thus provides a clear measure of their professional development, and success in meeting the learning outcomes.

When the students reconvene for their presentations at the end of the major industrial project, they will share and demonstrate the professional successes, or lack thereof, that they have achieved during their summer placement. Students continue to offer feedback after graduation, when alumni events provide additional opportunities to hear from them how well the program has met its learning objectives through the graduate’s preparations for industrial work. Placement rates for students going into industry after graduation will be tracked and used to monitor whether the program objectives are continuing to be met.

Feedback is also received from the industry practitioners who interact with the students. This occurs when the program has guest speakers, industry events (open houses, site visits, end of year dinner), and in the course of student interviews for summer placements and opportunities after graduation. Industry partners will be heavily relied upon to provide feedback as to how well the students are meeting professional expectations and requirements through their experience in the program. These provide a valuable guide in developing initiatives to better deliver program learning outcomes.

The greatest measure of success by students coming from the professional program is ultimately exhibited by their securing a future in the finance industry. Since the program learning outcomes were constructed specifically to prepare graduates for entry-level QRA careers in the financial industry, the overarching measure of students’ success is their success in landing such a position at the end of the program.

RESOURCES

6.1 GRADUATE PROGRAMS

I. ADMINISTRATIVE, PHYSICAL AND FINANCIAL RESOURCES

Two administrative positions will be required to run the MFM program smoothly, the Program Coordinator and a 25% secretarial position. Both will be given workspace within the Departmental Office. Other positions, notably the Program Director, will be filled by regular faculty as part of their regular duties.

The MFM students will require about 75 m^2 of suitably furnished workspace, which will include shared desks, personal storage lockers and discussion area with a blackboard. Teaching space adequate for 20 students for about 15 hours a week for Terms 1 and 2 will be found within the available departmental seminar rooms and university lecture rooms. During Term 3, most students will be placed within financial institutions, and thus additional physical resource requirements will be negligible.
Like most professional programs, the MFM program is designed to be revenue neutral. However, as the cohort of successful alumni and satisfied industry partners grows, it will be increasingly important to develop an outreach campaign. Donations can be used for faculty renewal and expansion, creation of scholarships, and the improvement of physical infrastructure.

II. LIBRARY, TECHNOLOGY, AND LABORATORY RESOURCES

The vast resources of the McMaster Library system will be critical for ongoing scholarly work in the MFM program. The existing periodical subscriptions include electronic access for the McMaster community to the most relevant international journals on financial mathematics, quantitative risk analysis, statistics, mathematics, economics and of course all other fields. The MFM faculty will continue to make recommendations for Library acquisition of hard copies of important and relevant textbooks.

It will be important that MFM students have access to critical proprietary software, notably MATLAB, Maple, R, S-plus. The Department of Mathematics and Statistics maintains subscriptions for such packages that permit access to graduate students. As professionals, MFM students will be required to have their own personal laptops, loaded with standard software packages such as Microsoft Office, LATEX, and networked to the university internet servers. This will be sufficient for the vast majority of their IT needs. MFM students will require the usual IT support offered to students by the departmental systems administrator and the University Technology Services (UTS).

It is intended that arrangements will be made with the Business School for MFM students for regular access to the Allen J. Gould Trading Floor.

III. FACULTY

Faculty List:

<table>
<thead>
<tr>
<th>Name</th>
<th>Rank</th>
<th>Area</th>
<th>Department</th>
<th>Employer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Thomas Hurd</td>
<td>Professor</td>
<td>Fin. Math.</td>
<td>Math &amp; Stats</td>
<td></td>
</tr>
<tr>
<td>Dr. Matheus Grasselli</td>
<td>Professor</td>
<td>Fin. Math.</td>
<td>Math &amp; Stats</td>
<td></td>
</tr>
<tr>
<td>Dr. David Lozinski</td>
<td>Assistant Professor</td>
<td>Fin. Math.</td>
<td>Math &amp; Stats</td>
<td></td>
</tr>
<tr>
<td>Dr. Traian Pirvu</td>
<td>Associate Professor</td>
<td>Fin. Math.</td>
<td>Math &amp; Stats</td>
<td></td>
</tr>
<tr>
<td>Dr. Petar Jevtic</td>
<td>Assistant Professor</td>
<td>Fin. Math.</td>
<td>Math &amp; Stats</td>
<td></td>
</tr>
<tr>
<td>Dr. Shui Feng</td>
<td>Professor</td>
<td>Statistics</td>
<td>Math &amp; Stats</td>
<td></td>
</tr>
<tr>
<td>Dr. Paul McNicholas</td>
<td>Professor</td>
<td>Statistics</td>
<td>Math &amp; Stats</td>
<td></td>
</tr>
<tr>
<td>Dr. Aaron Childs</td>
<td>Associate Professor</td>
<td>Statistics</td>
<td>Math &amp; Stats</td>
<td></td>
</tr>
<tr>
<td>Dr. Jeffery Racine</td>
<td>Professor</td>
<td>Econometrics</td>
<td>Economics</td>
<td></td>
</tr>
<tr>
<td>Dr. Richard Deaves</td>
<td>Professor</td>
<td>Finance</td>
<td>DeGroote Bus.</td>
<td></td>
</tr>
<tr>
<td>Dr. Rosemary Luo</td>
<td>Associate Professor</td>
<td>Finance</td>
<td>DeGroote Bus.</td>
<td></td>
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<tr>
<td>Dr. Alex Levin</td>
<td>Adjunct Professor</td>
<td>Fin. Math.</td>
<td>Math &amp; Stats</td>
<td></td>
</tr>
<tr>
<td>Dr. Ian Buckley</td>
<td>Adjunct Professor</td>
<td>Fin. Math.</td>
<td>Math &amp; Stats</td>
<td>Canadian Securities Transition Office</td>
</tr>
</tbody>
</table>
The Department of Mathematics and Statistics already includes enough qualified permanent faculty to offer the proposed set of MFM courses of Terms 1 and 2. In addition to the core PhiMac faculty comprising Drs. Grasselli, Hurd, Lozinski and Pirvu, Dr Jevtic is currently employed in the PhiMac group on a 3 year contract. In addition, every year the PhiMac research group hires one or more postdoctoral fellows in financial mathematics who are qualified to teach certain advanced courses in the MFM program as part of their contractual teaching. The two industry members of the MFM Faculty List, Dr. Buckley and Dr. Levin, are adjunct faculty who are qualified to teach one of several core MFM courses, in the format of a 3 hour meeting one evening a week for one term. Additional members of the Faculty List may also be interested in teaching certain MFM courses, notably MFM 703 and MFM 704, although their departmental responsibilities will certainly limit such involvement. Stats 721 is currently taught by Dr. Childs.

When the core teaching faculty have occasional research leaves or secondments, adjunct faculty, postdocs or industry partners will be given MFM courses to teach. Selection of a non-faculty instructor will be subject to the normal approval process for sessional instructors.

The preexisting PhiMac and Statistics research groups in the Department house research graduate students and postdoctoral fellows in financial mathematics and statistics. The PhiMac postdocs are highly qualified to be occasional instructors for MFM courses. We expect seven MFM courses each to have a TA allocation at the rate of 2.5 hours per student, with TAs drawn from the pool of PhiMac and Statistics graduate students.

Supervisory responsibilities for the major industry projects that run during the summer months require additional teaching resources that need to be funded. It is in this capacity that there is an opportunity for Faculty List members from outside the Department to make a small but important contribution. We propose that such supervisory responsibilities be compensated as overload teaching. The majority of summer projects are expected to be internships mentored by their industry supervisors. The academic supervisory responsibilities for such interns will be straightforward: monitoring that students remain on track to produce the requisite paper and presentation; evaluating final papers and presentations. We expect that fewer than 25% of students will undertake the self-directed mentored project. These will require a higher degree of supervisory responsibility: monitoring that students remain on track to produce the requisite paper and presentation; regular (weekly or biweekly) meetings; liaison with the industry mentor; evaluating final papers and presentations.

Finally, the Department is committed to making an additional 80% full-time equivalent staff position for a Program Coordinator and a 25% full-time equivalent secretarial staff position. The required qualifications and responsibilities for these two positions are described in Section 3.1.

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Area</th>
<th>Employer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Dr. Niall Whelan</td>
<td>Vice-President</td>
<td>Market Risk Measurement</td>
<td>Scotiabank</td>
</tr>
<tr>
<td>2 Mr. Ray Westcott</td>
<td>Vice President</td>
<td>Capital Markets Risk Measurement &amp;</td>
<td>CIBC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reporting</td>
<td></td>
</tr>
<tr>
<td>3 Dr. Alex Tchernitscher</td>
<td>Managing Director</td>
<td>Risk Models, ERPM</td>
<td>BMO</td>
</tr>
<tr>
<td>4 Dr. Z. Sokolovic</td>
<td>Associate Vice President</td>
<td>Market Risk Control, Risk Management</td>
<td>TDBank</td>
</tr>
<tr>
<td>5 Dr. Greg Nudelman</td>
<td>Vice President</td>
<td>Head of Model Validation and Management</td>
<td>TDBank</td>
</tr>
<tr>
<td>6 Dr. Anthony Vaz</td>
<td>VP</td>
<td>Models, Methodology &amp; Infrastructure, Market and Liquidity Risk Management</td>
<td>Manulife</td>
</tr>
<tr>
<td>7 Dr. Houben Huang</td>
<td>Vice President</td>
<td>Model Risk &amp; Validation</td>
<td>BMO</td>
</tr>
<tr>
<td>8 Mr. Jason Drysdale</td>
<td>Senior Vice-President</td>
<td>Enterprise Risk</td>
<td>RBC</td>
</tr>
</tbody>
</table>
The core MPhiMac faculty currently maintain an extensive network of over 80 associates in the Ontario finance industry. From this network, a number of partners have agreed to receive and review students' resumes or to mentor summer research projects for the program. These partners typically do not ask for compensation: they are happy to offer help and to maintain contacts with MPhiMac as a way to tap into the stream of potential industry hires. Ten or more industry partners have already expressed an eagerness to teach a module, or in some cases entire courses, for the MFM program. We anticipate that M702, 703, 704 and 705 will all include short modules taught regularly by industry partners. We intend to offer our industry partners the standard McMaster compensation rates when they teach modules and courses.

### IV. STUDENT FINANCIAL SUPPORT

Students will need to fund themselves fully, including tuition and incidental fees and living expenses for the one-year period. To partially offset these expenses, it is anticipated that most students will be able to supplement their financing through the summer internship. In recent years, at least 75% of MPhiMac students have been successful in obtaining paid summer internships or research fellowships, that typically pay in excess of $16K over a four month period. Canadian students with limited means will be eligible for OSAP funding and should also qualify for loans from Canadian banks.

Practical considerations mean that TAships will not be offered to MFM students. The rationale is that to deliver the course requirements of a Masters degree in Financial Mathematics in only 8 months, the MFM program will have an intense schedule which does not leave time for the additional work necessary to meet commitments for this avenue of funding. Moreover, typical TA duties, such as tutoring in undergraduate mathematics, do not harmonize with the industrial focus of the MFM courses.

The full-fee/no scholarship model of MFM funding will be effective for a one-year professional Masters in financial mathematics with a probable summer internship. It is not hard to justify: the MFM credential, like the MPhiMac credential that precedes it, will open doors to well-paid careers in the finance industry. While we cannot be certain that the applicant pool for the new MFM program, with its higher tuition fees, will not drop compared to MPhiMac, the cost-benefit analysis to the students suggests that this effect should be short term, and we expect to see program enrolment achieve its target of 20 within the first 5 years.

### V. FACULTY RESEARCH FUNDING

The MFM program does not have a core research component.

### VI. SUPERVISION

(invitations are being made: list to be confirmed):

<table>
<thead>
<tr>
<th>Faculty Members by Field</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fields</td>
<td>--</td>
</tr>
</tbody>
</table>

---

Master of Financial Math Program
<table>
<thead>
<tr>
<th>Faculty Name &amp; Rank</th>
<th>M/F</th>
<th>Home Unit</th>
<th>Supervisory Privileges</th>
<th>Mathematics</th>
<th>Statistics</th>
<th>Finance</th>
<th>Economics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Thomas Hurd - Professor</td>
<td>M</td>
<td>Math &amp; Stats</td>
<td>Full</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Matheus Grasselli -</td>
<td>M</td>
<td>Math &amp; Stats</td>
<td>Full</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Traian Pirvu - Associate</td>
<td>M</td>
<td>Math &amp; Stats</td>
<td>Full</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. David Lozinski -</td>
<td>M</td>
<td>Math &amp; Stats</td>
<td>Master's</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Shui Feng - Professor</td>
<td>M</td>
<td>Math &amp; Stats</td>
<td>Full</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Aaron Childs - Associate</td>
<td>M</td>
<td>Math &amp; Stats</td>
<td>Full</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Petar Jevtic - Assistant</td>
<td>M</td>
<td>Math &amp; Stats</td>
<td>Master's</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Paul McNicholas -</td>
<td>M</td>
<td>Math &amp; Stats</td>
<td>Full</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Richard Deaves - Professor</td>
<td>M</td>
<td>DeGroote Bus.</td>
<td>Full</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Rosemary Luo - Associate</td>
<td>M</td>
<td>DeGroote Bus.</td>
<td>Full</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Jeff Racine - Professor</td>
<td>M</td>
<td>DeGroote Bus.</td>
<td>Full</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Alex Levin - Adjunct</td>
<td>M</td>
<td>Math &amp; Stats</td>
<td>RBC</td>
<td>Master's</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Dr. Ian Buckley - Adjunct</td>
<td>M</td>
<td>Math &amp; Stats</td>
<td>Standard&amp;Poors</td>
<td>Master's</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**Category 1**: tenured or tenure-track core faculty members whose graduate involvement is exclusively in the graduate program under review. For this purpose the master's and doctoral streams of a program are considered as a single program. Membership in the graduate program, not the home unit, is the defining issue.

**Category 2**: non-tenure-track core faculty members whose graduate involvement is exclusively in the graduate program under review.

**Category 3**: tenured or tenure-track core faculty members who are involved in teaching and/or supervision in other graduate program(s) in addition to being a core member of the graduate program under review.

**Category 4**: non-tenure track core faculty members who are involved in teaching and/or supervision in other graduate program(s) in addition to being a core member of the graduate program under review.

**Category 5**: other core faculty: this category may include emeritus professors with supervisory privileges and persons appointed from government laboratories or industry as adjunct professors. Please explain who would fall into this category at your institution.

**Category 6**: non-core faculty who participate in the teaching of graduate courses.

**QUALITY AND OTHER INDICATORS**

**7.1 ACADEMIC QUALITY OF THE PROGRAM**

The CVs and research statements attached as Appendix show that the members of Faculty List are highly qualified to teach and supervise projects in the MFM program. All have PhDs in relevant fields; 8 have the rank of full professor; 2 are associate professors; 2 are assistant professors. The 2 adjunct professors are
full-time employees in the financial industry and both have considerable experience teaching quantitative finance at the Master level, both at McMaster and elsewhere. Even though MFM is foremost a professional program, it is relevant that almost all members of the Faculty List have extensive experience in the supervision of graduate research, both at the master and doctoral levels.

The quality of the MFM program will be monitored on an ongoing basis by a variety of indicators. In rough order of importance, these will include:

1. Employability: as the most tangible goal of the program, this is also the most important objective to measure. Each year, our students will compete for positions in QRA with a wide range of firms. The Academic Committee will use various means to assess employability, including job placement statistics and feedback from our industry partners, commenting on students’ interview performance and preparation.

2. Formative assessment: The quality of courses and the level of student engagement will be monitored by mid-term student evaluations in all courses.

3. Grades/averages: The Academic Committee will assess final marks given in every course, including comparison across different cohort years. This will ensure continuity in course standards, will equalize grading standards for students from different years, and allow fair comparison of their achievements.

4. Internships: it will be students’ own responsibility to obtain desirable internships with which they may complete their major industrial project. The value of their internship experience will be measured by the quality of their presentation and submitted paper, and by the assessment given by their industry mentor.

5. Applicant pool: attracting increasingly high quality applicants and maintaining a high admission cut-off is an important indicator of program quality.

7.2 INTELLECTUAL QUALITY OF THE STUDENT EXPERIENCE

The two-pronged nature of the MFM program structure, with its balance between theoretical foundations and practical knowledge of QRA, will ensure that the program content will be intellectually satisfying for the targeted students.

There will be many opportunities for MFM students for further exposure to intellectually exciting topics: all will be invited to attend the regular PhiMac meetings devoted to current financial math research and the Applied Math/Financial Math research seminars, all will be strongly encouraged to travel to the Fields Institute to attend the monthly Quantitative Finance Seminar Series.

Finally, MFM 797, the major industrial project in Term 3, will be for many the crown of the program. It will be an opportunity for students to develop a research or development topic of personal interest, either in an industry setting as an intern, or in the academic environment as a self-directed mentored student.
CHECKLIST FOR NEW PROGRAM PROPOSALS

The following section indicates all the items that are required as part of a complete new program proposal package which includes all the necessary documents. Part I, II and III should be submitted as separate files to iqap@mcmaster.ca.

PART I: COMPLETE NEW PROGRAM PROPOSAL DOCUMENT

☐ Complete New Program Proposal Template
☐ Faculty CVs (can be submitted on CD or USB)
☐ Memorandum(s) of Understanding (Letters of Support) (if applicable)

PART II: RESOURCE IMPLICATIONS AND FINANCIAL VIABILITY OF PROGRAMS TEMPLATE

☐ Completed
☐ Approved

PART III: FEES MEMO

☐ Completed
☐ Approved
## New Graduate Program or Existing Program Undergoing Major Changes (more than 30%)

### Details of Resource Implications and Financial Viability

**Faculty:** Science  
**Program Name:** Master of Financial Mathematics

#### A. FINANCIAL SUSTAINABILITY OF PROGRAM

[Complete New Graduate 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)]

<table>
<thead>
<tr>
<th>REVENUE</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Generated Gross Graduate Revenue</td>
<td>$652,778</td>
<td>$722,978</td>
<td>$794,001</td>
<td>$869,319</td>
<td>$956,082</td>
</tr>
<tr>
<td>Other Revenue (Specify)</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total Gross Revenue</td>
<td>$652,778</td>
<td>$722,978</td>
<td>$794,001</td>
<td>$869,319</td>
<td>$956,082</td>
</tr>
<tr>
<td>University Fund / Research Infrastructure Contribution</td>
<td>-$51,736</td>
<td>-$57,299</td>
<td>-$62,928</td>
<td>-$68,897</td>
<td>-$75,774</td>
</tr>
<tr>
<td>Total Support Unit Allocations (Indirect Costs)</td>
<td>-$170,045</td>
<td>-$180,153</td>
<td>-$189,948</td>
<td>-$201,128</td>
<td>-$210,969</td>
</tr>
<tr>
<td>NET REVENUE</td>
<td>$430,997</td>
<td>$485,525</td>
<td>$541,124</td>
<td>$599,293</td>
<td>$669,339</td>
</tr>
<tr>
<td>Total Teaching Costs</td>
<td>-$365,959</td>
<td>-$384,257</td>
<td>-$403,470</td>
<td>-$423,643</td>
<td>-$444,825</td>
</tr>
<tr>
<td>Total Admin Salaries &amp; Benefits</td>
<td>-$50,000</td>
<td>-$57,299</td>
<td>-$62,928</td>
<td>-$68,897</td>
<td>-$75,774</td>
</tr>
<tr>
<td>Total Student Support (From operating)</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Total Capital / Equipment Costs</td>
<td>-$2,000</td>
<td>-$2,060</td>
<td>-$2,122</td>
<td>-$2,185</td>
<td>-$2,251</td>
</tr>
<tr>
<td>Total Other Direct Expenses - Supplies / Services / Travel etc</td>
<td>-$15,000</td>
<td>-$15,450</td>
<td>-$15,914</td>
<td>-$16,391</td>
<td>-$16,883</td>
</tr>
<tr>
<td>Total Share of Faculty's Central Expenses</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>PROGRAM EXPENSES</td>
<td>-$448,434</td>
<td>-$470,516</td>
<td>-$493,691</td>
<td>-$536,768</td>
<td>-$563,235</td>
</tr>
<tr>
<td>IN-YEAR (Surplus/ Deficit)</td>
<td>-$17,437</td>
<td>$15,010</td>
<td>$47,433</td>
<td>$62,524</td>
<td>$106,104</td>
</tr>
<tr>
<td>Total Grad support per FT student (Scholarship, Taship) excluding RA</td>
<td>$688</td>
<td>$670</td>
<td>$670</td>
<td>$670</td>
<td>$670</td>
</tr>
</tbody>
</table>

#### B. NUMBER OF STUDENTS

- **FT**:  
  - Intended Steady-state annual intake: 20  
  - Intended Steady-state total enrolment: 20  
  - Number of International Students included in steady state: 6.6  
  
- **PT**:  
  - Intended Steady-state annual intake: 0  
  - Intended Steady-state total enrolment: 0  
  - Number of International Students included in steady state: 0

| Proposed number of additional students to University at steady state: | 20 |

| Will there be an impact to enrollments in Programs in other Faculties? | No |

#### C. FORMAT OF INSTRUCTION

- **During which terms will the program run?**  
  - Fall: 1  
  - Winter: 1  
  - Summer (May-June): 1  
  - Summer (July-August): 1  
  - Annual program units: 30

| Is there a co-op or internship as part of the program? | Yes |
| 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 FEE

<table>
<thead>
<tr>
<th>School, Degree, Focus of the program, Current enrolment, Program Length, Tuition and Fees (2015-16)</th>
</tr>
</thead>
<tbody>
<tr>
<td>McMaster University (DeGroote School of Business), Master of Finance, Specialized finance education, 21, 12 Months, $39690/$39690</td>
</tr>
<tr>
<td>University of Toronto (Department of Mathematics), Master of Mathematical Finance, Mathematical finance, 30, 12 Months, $46,311/$46,311</td>
</tr>
<tr>
<td>University of Toronto (Department of Statistical Sciences), Master of Financial Insurance, Mathematical finance, 10-30, 12 Months, $27,000/$45,000</td>
</tr>
<tr>
<td>University of Waterloo (Department of Actuarial Science; School of Accountancy), Collaborative Master’s Program in Finance (Master of Mathematics; Master of Accounting), Mathematical finance, 15, 16 Months, $18,719/$19,535</td>
</tr>
<tr>
<td>York University (Schulich School of Business.), Master of Finance, Specialized finance education, 12 Months, $38,568/$45,000</td>
</tr>
</tbody>
</table>

Please see IQAP page 14.

### D2. SUPPLEMENTARY FEES

Will regular Mandatory Supplementary Fees apply?

<table>
<thead>
<tr>
<th>Full Time</th>
<th>Part Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

If no, please contact Dean of Grad Studies 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?)

| No | Describe & Approximate amounts |

### 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:

<table>
<thead>
<tr>
<th>Onetime</th>
<th>Ongoing</th>
<th>Value $</th>
<th>Details</th>
</tr>
</thead>
</table>

### F. FACULTY RESOURCES

- Please append evidence of endorsement from other faculties affected if necessary.

<table>
<thead>
<tr>
<th>Incremental FTEs required:</th>
<th>Science</th>
<th>N/A</th>
<th>N/A</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty - Tenure Track</td>
<td>1.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faculty - Sessional and CLAs</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Teaching Assistants

Additional Non-salary costs in other Faculties
### G. OTHER RESOURCE IMPLICATIONS:

Unless otherwise defined in the categories below, please use these descriptions to define impact:

<table>
<thead>
<tr>
<th>Impact</th>
<th>New Sq Ft Required</th>
<th>Approx Existing Sq Ft required</th>
<th>Comments (Include location and for new space, plans to fund and acquire space)</th>
<th>If Major, estimate $</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Impact</td>
<td>Can be dealt with as part of normal, daily operations. No budgetary or resource impact.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td>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.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 1. PHYSICAL FACILITIES - Please contact Coordinator, Design and Space Management x2398 for assistance in determining additional resource costs if needed.

<table>
<thead>
<tr>
<th>Facility/Space</th>
<th>Impact</th>
<th>New Sq Ft Required</th>
<th>Approx Existing Sq Ft required</th>
<th>Comments (Include location and for new space, plans to fund and acquire space)</th>
<th>If Major, estimate $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty space - Offices, Labs, seminar rooms, student space, etc</td>
<td>Minor</td>
<td>-</td>
<td>75.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other space (excluding registrar controlled classrooms)</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 2. TECHNOLOGY RESOURCES - Please contact UTS Director, Technology x21688 for assistance in determining impact if needed.

<table>
<thead>
<tr>
<th>Technology Resource</th>
<th>Impact</th>
<th>Are additional resources required to support this program? If so, please list.</th>
<th>If Major, estimate $</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTS Computer Labs and Software</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network/Internet/Cloud services access &amp; usage</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio-Visual / Telecommunications</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wireless Connectivity</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Please specify)</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 3. LIBRARY SERVICES - Please contact Associate University Librarian, Collections x26557 for assistance in determining impact if needed.

<table>
<thead>
<tr>
<th>Library Resource</th>
<th>Impact</th>
<th>Are additional resources required to support this program? If so, please list.</th>
<th>If Major, estimate $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staffing (Adjunct service desk staff, adjunct librarians, new staff with skills/knowledge not currently present)</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collections, One Time Purchases (books, ebooks, purchased online resources)</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collections, Ongoing Subscriptions/licenses (print or online journals)</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology and Computing (new or additional hardware/software, increased digital storage capacity)</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Library Spaces (study space, new or specialized user or collection spaces)</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Please specify)</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 4. OFFICE OF THE UNIVERSITY REGISTRAR - Please contact the Registrar for assistance in determining impact if needed.

<table>
<thead>
<tr>
<th>Resource Implication</th>
<th>Impact</th>
<th>Support required</th>
<th>Area Responsible</th>
<th>If Major, estimate $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admissions/Recruitment</td>
<td>Major</td>
<td>Requires specialized recruiting campaign or manual admission processes (eg target intl students or direct entry programs)</td>
<td>SGS</td>
<td></td>
</tr>
<tr>
<td>Student Record Support (maintaining records, transcripts, grades, student card, etc)</td>
<td>Minor</td>
<td>Standard services for graduate program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class Scheduling Services</td>
<td>Minor</td>
<td>Follows existing timelines/processes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classrooms</td>
<td>None</td>
<td>Scheduled into Faculty controlled classrooms or only summer term or off campus.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 5. STUDENT SUPPORT - Please contact Assistant Dean, Student Services for assistance in determining impact if needed.

<table>
<thead>
<tr>
<th>Resource Impact</th>
<th>Impact</th>
<th>Please Describe any impacts on the support areas</th>
<th>If Major, estimate $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Services - International Student support</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Services - Athletics &amp; Rec., Health/Counselling, Career</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residence</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grad Scholarships/Bursaries*</td>
<td>None</td>
<td>Approx. Annual Draw on Scholarship pool</td>
<td>$ 12,395</td>
</tr>
</tbody>
</table>

*If you are anticipating OSAP funding for these students please contact SFAS to provide additional information to activate approval from MTCU*

#### 6. MIE TL - Please contact Educational Consultant for assistance in determining impact if needed.

<table>
<thead>
<tr>
<th>Resource Impact</th>
<th>Impact</th>
<th>Please Describe any impacts on the support areas</th>
<th>If Major, estimate $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re/Development of blended or online courses</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning Management System (Avenue to Learn)</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training and development for TAs or faculty</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research on teaching and learning initiatives</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Please specify)</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 7. OTHER

<table>
<thead>
<tr>
<th>Resource Impact</th>
<th>Impact</th>
<th>Please Describe any impacts on the support areas</th>
<th>If Major, estimate $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Services</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Resources</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advancement</td>
<td>Minor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Services Office</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Please specify)</td>
<td>None</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
McMaster University

Strategic Mandate Agreement Annual Report 2015-2016
## 2015-2016 System Wide Indicators

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Introduction
The 2014-15 to 2016-17 Strategic Mandate Agreements (SMAs) between individual universities and the Ministry of Advanced Education and Skills Development (the ministry) outline the role that each university currently performs in the postsecondary education system and how it will build on its current strengths to achieve its vision and help drive system-wide objectives articulated by the ministry’s Differentiation Policy Framework.

The ministry and the university are committed to continuing to work together to ensure a postsecondary education system that achieves and supports accessibility, high-quality and student-centred learning experiences, social and economic development, financial sustainability and accountability.

As the ministry noted throughout the SMA process, robust metrics and reporting are crucial to achieving greater differentiation, and will lay the foundation for further transformation by providing the evidence base for future discussions and decisions.

In general, the metrics in the 2015-2016 SMA Report Back reflect the system-wide metrics in the ministry’s Differentiation Policy Framework. Colleges and universities also have the opportunity to provide a narrative outlining each institution’s strengths.

The ministry recognizes that many of these metrics are proxy measures and that more robust system wide metrics will be developed in consultation with the sector. The ministry will continue to work with institutions to strengthen transparency and accountability by developing system-wide metrics. SMA Report Backs will be updated in the future as new system-wide metrics become available.

Overview
This year, the deadline for colleges and universities to submit the 2015-2016 SMA Report Back to the ministry is November 15, 2016. The SMA Report Back includes the following features:

- **Save as You Go** - Users can save the information they enter into the SMA Report Back at any time. Clicking either the save or next button will save the information.
- **Review Before You Submit** - Users can review all of the information before submitting their institution’s SMA Report Back.
- **Save or Print a PDF Copy of the Report Back** - Users can save to their computer or print a PDF copy of their institution’s 2015-2016 SMA Report Back at any time.
- **Enter Text** - Users can input up to 4000 characters (equivalent to approximately 600 words or one single-spaced page) into the text box for each of the SMA Report Back indicators.
- **Text Box Formatting** - Users can paste text from other sources (Word documents, emails, etc.) into the SMA Report Back text boxes.

Where possible, to help streamline the 2015-2016 SMA Report Back process, the ministry pre-populated McMaster University’s 2015-2016 SMA Report Back template with data from a variety of confirmed ministry and institutional sources (e.g., Key Performance Indicators, USER, previous SMA Report Backs, etc.). University users can send questions to Arlene Woolley, Senior Policy Advisor at Arlene.woolley@ontario.ca. Thank you for your continued support of the annual SMA Report Back process.
1. Jobs, Innovation & Economic Development (JIED)
This component highlights McMaster University’s collaborative work with employers, community partners and regions, or at a global level. It establishes the university’s role in fostering social and economic development, and serving the needs of students, the economy and labour market.

The ministry will be consulting institutions on a proposed short list of additional system-wide JIED metrics that have been developed in collaboration with the Ministry of Research and Innovation (MRI), Ontario Centres of Excellence (OCE), and MaRS Data Catalyst.

Through consultations with institutions, the ministry will select new metrics from the short list. These will become part of future SMA Report Backs. The additional metrics will serve as a basis for a narrative on the economic and social contribution of institutions to local communities and to the province.

1a. Graduate Employment Rate
Per the KPI results reported from the graduate survey of 2013 graduates:
| The employment rate for 2013 graduates, 6 months after graduation, at McMaster University was: | 88.8 |
| The employment rate for 2012 graduates, 2 years after graduation, at McMaster University was: | 94.5 |

1b. Employment in a Related Job
Per the graduate survey of 2013 graduates:
| The respondents that indicated that, 2 years after graduation, their work was closely or somewhat related to the subject matter of the program of study that the respondent completed in 2013 at McMaster University was: | 77 |
| The respondents that indicated that, 2 years after graduation, their work was closely or somewhat related to the skills (i.e. critical thinking, analytical, communication, problem solving) that the respondent developed at McMaster University was: | 89 |

Additional Information
Additional survey tools, caveats and/or other information regarding the data reported above re: Graduate Employment Rates (up to 600 words approx.).

Over 95% of the respondents of a graduate survey, administered during the July 2016 convocation, indicated that McMaster prepared them for employment. About 42% of them had received an offer of employment as a result of attaining their degree at McMaster University.

The 2016 Maclean’s University Reputation Rankings ranked McMaster as the fifth best university in Canada for the categories of Most Innovative and Best Overall. McMaster also ranked third in Ontario in the categories of Leaders of Tomorrow and fourth in Highest Quality. This ranking was based on a national survey of business professionals, high school guidance counsellors, university faculty and senior administrators, asking for their views on quality and innovation. McMaster’s high standing, especially with private sector respondents, has a positive effect on the graduate employment rate of our graduates.

The Times Higher Education 2015 Global Employability University Rankings, which assesses
universities based on the employability of their graduates, ranked McMaster as the fifth best Canadian University and among the top 100 in the world.

Highlights
Please provide highlights of McMaster University’s collaborative work with employers, community partners and regions, or at a global level, to establish the university’s role in fostering social and economic development, and serving the needs of students, the economy and labour market. This could include a strategy, initiative or program viewed by McMaster University to be an innovative practice, success story and/or key accomplishment (up to 600 words approx).

1. McMaster is a hub of research and innovation that has high societal and economic impact in the local, provincial and global community. Successful initiatives include:

   - McMaster Innovation Park (MIP) provides specialized facilities and support to over 55 companies, enabling them to successfully bridge the gap from research to commercial application. More than 700 people work at MIP.
   - “The Forge” helps student entrepreneurs grow successful businesses. It has incubated over 60 companies; 2 of which are self-sustaining, and another 18 are either making money or have received investment or award money.
   - The McMaster Automotive Resource Centre (MARC), a state-of-the-art automotive research centre, houses the industry-scale labs, classrooms and equipment needed to develop the vehicles of the future. It is home to about 500 researchers, faculty and students and has partnerships with companies such as Chrysler, Ford, GM and ArcelorMittal Dofasco. In 2015-16, research conducted through the Canada Excellence Research Chair in Hybrid Powertrain trained 45 graduate students, 10 undergraduates and 7 postdoctoral fellows, and secured funding to enhance the research infrastructure of MARC.
   - The McMaster Manufacturing Research Institute (MMRI), one of Canada’s most advanced and best equipped research laboratories, undertakes high-profile applied research in cooperation with industrial partners, and provides education and training to graduate and undergraduate students.
   - The McMaster Fraunhofer Biomedical Engineering and Advanced Manufacturing Project Centre (BEAM), undertakes research in technologies for cell therapy and point-of-care diagnostics. It will train 18 postdoctoral fellows, 12 graduate and more than 30 undergraduate students over 5 years.
   - The Population Health Research Institute (PHRI), a collaborative initiative with Hamilton Health Sciences, is a world leader in large clinical trials and population studies, supporting advances in population health on a global scale.

2. McMaster students have access to opportunities to connect and/or work with community partners or employers to apply what they learn in the classroom in a research or work environment. The fact that in 2015, 89% of McMaster graduates were employed six months after graduation and 95% were employed after two years demonstrate their preparedness for the labour market. Successful initiatives include:

   - The Michael G. DeGroote Institute for Infectious Disease Research, a multidisciplinary team of world-class scientists is training the next generation of infectious disease researchers and clinicians.
   - “Industry Link”, a mentorship initiative of the Medical Sciences graduate program connects
McMaster University's Community Engagement Strategic Plan (2015-16), focuses on developing community-driven research, education, and service partnerships, and brings together interdisciplinary and cross-sectoral working groups on themes such as Poverty & Inclusion, and Healthy Spaces & Communities.

2. Teaching and Learning

2a. Teaching and Learning - Student Satisfaction

The metrics in this component capture McMaster University's strength in program delivery methods that expand learning options for students, and improve their learning experience and career preparedness. This may include, but is not limited to, experiential learning, online learning, entrepreneurial learning, work integrated learning, and international exchange opportunities.

<table>
<thead>
<tr>
<th>2a. Student Satisfaction:</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per the 2014 National Survey of Student Engagement (NSSE), the undergraduate student satisfaction rate (total of excellent and good responses) at McMaster University (MAC) for NSSE question “How would you evaluate your entire educational experience at this institution?” for Senior Year respondents.</td>
<td>86.2%</td>
</tr>
<tr>
<td>Per the 2014 National Survey of Student Engagement (NSSE), the undergraduate student satisfaction rate (total of definitely yes and probably yes responses) at McMaster University (MAC) for NSSE question “If you could start over again, would you go to the same institution you are now attending?” for Senior Year respondents.</td>
<td>84.9%</td>
</tr>
</tbody>
</table>

Additional Information

Additional survey tools, caveats and/or other information regarding the data reported above related to measuring student satisfaction (up to 600 words approx.).

In the 2016 Maclean’s University Rankings, McMaster ranked third in Ontario in overall reputational and in Student Satisfaction in the category of Medical Doctoral Universities.

Additional methods used to measure student satisfaction include:

- An undergraduate in-program survey, distributed in the fall of 2015;
- An undergraduate graduate survey, distributed in the Winter of 2016, to all graduating undergraduate students;
- The Canadian Graduate Professional Student Survey;
- CBIE Survey of International Students in Canada;
- The First Generation Student Services Survey; and course evaluations.

**Highlights**

Please provide highlights of McMaster University’s activity in 2015-2016 that contributed to maintaining or improving student satisfaction. This could include a strategy, initiative or program viewed by McMaster University to be an innovative practice, success story and/or key accomplishment (up to 600 words approx.).

1. The McMaster Institute for Innovation and Excellence in Teaching and Learning (now named the MacPherson Institute), which facilitates the development and use of advanced pedagogies, engages students to serve as apprentices and collaborators to improve the student experience. Collaborative programs with Faculties include:

   - MacChangers: An extracurricular activity that provides resources, coaching and support to small interdisciplinary teams of students to work collaboratively to develop innovative ideas and solutions intended to contribute to positive change locally or globally.
   - The Student Scholar Program: A program that provides students interested in pedagogical research and innovation with opportunities to contribute to the design and development of new courses, create new resources for staff/faculty and students, and collaborate with the MacPherson Institute on teaching and learning research projects.

2. McMaster is known for pioneering inquiry and problem-based approaches to learning, which have been adopted worldwide. McMaster’s Learning Portfolio (LP) program continues the University’s tradition of developing and implementing innovative pedagogy. Through the LP program, students set goals and reflect on curricular and co-curricular activities, integrating all of their experiences into a single platform. The LP has been implemented into 17 curricular and co-curricular programs, and the number of users has grown 11% since 2014-15, to 8,237.

3. McMaster is continually reviewing programming to respond to student needs and improve satisfaction. Based on student feedback, recent changes include:

   - The DeGroote School of Business offered additional elective courses during the summer term, including the first fully online course for undergraduate Commerce students.
   - The Physician Assistant Program revised its curriculum to improve professional competencies.
   - The Faculty of Engineering included co-curricular programming by fostering peer-to-peer teaching and learning. An experiential program coordinator works with students to support and integrate learning inside and outside the classroom.
   - The curriculum for “Skills for Career Success in Science” designed to help students think about post-graduate transition, was revised to support students in engaging with the scientific community.

4. McMaster strives to nurture and support students to be as healthy as possible through various programs including:
• The 2016 Maclean’s University Rankings indicate that McMaster students ranked the University first in the country in the provision of mental health services. The Arrive and Thrive program is designed to prevent the development of addictive behaviours, through a series of brief interventions among those at risk. The program helps students reduce negative coping strategies (e.g. smoking, alcohol use), while enhancing positive coping and adaptive behaviours. The project is funded by MAESD, through the Mental Health Innovation Fund.

• Dogs At Mac is a wellness program run by the Faculty of Social Sciences, which uses therapy dog assisted interventions with students, faculty and staff. The program also features a social media campaign that uses the popularity of the dogs to promote positive morale on campus.

• “Light Up the Night” and the “Last Lecture” are annual end-of-year events that recognize and celebrate the holistic ways in which students have struggled, learned, and grown over the course of the year. The events aim to set a positive tone at the end of the academic year, and have been recognized with a Canadian Events Industry Award.

2b. Teaching and Learning - Graduation Rates

<table>
<thead>
<tr>
<th>2b. Graduation Rates:</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per the KPI results reported in 2015-2016, the graduation rate at McMaster University is:</td>
<td>80.1</td>
</tr>
</tbody>
</table>

*The graduation rate shown involves the selection of all First Year, New to the Institution, Undergraduate students from the Fall 2007 enrolment file who were seeking a Bachelors or First Professional degree, for whom an FTE value of 0.4 or greater is recorded, and who also have a valid Student ID number. This subset of year one enrolments is then matched against records of students who received a Bachelors or First Professional degree from the same institution during the period 2007 – 2014 (subsequent 7 years). For students who received two or more degrees during this 7 year period, every effort was made to use the initial degree awarded (based upon the year in which the degree was awarded).

Additional Information
Additional survey tools, caveats and/or other information regarding the data reported above related to measuring student satisfaction (up to 600 words approx.).

In the 2016 Maclean’s University Rankings, McMaster University has the third highest 7-year graduation rate compared to all Ontario universities.

Additional methods used to measure the McMaster’s graduation rate in 2015-16 included the Consortium for Student Retention Data Exchange (CSRDE). The CSRDE measures the percentage of undergraduate students that graduate within four to ten years.

Highlights
Please provide highlights of McMaster University’s activity in 2015-2016 that contributed to maintaining or improving the graduation rate. This could include a strategy, initiative or program viewed by McMaster University to be an innovative practice, success story and/or key accomplishment (up to 600 words approx.)
1. McMaster provides assistance to undergraduate students who are at risk of not completing their degrees, including:

   • Academic Reboot is a one day conference that takes place each year over the summer. The program is operated by the University’s Student Success Centre, and teaches and supports upper-year students to more effectively and efficiently manage a university workload. Participants learn time management strategies, note-taking methods, strategic approaches to reading and studying, and receive support in engaging with instructors. The program is intended for students who are on academic probation or struggling academically. As a consequence of participating in this program, learners are more confident in their ability to manage their workload and in the skills and knowledge they are honing through study and class participation.
   • Career counselling is offered to students who are at risk of dropping out of the University as a preventative measure. Students have the opportunity to discuss academic and career options and receive guidance and coaching, and are equipped with tools to assist them in decision-making.

2. McMaster has introduced programming changes to help students graduate on time:

   • Changes were made to the structure of the undergraduate Commerce program to enable students pursuing a Chartered Professional Accountants designation to complete their required coursework without overloading or delaying their graduation.
   • Enrolment cap and entry requirements were removed to eliminate barriers to students interested in a Science program and allow them to enrol in their preferred program directly.

3. Support services for international students intended to improve their graduation rate include:

   • The McMaster English Language Development (MELD) diploma enables international students to improve their English Language skills prior to attending their first year at university, and enhance their academic success. Enrolment in the program has more than doubled from 36 students in 2014-15 to 75 in 2015-16. Around 95% of the 2015-16 intake successfully completed the program and will enrol in first year programs at McMaster in September 2016.
   • Additional support services provided include: student based mentorship programs; additional faculty being made available; extra support for language training; space being made available to celebrate the diversity of religious beliefs; social events for international learners; and student exchange nights.

4. McMaster introduced a “Thesis Completion Boot Camp” to help graduate students complete their Master’s and PhD theses. Participants gain insight into writing style and practice, and develop strategies to write more efficiently and effectively.

2c. Teaching and Learning - Student Retention

Using data from McMaster University (MAC)’s Institutional Consortium for Student Retention Data Exchange (CSRDE) submissions, please provide McMaster University (MAC)’s achieved results:
### Highlights

Please provide highlights of McMaster University's activity in 2015-2016 that contributed to maintaining or improving the retention rate. This could include a strategy, initiative or program viewed by McMaster University to be an innovative practice, success story and/or key accomplishment (up to 600 words approx.).

1. The 2013-14 Productivity and Innovation Fund supported the development of Level 1 foundational courses to enhance the first year student experience. McMaster has introduced new and expanded existing Level 1 foundational courses to assist new undergraduate students with the transition to university:

   - A new Level 1 course, “Business I Orientation” was introduced to provide new Business undergraduate students with information and activities to set them up for success. Students build their knowledge of academic regulations, strategies for success, and services available within the University. Additionally, students earn participation marks through engaging and participating in workshops.
   - The Level 1 foundational course, “Life, the University and a bit of Everything”, designed for Social Sciences students, expanded from 100 to 300 students in 2015-16. This course helps students successfully navigate their first year of study and move through their degree. Face-to-face class time is also used to build important university skills, such as critical and reflective thinking, study habits, time management, and conflict resolution.
   - The “Investigating Science: Opportunities and Experiences” course was made available to a larger cohort of Science students. This foundational course prepares students for transition to university by exploring a range of scientific disciplines, with an emphasis on skills development, such as critical thinking and collaboration. Students are introduced to the programs offered in level two enabling them to explore potential areas of interest. Through weekly mini research investigations, the course also ensures that students gain the skills they will need to succeed in any area of science. The course is facilitated by senior student “peer mentors” who develop effective communication and leadership skills for credit in “Peer Mentoring in Science”.

2. The University has implemented mentoring programs that connect senior students with first-year mentees to foster strong peer relationships and improve student engagement, success and retention. Mentors receive training in effective communication, cultural sensitivity, and mental health awareness. The “Art of Leadership: Mentorship Program” enables upper-year Humanities students to make a positive impact on the experience of fellow students new to the University. Mentors have the option of mentoring first year Humanities students or international students whose first language is not English. Mentors also engage in an in-class component where they study the foundations of leadership and cultivate an interest in the mentoring process.

3. McMaster offers orientation sessions to incoming students to prepare them with the skills and knowledge they will require to meet academic expectations.
• The Summer Orientation for Academic Readiness (SOAR) program is a four-week online program operated by the Student Success Centre. It includes blog posts from instructors and students, videos and fact sheets on academic skills, and activities for students to test their knowledge.

• The Outdoor Orientation Student Experience is a four-day camping and canoe trip in northern Ontario specific to exchange students and incoming first year students. In both cases, students have the opportunity to engage in outdoor activities, as well as learn from upper year student leaders on how to succeed academically and personally at university.

4. An early identification and intervention system for at risk Level I students, has been implemented for students in Engineering programs. The intervention is overseen by academic advisors and peer tutors. Overall, these initiatives have resulted in a significant reduction in the Level 1 to Level 2 attrition rates. Specifically, attrition rates have reduced from 25% for the 2008 cohort to under 10% for the 2014 cohort.

2d. Teaching and Learning-Work-Integrated Learning*
As part of the Ontario government’s postsecondary education transformation agenda, the government is interested in expanding work-integrated learning (including co-operative education) to make future Ontario students more career and job ready. Co-ops, internships, work placements and other types of work-integrated, experiential or entrepreneurial learning are already available in colleges and universities, often in partnership with industry.

*DEFINITIONS:

Work-Integrated Learning (WIL) is the process where students learn from experiences in educational and practice settings and integrate those experiences for effective professional practice and employment (adapted from HEQCO, 2012).

A Co-operative Education Program is defined as one that formally integrates a student’s academic studies with work experience. Usually, the student alternates periods of study with experience in career-related fields according to the following criteria (adapted from Canadian Association for Co-Operative Education, http://www.cafce.ca/coop-defined.html, 2012):

• Each work situation is approved by the co-operative education institution as a suitable learning situation;
• The co-operative education student is engaged in productive work rather than merely observing;
• The co-operative education student receives remuneration for the work performed;
• The co-operative education student’s progress on the job is monitored by the cooperative education institution;
• The co-operative education student’s performance on the job is supervised and evaluated by the student’s employer;
• The time spent in periods of work experience must be at least 30 per cent of the time spent in academic study

Based on the definitions provided above, please provide WIL data for the McMaster University (MAC) in 2015-2016:
Co-operative Education Program Type | Number of programs at the McMaster University (MAC) with a Co-op Stream | Number of students at the McMaster University (MAC) enrolled in a Co-op program
--- | --- | ---
Undergraduate | 53 | 3831
Graduate | 1 | 344

### Highlights

Please provide highlights of McMaster University’s activity in 2015-2016 that contributed to providing WIL opportunities for students. Along with co-op, other examples may include internships, mandatory professional practice, field experience, service learning, applied research projects, innovation incubators and other WIL opportunities. This could include a strategy, initiative or program viewed by McMaster University to be an innovative practice, success story and/or key accomplishment (up to 600 words approx.).

1. Students at McMaster are offered academic programs that engage them in transformative experiential learning experiences and work-integrated learning. For example:

   - In 2015-16, the University added three new Science co-op programs: Environmental Sciences, Earth and Environmental Sciences; and Geography and Environmental Sciences. This increased the Faculty of Sciences total number of programs with a co-operative education option to 14. For each job search cycle, at least 90% of engaged students secure a co-op job.
   - The Master’s program in Biomedical Discovery and Commercialization (BDC) requires a Team Project, an internship in a related field, and culminates in a scholarly paper that demands a rigorous synthesis of the student’s experiential and in-course learning.
   - The Master of Science in Global Health culminates in a symposium where students present and receive critical feedback from policy makers, activists and expert researchers on their research, and a 4-6 week practicum.
   - The new Master of Public Health program offers two community-based practica.
   - The DeGroote School of Business Commerce Internship program is the largest undergraduate business internship program in Ontario, providing students with 12-16 months of WIL. In 2015-16, 119 students secured an internship following their third year of study, an increase over 2014-15, in which 104 students secured a work placement opportunity.
   - Over 2015-16, McMaster’s MBA co-op program expanded its placement opportunities: students in the program had a WIL placement rate of 91%, resulting in 347 co-op work terms.

2. McMaster is committed to providing students with opportunities to engage with a community partner or employer and develop the skills needed to build successful careers:

   - Change Camp Hamilton, led by McMaster’s Office of Community Engagement, is a partnership with the City of Hamilton, Mohawk College, Redeemer University College, and the Social Planning & Research Council of Hamilton. The program connects students, residents, and community organizations to identify actions that support community and city-building. Students are given an opportunity to foster social and economic development, while also building networks and relationships that will keep them in the region after graduation. Over 200 participants were involved in developing 234 action recommendations aligned with the City of Hamilton’s new strategic plan.
• “The Forge” supports student startups at McMaster and runs on-campus programming (workshops, events, competitions) to support student entrepreneurs under the umbrella of “Forge@Mac”.

• MacServe Day of Learning and MacServe Reading Week are two programs that connect students with local, regional and provincial agencies to complete volunteer service and support social development in the host communities. In 2015-16, over 240 students connected with agencies in Hamilton, Montreal, Ottawa, Vancouver, New Orleans (USA), and La Romana (Dominican Republic).

• “Career Field Experience” is an annual externship program offered during the University’s Fall and Winter reading weeks. Through placements that range between 3 and 5 days, the program allows participants to establish or build upon career goals, explore industries, gain practical work-related experience, and apply knowledge in a career field of interest. Follow-up sessions are held at the completion of the program, to help participants leverage their experience as they explore post-university opportunities. Additionally, each student receives a CFE certificate of completion, personalized and customized by the placement.

• Social Sciences students are engaged with employers and community partners in a variety of ways including job shadowing, academic placements, and in undertaking courses which require that 80 hours must be spent working in the community.

2e. Teaching and Learning - E-Learning
As part of the Ontario government’s postsecondary education transformation agenda, the government is interested in expanding online learning and technology enabled learning opportunities for students in Ontario. McMaster University is asked to provide information on e-learning courses, programs and registrations in 2015-2016.

Through the development of metrics under the SMAs, the ministry will be developing long-term indicators and updated definitions for online and technology-enabled learning in consultation with the sector. Indicators developed are intended for use in future SMA Report Backs.

In future years, the ministry anticipates collecting more comprehensive data that will profile a broader range of online and technology-enabled learning indicators to ensure students have access to high-quality flexible learning opportunities across the system.

eCampusOntario will be leading the development of eLearning indicators in collaboration with the sector.

Fully Online Learning* and Synchronous Conferencing*

*DEFINITIONS:

Courses:

A Fully Online Learning (asynchronous) course is a form of distance learning delivered to individuals with access to the Internet, either at home, work or through an access centre. Although courses may have a set start date and set due dates for assignments, students can otherwise access and participate in courses at times and places of their own choosing. The online component is typically over 80% of the total delivery. For example, a fully online course may include occasional face-to-face meetings, a proctored exam, etc. with the remainder of the content delivered online.
A **Synchronous Conferencing course** is delivered through audio and video conferencing to provide synchronous communications (i.e., at the same time) between an instructor at one site and students at other sites. Conferencing can make use of the public telephone system (ISDN), dedicated wideband networks or the Internet. A course is considered to be offered via synchronous conferencing if 80% or more of the content is delivered this way. For example, a synchronous conferencing course may have occasional face-to-face meetings, a proctored exam, etc. with the remainder of the content delivered through audio and video conferencing.

**Programs:**

A **Fully Online Learning (asynchronous) program** describes a program that offers 80% or more of its courses fully online. For example, if a program consists of 10 courses (8 delivered fully online and 2 delivered via traditional face-to-face) the program is defined as a fully online program.

A **Synchronous Conferencing program** describes a program that offers 80% or more of its courses via synchronous conferencing. For example, if a program consists of 10 courses (8 via synchronous conferencing and 2 via traditional face-to-face) the program is defined as a synchronous conferencing program.

**e-Learning Course, Program and Registration Data Based on the definitions provided above, provide the McMaster University’s eLearning data for 2015-2016:**

<table>
<thead>
<tr>
<th>Course Data</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of ministry-funded, for-credit courses offered through fully online learning</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>Number of ministry-funded, for-credit courses offered through synchronous conferencing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Number of ministry-funded, for-credit courses offered in e-Learning format</td>
<td>8</td>
<td>25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Program Data</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of ministry-funded, for-credit programs offered through fully online learning</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Number of ministry-funded, for-credit programs offered through synchronous conferencing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Number of ministry-funded, for-credit programs offered in e-Learning format</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Registrations</th>
<th>Undergraduate</th>
<th>Graduate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registrations in ministry-funded, for-credit courses offered through fully online learning</td>
<td>3331</td>
<td>575</td>
</tr>
<tr>
<td>Registrations in ministry-funded, for-credit courses offered through synchronous conferencing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Number of Registrations in ministry-funded, for-credit courses offered in e-Learning format</td>
<td>3331</td>
<td>575</td>
</tr>
</tbody>
</table>
Additional Information

Additional survey tools, caveats and/or other information regarding the data reported above re: e-Learning Course, Program and Registration Data (up to 600 words approx.).

The above eLearning information represents eLearning course and program information as reported in the University’s 2015-16 undergraduate and graduate course calendars.

Highlights

Please provide highlights of McMaster University’s activity in 2015-2016 that captures the strength in program delivery methods that expand e-learning options for students, and improve the student’s e-learning experience and career preparedness. This could include a strategy, initiative or program viewed by McMaster University to be an innovative practice, success story and/or key accomplishment (up to 600 words approx.)

1. McMaster University is developing new programs that incorporate creative e-learning formats for students:
   • The new Master in Child Life and Pediatric Psychosocial Care graduate program is delivered using a creative web-based online learning format, complemented by two residency periods. This mode of delivery is unique in child life education. The blended delivery model broadens the reach of this type of education, and also provides flexibility for working professionals.
   • The Master of Science in Global Health program is delivered through a network of five universities in four continents, and with experts from health sciences, social sciences and business, using digital technology. The program’s unique delivery combines face-to-face classroom experiences, online collaboration in virtual teams, and student exchanges to Maastricht University in the winter term. Using WebEx, Google+ Hangouts and Avenue to Learn, live lectures are delivered to students in the classroom at McMaster while broadcasting to over 200 students in Maastricht University and Manipal University.

2. McMaster’s Bachelor of Technology program will place its Information and Communication Technology (ICT) degree program completely online in both lecture and lab contexts. This innovative high quality collaboration will make the program a leader in delivering blended learning at McMaster.

3. McMaster uses e-learning formats to help students prepare to be successful in career endeavours after graduation:
   • InterviewStream is an online tool that provides students with an opportunity to prepare and practice their interviewing skills well in advance of meeting the interviewer. Students have the option to self-access or request a career advisor’s expert review of their performance. The online platform allows for the development of customized interview questions that can be used for professional school, volunteering and job search interview practice. This is a very popular tool for students.
   • Job Search Essentials is an online course offered exclusively for alumni up to 10 years after graduation. The program runs for 30 days and consists of 3 modules. A different aspect of job search is discussed in each module, and includes an assignment which participants
receive feedback on from the instructor.

- Skills and Experience eDevelopment (SEED) program engages students in skills building and career exploration in a virtual platform by combining self-directed practicums and Student Success Centre career programming. Students work with industry partners to learn how their skills apply in the workforce. This pilot attracted 25 students and 30 employer partners from the creative, green, health care and social services industries. As part of the program, students participate in an online learning portfolio to complete tasks, reflect and record their experience.

Hybrid Learning*

A Hybrid Learning course is a course where face-to-face teaching time is reduced, but not eliminated, to allow students more time for online study. This model comes in a number of formats, however the online component is typically 50-80% of the total course delivery. In this case, a hybrid learning course may have components delivered via traditional face-to-face; however, over 50% of the course delivery should be online.

A Hybrid Learning program is one in which 80% or more of its courses are hybrid learning courses.

Hybrid Learning Highlights

Please highlight one example of McMaster University’s use of Hybrid Learning courses and/or programs.(up to 600 words approx.).

1. McMaster has redesigned high-enrolment courses to include blended formats and incorporate technology-enabled learning:

   - Introduction to Macroeconomics is a traditional high-enrolment service course in the Faculty of Social Sciences with an enrolment level of about 2,500 students per term. In 2015-16, its delivery method was changed to a hybrid model. The course is broken into several broad content modules. Students come to class for one hour per week. The rest of the content is accessed online or by reading the text book. Students use a “weekly schedule” to keep them on task as they read the text book, watch instructor videos, attend the weekly face-to-face session, and complete online homework.
   
   - The first year foundations course, “Life, the University, and a Bit of Everything”, uses a blended learning model that includes one-hour online modules and 2-hour small group tutorials per week. In 2015-16, the course was modified in response to student feedback and research results and reached a capacity of 300 students. The University is hoping to further increase capacity in 2017-18.
   
   - An “Introduction to Health Management” course was incorporated into the University’s Master of Business Administration (MBA) program to provide students with a hybrid learning opportunity. This course has eight in-class sessions and five on-line classes. The in-class sessions include a combination of lectures, guest speakers and group discussions, whereas the on-line portion of the course is largely self-directed.
   
   - Five high enrolment level 1 Science courses in Biology, Chemistry, Physics, Psychology and Environmental Science, are being delivered in a blended format. Using a blended model in core level 1 courses provides students with a much firmer understanding in these important base areas.

2. McMaster is re-designing existing programs to incorporate hybrid learning models. For example,
the Software Engineering Technology (SET) degree completion program is being moved to an online delivery format. In 2015-16, SET offered four synchronous conferencing hybrid courses: Entrepreneurship (over 80% delivered online), Creativity and Decision Making (100% delivered online), Sustainability and Ethics (over 90% delivered online), and Management Principles (over 80% delivered online).

3. McMaster recognizes that hybrid learning models can provide students with more flexibility and enhanced learning environments by enabling the use of innovative new pedagogical approaches. To help support students, the University is actively developing new programs that incorporate blended learning models:

- The new Master in Public Health program includes an elective course on Behavioural Change. The teaching model involves students meeting every three weeks. Between meetings, students communicate through online discussion boards. The first course, offered in spring 2016, received positive reviews and is being offered again in 2016-17.

- “Electronic Devices and Circuits”, a traditionally challenging course in the Faculty of Engineering’s Department of Electrical and Computer Engineering, revised its teaching format to include a greater component of hybrid learning. The core instructional content of these courses was moved online, and face-to-face class time is now devoted to applications and problem solving. This change in the learning model resulted in a dramatic increase in student satisfaction.

- The “LearningSpace” in the Faculty of Health Sciences Centre for Simulation Based Learning (CSBL) allows Faculty programs to digitally record standardized patient encounters. This innovative initiative allows instructors and students to annotate, evaluate, record, and analyze encounters. Sessions can be recorded and reviewed after the simulation-based interaction is completed.

3. Student Population
This component highlights McMaster University’s contributions to improve access and success for underrepresented groups (Aboriginal, first generation, students with disabilities and French-language students).

<table>
<thead>
<tr>
<th>Full-Time Students</th>
<th># of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>The total Full-Time Headcount Enrolment* at McMaster University (MAC) in 2015-2016:</td>
<td>28,413</td>
</tr>
</tbody>
</table>

*DEFINITION: *Headcount is the actual enrolment for Fall 2015 as of November 1, 2015 including full-time undergraduate and graduate students eligible for funding as reported to the ministry for the 2015-2016 fiscal year (enrolment reported in 2015-2016 remains subject to audit and/or correction).


*Please do not include International Students in the calculations below.
Students with Disabilities

*DEFINITION:  Students with disabilities is the total number of students with disabilities (excluding apprentices) registered with the Office for Students with Disabilities and reported in Table 1 of the McMaster University (MAC)'s annual report to the ministry for the Accessibility Fund for Students with Disabilities (AFSD).

<table>
<thead>
<tr>
<th>Students with Disabilities</th>
<th># of Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>The total number of Full-Time Students with Disabilities at McMaster University who registered with the Office for Students with Disabilities and received support services in 2015-2016:</td>
<td>1008</td>
<td></td>
</tr>
<tr>
<td>The total indicated above as a comparative % of the McMaster University's 2015-2016 Full-Time Enrolment Headcount:</td>
<td></td>
<td>3.55%</td>
</tr>
</tbody>
</table>

Highlights
Please provide highlights of McMaster University (MAC)'s activity in 2015-2016 that capture contributions to improve access, and success for students with disabilities (up to 600 words approx.).

1. McMaster is committed to ensuring that each student is afforded an academic environment that is dedicated to the advancement of learning and is based on the principles of equitable access and individual dignity. For students with disabilities, McMaster provides a number of accommodations, which includes but is not limited to, a new student transition program, academic supports (including assistance with completing tests and exams, notetaking services, support with assistive technologies, support with learning strategies), the provision of bursary funds for disability and educational needs, and library support services (e.g. provision of textbooks in alternate format, support with sign language and video captioning need etc). All of McMaster’s Faculties work closely with the University’s Student Accessibility Services office to ensure that all students requiring accommodation are identified and appropriate strategies are put in place.

2. “Shifting Gears” is McMaster’s transition program for students with disabilities that provides workshops and orientation sessions over the summer to assist incoming students with their transitional needs. A developmental component of the program, directed at personal and academic growth, provides for weekly drop-in sessions to address questions and individual needs. The program includes a mentoring initiative that matches students with disabilities to upper year volunteer mentors, and monthly activities designed to encourage fellowship and social integration. Academic accommodation planning is also provided.

3. The University has partnered with regional associations to support students with disabilities with their career transitions post-university. For example, Accessible Career Transition (ACT) is a partnership between McMaster’s Student Accessibility Services, the Student Success Centre and LIME Connect that supports career transitions for Students with Disabilities. LIME is a not-for-profit recruitment organization that works with employers to recruit post-secondary students/alumni with disabilities. In 2015-16, events included: on-campus workshops campus, which provided advice to student job seekers, and various recruitment events for students and alumni with disabilities that included a number of employer partners looking to hire students with disabilities.
First Generation Students

*DEFINITION: First Generation is a student whose parent(s)/guardian(s) has/have not attended a postsecondary institution. If a sibling of the student has attended a postsecondary institution, but the parent(s)/guardian(s) have not, the student is still considered a First Generation student.

- Parents/guardians: one or more adults, over the age of 21, who are legally responsible for the care and management of the affairs of the student.
- Postsecondary Attendance: have attended (but have not necessarily obtained a credential from) any institution of higher education in Ontario or elsewhere including outside Canada after high school (includes programs that lead to a postsecondary credential. e.g., degree, diploma, certificate).

<table>
<thead>
<tr>
<th>First Generation Students</th>
<th># of Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>The total number of Full-Time First Generation Students enrolled at McMaster University in 2015-2016:</td>
<td>5222</td>
<td></td>
</tr>
<tr>
<td>The total indicated above as a comparative % of the McMaster University’s 2015-2016 Full-Time Enrolment Headcount:</td>
<td>18.38</td>
<td></td>
</tr>
<tr>
<td>The total number of Part-Time First Generation Students enrolled at McMaster University in 2015-2016:</td>
<td>301</td>
<td></td>
</tr>
</tbody>
</table>

Highlights
Please provide highlights of McMaster University (MAC)’s activity in 2015-2016 that capture contributions to improve access, and success for first generation students (up to 600 words approx.).

1. McMaster provides a number of supports and services to first generation students over the course of the academic year. This includes, but is not limited to, transitioning programs, peer and mentoring support programs, academic workshops, and life skills sessions. The programs and services focus on the success of the “whole” student. In addition, social activities are organized to allow students to share their experiences with fellow students and interact and ask questions of upper-year peers.

2. In addition, University staff and student leaders work together to offer first generation learners a series of workshops and social activities that address and support their academic, personal, and professional growth and needs. This “road map” of workshops and social events connects First Generation students with one another, as well as non-first generation students, and helps to ensure that first generation learners are exposed to the full range of student services offered at the University.

3. The University has partnered with community organizations to provide joint services that assist first generation students. For example, the Social Sciences Dog Visiting Program, in partnership with the Hamilton-Burlington SPCA, brings certified therapy dogs to campus as a way of helping first year Social Sciences students – particularly those who are first generation students – with their transition into university. The goal is to help students feel more socially connected and act as a “de-stressor” during stressful times of the academic year. This program is being evaluated to assess the benefits in relation to students’ successful transition, social connections, and retention.
**Indigenous Learners**

* DEFINITION: Indigenous is a collective name for the original people of North America and their descendants. The Canadian Constitution, Constitution Act 1982, recognizes three groups of Indigenous peoples - First Nations, Métis and Inuit. These are three separate peoples with unique heritages, languages, cultural practices and spiritual beliefs.

<table>
<thead>
<tr>
<th>Indigenous Learners</th>
<th># of Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>The total number of Full-Time Indigenous Learners enrolled at McMaster University in 2015-2016:</td>
<td>487</td>
<td></td>
</tr>
<tr>
<td>The total indicated above as a comparative % of the McMaster University (MAC)’s 2015-2016 Enrolment Headcount:</td>
<td></td>
<td>1.71%</td>
</tr>
<tr>
<td>The total number of Part-Time Indigenous Learners enrolled at McMaster University in 2015-2016:</td>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>

**Highlights**

Please provide highlights of McMaster University (MAC)’s activity in 2015-2016 that capture contributions to improve access, and success for Indigenous Learners (up to 600 words approx.).

1. McMaster is invested in supporting Indigenous learners and strengthening Indigenous scholarship:
   - McMaster has a strong partnership with Six Nations Polytechnic (SNP) and is a member of a six university consortium that works in co-operation with SNP to assist students seeking university degrees to transition to university. Students enrolled in SNP’s first year Native University Program are eligible to receive a total of five credits; credits achieved with a minimum grade of 60% are transferable into undergraduate degree programs offered at the consortium universities.
   - The University has developed new Honours programs in Indigenous Studies. 2015-16 was the first year for the new Honours Indigenous Studies and Combined Honours Indigenous Studies Bachelor of Arts programs. Designed for both Indigenous and non-Indigenous students, these programs allow students to explore the intellectual traditions of many Indigenous peoples, with an emphasis on the Haudenosaunee and Anishinaabe of southern Ontario. Through these programs, students increase their understanding, awareness, and respect for Indigenous knowledge, spirituality, and social/political experience. Students also engage with innovative approaches to learning and scholarship through experiential educational opportunities as a means to develop the professional skills needed to work with Indigenous communities. As of Fall 2016, the program will be housed in a dedicated new space, including a ceremonial meeting room and dedicated outdoor garden, in L.R.Wilson Hall.

2. McMaster works towards improving access and the success of Indigenous learners through a number of programs and initiatives including:
   - An Elders in Residence program provides access to traditional knowledge keepers in a number of areas such as foods, medicines, ceremonial practices, languages, and artistic
endeavours. Elders from the region provide a supportive and empathetic avenue for one-on-one interactions with students. Additionally, Elders are engaged in a number of course offerings for their particular expertise and wisdom, and provide extra-curricular programming, workshops and demonstrations to engage students.

- Academic skills and career preparation workshops are offered through the Office of Indigenous Student Services (ISS). These workshops focus on study skills such as research techniques, numeracy and academic writing; career preparation, including interview skills, resume building, and networking; and traditional knowledge (i.e. traditional survival skills camp, food preparation, and arts).
- Community building and social activities take place throughout the year and include cultural gatherings, round dances, and a graduation celebration dinner to recognize Indigenous graduates from across all Faculties.
- The ISS provides Indigenous learners from all Faculties with access to a full-time academic counsellor, and nutritional support.
- A peer mentoring program for Indigenous learners, “Yonkwahahivos”, which includes a series of events with Indigenous Community Leaders and invited guests, educates and promotes a deeper understanding of Indigenous knowledge and beliefs.

3. The Indigenous Learners Health Sciences (ASHS) office delivers a two-day Medical School Entrance Interview (MSEI) workshop developed by the Indigenous Physicians Association of Canada (IPAC), to increase the positive performance of Indigenous candidates during the medical school interview. A highly beneficial program, it has been presented in collaboration with IPAC at the 2014 Pacific Region Indigenous Doctors Congress and the 2014 Canadian Conference on Medical Education.

### French-Language Students

* DEFINITION: A student is considered a French-language student if he or she meets at least one of the following criteria:

1) His/her mother tongue is, or includes French (the student is a francophone);
2) His/her language of correspondence with the institution is French;
3) He/she was previously enrolled in a French-language education institution; or
4) He/she was enrolled in a postsecondary program delivered at least partially in French.

<table>
<thead>
<tr>
<th>French-Language Students</th>
<th># of Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>The total number of Full-Time French-Language Students enrolled at McMaster University in 2015-2016:</td>
<td>192</td>
<td></td>
</tr>
<tr>
<td>The total indicated above as a comparative % of the McMaster University's 2015-2016 Enrolment Headcount:</td>
<td></td>
<td>0.68%</td>
</tr>
<tr>
<td>The total number of Part-Time French-Language Students enrolled at McMaster University in 2015-2016:</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

### Highlights

Please provide highlights of McMaster University (MAC)’s activity in 2015-2016 that capture contributions to improve access, and success for French-language students (up to 600 words approx.).
In 2015-16, McMaster began a three-year partnership with the Association of Faculties of Medicine of Canada to launch an initiative called “Franco Doc”. Franco Doc identifies and mobilizes Francophone and Francophile students, prepares and equips them for experiential activities in the community, and recruits them for placements in official language minority communities (OLMC) so they may provide safe health services in French. Francophone students currently enrolled in the Medical Doctorate Program were identified and engaged in community building, with about 80 students having self-identified as Francophone or Francophile. The goal is to identify advisors and mentors with whom students can discuss, in French, such things as their medical education, terminology, the cultural aspects of patient care, and career plans.

**Additional Information**

Additional survey tools, caveats and/or other information regarding the data reported above related to measuring student satisfaction (up to 600 words approx.).

Note that the November 1, 2015, full-time enrolment figure (i.e. 28,413) used for McMaster University in Section 3, Student Population, is not current. The University’s true November 1st full-time enrolment was 28,410. As a result, the proportions shown for the under-represented student groups in Section 3 are not accurate.

**3b. Student Population - International Students**

**International Students**

**DEFINITION:** International enrolment is the headcount of full-time university (undergraduate and graduate) students who are not Canadian citizens (includes Inuit, North American Indian and Metis) or permanent residents (i.e., student visa, other visa, non-Canadian status unknown, or non-Canadian no visa status) on November 1, 2015, who are taking part in university courses or programs normally leading to a post-secondary qualification (does not include ESL, continuing education, general interest or non-credit courses).

<table>
<thead>
<tr>
<th>International Students</th>
<th># of Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>McMaster University reported to the ministry Full-time International Enrolment* in 2015-2016:</td>
<td>2529</td>
<td></td>
</tr>
<tr>
<td>The total indicated above as a comparative % of the McMaster University's 2015-2016 Full-Time Enrolment Headcount:</td>
<td></td>
<td>8.90%</td>
</tr>
<tr>
<td>McMaster University’s 2015-2016 Part-time International Enrolment</td>
<td>53</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Information**

Describe the methodology, survey tools, caveats and other information regarding the numbers reported above (up to 600 words approx.).

As defined by MEASD, the number of international students represents full-time headcount.
enrolment as of November 1, 2015, who took part in university courses or programs normally leading to a post-secondary qualification (i.e. does not include ESL, continuing education, general interest or non-credit courses). Please note that the number provided for McMaster University (i.e. 2529) over includes international students in courses and programs that do not lead to a post-secondary qualification. McMaster University’s true full-time international enrolment figure is 2409.

In a 2015 survey, 84% of international student respondents indicated that their program met or was significantly above their expectations. More than 91% of the respondents indicated that they may or definitely would recommend their program to others with similar interests.

**Highlights**

Please provide highlights of McMaster University’s activity in 2015-2016 that contributed to maintaining or improving the international student experience at McMaster University. This could include a strategy, initiative or program viewed by McMaster University to be an innovative practice, success story and/or key accomplishment (up to 600 words approx.).

1. In an effort to improve the success of the University’s international learners, McMaster offers a number of targeted support services to international learners:

   - “Academic Boot Camp” for international students is run through the University’s Student Success Centre (SSC) and provides information sessions for the University’s international learners on topics related to academic skills, leadership development, and employment preparation. These sessions are intended to help international students improve their study skills and habits, and also balance their academic and co-curricular commitments.
   - Each year, the SSC provides a three-day Employment Boot Camp for international students. Participants learn how to write resumes, conduct job searches, network, write cover letters, explore the legalities of working in Canada, and receive feedback from employers in simulated job interviews.
   - The Get Ready! Get Hired Program is a one-day program offering held twice a year to coincide with the timing of job fairs to help prepare international students for these events and employment opportunities. The program covers resume and cover letter writing, interview preparation, networking, job searching in Canada and the legalities of working in Canada. Around 70 international students participated in this program in 2015-16.
   - Each year, McMaster’s School of Graduate Studies (SGS) holds an international graduate student fair. The fair was developed by the University’s International Graduate Student Advisory Group, to help international graduate students adapt to their new environment and includes information about housing, cell phones, grocery shopping, ethnic food options in Hamilton, banking, transportation and campus services. Also, each year, SGS provides International Excellence Awards, valued at $5,000 per recipient, and recognizes academic excellence among the University’s international graduate learners.

2. In 2015-16, the University re-designed the orientation program for MBA students based on feedback from the program’s international students. Students now engage in two days of sessions focused on adjusting to life in Canada and team building. In addition, the program hosts an excursion to Niagara Falls and concludes with two days of workshops on Professional Communication. The BizX Mentorship Program supports international undergraduate students by matching them with McMaster students to provide mentorship and support in experiencing life in Canada and at McMaster.
3. In 2015, the Master of Science in Global Health, a joint offering with Maastricht University in the Netherlands, received the Canadian Bureau for International Education (CBIE) Panorama Award for Outstanding International Education Program in the Academic category. Since this program launched in 2010, enrolment has tripled and over 600 students working virtually in transcontinental teams have been prepared for careers in a globalized world.

4. In June 2016, McMaster published a new strategy document entitled “The McMaster Model for Global Engagement”, which outlines the University’s vision for developing international research and education activities that foster cooperation, engaging in education and knowledge generation for the benefit of society, and enabling global citizenship.

3c. Student Population - Proportion of an institution’s enrolment that receives OSAP*

* DEFINITION: Receives OSAP is the number of OSAP awards, including any student at McMaster University who has applied for full-time OSAP assistance and qualified for assistance from any federal or Ontario OSAP loan or grant program, and any student who applied using the stand-alone 30% Off Ontario Tuition grant application and was issued a 30% Off Ontario Tuition grant.

<table>
<thead>
<tr>
<th>Proportion of an institution’s enrolment that receives OSAP</th>
<th># of Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>McMaster University’s 2015-2016 proportion of an institution’s enrolment that receives OSAP is</td>
<td>13,817</td>
<td>54.92%</td>
</tr>
<tr>
<td>November 1, 2015, total full-time eligible headcount enrolment (undergraduate and graduate)</td>
<td>25158</td>
<td></td>
</tr>
</tbody>
</table>

Additional Information
Describe the methodology, survey tools, caveats and other information regarding the information reported above (up to 600 words approx.).

The information for this section was provided by the Ministry of Advanced, Education and Skills Development.

4. Research and Graduate Education
McMaster University’s 2014-15 to 2016-2017 Strategic Mandate Agreement (SMA) includes information which identifies the breadth and depth of institutional research activity. The 2015-2016 SMA Report Back does not require McMaster University to report on the system wide research and graduate education metrics included in its 2014-15 to 2016-2017 SMA.

5. Program Offerings
This component articulates the breadth of programming based on enrolment, along with program areas of institutional strength/specialization as outlined in McMaster University’s SMA.

- Concentration of enrolment* at universities by program specialty or major (SPEMAJ)
- Institution’s share of system enrolment by program specialty or major (SPEMAJ).
DEFINITION: Headcount is the actual funding eligible enrolment for Fall 2015 as of November 1, 2015 including full-time undergraduate and graduate students as reported to the ministry for the 2015-2016 fiscal year.

<table>
<thead>
<tr>
<th>Undergraduate / Graduate Students</th>
<th>Percentage of System Enrolment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>6.75</td>
</tr>
<tr>
<td>Graduate</td>
<td>6.38</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SPEMAJ</th>
<th># of undergraduate students in a program as a % of total # of undergraduate students across all programs at McMaster University (MAC)</th>
<th># of graduate students in a program as a % of total # of graduate students across all programs at McMaster University (MAC)</th>
<th>McMaster University (MAC)'s share of system-wide undergraduate enrolment in each PROGRAM</th>
<th>McMaster University (MAC)'s share of system-wide graduate enrolment in each PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Architecture &amp; Landscape Arch.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4. Computer Science</td>
<td>1</td>
<td>0.25</td>
<td>2.71</td>
<td>1.03</td>
</tr>
<tr>
<td>5. Dentistry</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6. Education</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7. Engineering</td>
<td>18.21</td>
<td>12.66</td>
<td>13.51</td>
<td>7.96</td>
</tr>
<tr>
<td>8. Fine &amp; Applied Arts</td>
<td>1.13</td>
<td>0</td>
<td>1.96</td>
<td>0</td>
</tr>
<tr>
<td>9. Food Science &amp; Nutrition</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10. Forestry</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12. Humanities</td>
<td>6.46</td>
<td>9.35</td>
<td>5</td>
<td>6.54</td>
</tr>
<tr>
<td>13. Journalism</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14. Kinesiology/Recreation/Phys-Ed</td>
<td>3.62</td>
<td>1.55</td>
<td>5.7</td>
<td>4.53</td>
</tr>
<tr>
<td>15. Law</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16. Mathematics</td>
<td>1.63</td>
<td>2.7</td>
<td>7.59</td>
<td>9.84</td>
</tr>
<tr>
<td>17. Medicine</td>
<td>2.73</td>
<td>0.37</td>
<td>13.9</td>
<td>100</td>
</tr>
<tr>
<td>18. Nursing</td>
<td>8.57</td>
<td>2.04</td>
<td>15.69</td>
<td>6.15</td>
</tr>
<tr>
<td>19. Optometry</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20. Other Arts &amp; Science</td>
<td>9.29</td>
<td>0.41</td>
<td>6.78</td>
<td>3.37</td>
</tr>
<tr>
<td>21. Other Education</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>22. Pharmacy</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>23. Physical Sciences</td>
<td>1.63</td>
<td>3.92</td>
<td>6.42</td>
<td>6.46</td>
</tr>
<tr>
<td>24. Social Sciences</td>
<td>13.21</td>
<td>13.73</td>
<td>4.15</td>
<td>3.63</td>
</tr>
<tr>
<td>25. Theology</td>
<td>0.18</td>
<td>0</td>
<td>10.05</td>
<td>0</td>
</tr>
<tr>
<td>26. Therapy &amp; Rehabilitation</td>
<td>0</td>
<td>12.38</td>
<td>0</td>
<td>16.82</td>
</tr>
<tr>
<td>27. Veterinary Medicine</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Notes: Other Arts & Science includes students enrolled in General Arts and Science majors not specified by other categories or unspecified.

Optional Additional Information
Caveats and/or other information regarding the numbers reported above (up to 600 words approx.).

As published in 2016 Maclean’s University Rankings, McMaster ranks second amongst universities in Canada for size of total research dollars from sponsored research by full-time faculty. In Social Sciences and Humanities, McMaster ranks first in Ontario for the average size of grants per full-time faculty member and third in the number of grants per 100 full-time faculty members.

A report on McMaster’s Strategic Goals and Priorities, which includes further information on programming and the student experience, as well as McMaster’s research and graduate education, can be found at this url:


Highlights
Please provide highlights of McMaster University’s activity in 2015-2016 that contributed to maintaining or improving programming. This could include a strategy, initiative or program viewed by McMaster University to be an innovative practice, success story and/or key accomplishment (up to 600 words approx.).

1. McMaster has developed new academic programs that align with program areas of growth identified in the Strategic Mandate Agreement, 2014-2017 (SMA). Since 2014, McMaster has received Ministry approval for all its new program submissions, with 4 undergraduate and 10 graduate programs approved under the expedited review process. Examples include:

   - Honours Bachelor of Health Sciences and Master’s in Biomedical Discovery and Commercialization (BDC): With its multidisciplinary composition, the program falls under three program areas for growth (Health Sciences and the broad determinants of health, Business and Economics, Science and Engineering). The program encompasses level III and IV of undergraduate studies, as well as a twelve month course-based Master-level program. BDC graduates will have a unique combination of skills and knowledge, for employment in the biotechnology, pharmaceutical and other biomedical science sectors of the economy.

   - Honours Bachelor of Applied Science in Human Behaviour: Approved under the Fostering Robust Societies program area for growth, this program is a partnership between McMaster University and Mohawk College of Applied Arts and Technology. Graduates receive an Honours Bachelor of Applied Science degree in Human Behaviour. Students in one of two specialization streams can earn either an Ontario College Graduate Certificate (in Autism & Behavioural Science) or an Ontario College Diploma (in Early Childhood Education) from Mohawk College. Normally, it would take six years to complete both designations; however, this new program enables students to obtain both in only four years.

   - PhD in Labour Studies, the first of its kind in Canada, will support students in developing leadership and high level skills in community engaged research and critical theory, to enable graduates to engage constructively in public policy debate. It was approved by the Ministry under McMaster’s Business and Economics program area for growth.
• The Master of Science in Child Life and Pediatric Psychosocial Care, the first program of its kind in Canada, is a professional and practice-focused graduate degree. Students learn about pediatric psychosocial assessment and interventions, examine ethical issues, apply theoretical knowledge and patient and family-centred care principles to diverse pediatric clinical settings.

2. McMaster is committed to ongoing program enhancement. The MacPherson Institute’s Quality Assurance Office coordinates McMaster’s quality assurance process to facilitate holistic academic program reviews that focus on overall program enhancement through evidence-informed decision making. The Office also supports programs in the development and assessment of in-program learning outcomes, and assists with mapping courses and learning experiences to developed learning outcomes. Further, it encourages and enables the involvement of students in the review process.

3. During 2015-16, the Faculties of Engineering and Health Sciences developed a new interdisciplinary program, “Integrated Biomedical Engineering and Health Sciences Plus” which recently received Ministry approval to begin in September 2017. Apart from careers in Engineering and Health Sciences, graduates of this program will be uniquely prepared for careers that integrate biological and medical sciences with engineering and the physical sciences.

4. McMaster’s program offerings are highly ranked globally. In 2015 the QS World University Rankings by Subject ranked McMaster as one of the top 100 globally in five subject areas: Medicine (33); Philosophy (51-100); Geography (51-100), Statistics (51-100) and Materials Science (51-100). In the same year, the McMaster MSc eHealth Program received recognition by placing 41st globally in the 2015-16 Eduniversal rankings for Master’s health management programs.

6. Student Mobility
   As part of the development of metrics under the SMAs, the ministry will be developing long-term indicators for credit transfer in consultation with the sector through the Credit Transfer Accountability Framework.

   As part of this work, a new Credit Transfer Student Flag was introduced into 2015-16 enrolment reporting for colleges and universities. The ministry will work with the sector throughout 2016-17 on any refinements to the metric with a view to integrate this new information into the SMA report back beginning in 2017-18.

   In future years, the ministry will be expecting more complete data that will profile partnerships between institutions that ensure students have access to a continuum of learning opportunities in a coordinated system. This may include, but is not limited to, metrics related to credit transfer pathways and collaborative or joint programs between or within sectors.

   Development of these metrics will be done in partnership with the sector and ONCAT.

   Transfer Applicants and Registrants

   Using Ontario Universities Application Centre’s (OUAC) reports, please provide data for 2015.
<table>
<thead>
<tr>
<th>Year</th>
<th>Total Applications</th>
<th>Total Registrations</th>
<th>Transfer Applications</th>
<th>Transfer Registrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>40,248</td>
<td>5,581</td>
<td>767</td>
<td>97</td>
</tr>
<tr>
<td>2012</td>
<td>41,427</td>
<td>5,447</td>
<td>780</td>
<td>86</td>
</tr>
<tr>
<td>2013</td>
<td>42,957</td>
<td>5,392</td>
<td>651</td>
<td>60</td>
</tr>
<tr>
<td>2014</td>
<td>44,464</td>
<td>5,560</td>
<td>646</td>
<td>62</td>
</tr>
<tr>
<td>2015</td>
<td>45,425</td>
<td>5,633</td>
<td>584</td>
<td>73</td>
</tr>
</tbody>
</table>

*Transfers from publicly assisted colleges in Ontario.

NOTE:

- OUAC collects information on the number of transfer student applications and registrations. The ministry recognizes that:
  - the transfer data set only includes students who have applied to university through OUAC and have self-identified on applications to OUAC;
  - a significant number of transfer students apply directly to the university and, as such, are not captured in OUAC data;
  - Information only includes full-time students applying and registering in the fall to the first year of a university program.

The ministry encourages McMaster University to augment the OUAC data with its own institutional data, particularly pertaining to college graduates entering university. Reporting this data is optional. In the space provided below, McMaster University should report institutional data that includes data from OUAC and other sources.

<table>
<thead>
<tr>
<th>Year</th>
<th>McMaster University’s (MAC)’s Total Applications</th>
<th>McMaster University’s (MAC)’s Total Registrations</th>
<th>McMaster University’s (MAC)’s Transfer Applications</th>
<th>McMaster University’s (MAC)’s Transfer Registrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>42,349</td>
<td>5,148</td>
<td>776</td>
<td>84</td>
</tr>
<tr>
<td>2013</td>
<td>43,846</td>
<td>5,403</td>
<td>640</td>
<td>61</td>
</tr>
<tr>
<td>2014</td>
<td>45,421</td>
<td>5,401</td>
<td>637</td>
<td>58</td>
</tr>
<tr>
<td>2015</td>
<td>46,446</td>
<td>5,638</td>
<td>662</td>
<td>89</td>
</tr>
</tbody>
</table>

**Additional Information**

Describe the methodology, survey tools, caveats and other information regarding the numbers reported above (up to 600 words approx.).

The difference between the transfer registration information in the two tables potentially reflects 105 applicants who applied to one program and then were subsequently admitted to another program instead. These 105 applicants are not included in OUAC’s data.
Highlights
Please provide highlights of McMaster University's activity in 2015-2016 that demonstrates McMaster University’s efforts to ensure students have access to a continuum of learning opportunities in a coordinated system. This may include, but is not limited to expansion of credit transfer pathways and collaborative or joint programs between or within sectors, changes to student supports viewed by McMaster University to be an innovative practice, or improved timeliness of credit/credential recognition (up to 600 words approx.).

1. McMaster has a number pathway programs with CAAT institutions, which allow students to earn both a college diploma and a degree from McMaster:

   • Graduates of Mohawk College’s McKeil School of Business, who have a weighted GPA of at least 77%, are eligible to apply to McMaster’s Bachelor of Commerce program. Eligible students will receive 60 credits towards their degree and must complete an additional 60 credits as specified by McMaster.

   • McMaster’s Bachelor of Technology (B.Tech) program is a joint program between the University’s Faculty of Engineering and Mohawk College. Students who successfully complete the program receive a Bachelor of Technology degree from McMaster and an Advanced College Diploma from Mohawk College, in one of three specialties: Automotive and Vehicle Technology; Biotechnology; or Process Automation Technology. Students who choose to first attend Mohawk College, and obtain an Advanced Diploma, receive two years of transfer credits towards a Bachelor of Technology degree in: Civil Engineering Infrastructure Technology; Computing and Information Technology; Energy Engineering Technologies; or Manufacturing Engineering Technology.

   • McMaster’s Collaborative Nursing program allows students to complete their McMaster Bachelor of Science in Nursing at both Mohawk and Conestoga College. Each program uses the University’s nursing curriculum and applies the same problem-based, small group, self-directed educational model. Students attend the institution to which they are admitted for the entire four-year period of the program, and upon completion receive a McMaster University Bachelor of Science in Nursing degree.

   • The McMaster University and Mohawk College Medical Radiation Sciences (MRSc) program is a collaborative diploma-degree program. Medical Radiation Sciences (MRSc) today represents one of the fastest growing primary health care fields. The collaborative program provides students with the opportunity to obtain both an Ontario College Advanced Diploma and a Bachelor of Medical Radiation Sciences degree. All students enter the program at level one, which provides a common curriculum; in level two students move into one of the programs’ three specializations (Radiography, Ultrasonography or Radiation Therapy).

   • Mohawk graduates of the General Arts and Science two-year diploma program, who achieve a cumulative average of at least 75%, are eligible for advanced standing toward their Bachelor of Arts (Honours) program in the Faculties of Social Sciences or Humanities at McMaster.

2. McMaster, one of seven members of the University Credit Transfer Consortium, grants specific course credit for 20 first-year and second-year courses to students transferring from member universities of the Consortium. Students who have completed any first-year Humanities, Social Sciences and Science degree courses at member universities with a minimum grade of 60% are assured of general, first year credit upon admission to McMaster.
3. Within McMaster, students have access to a continuum of learning opportunities in a coordinated system. For example, in collaboration with the DeGroote School of Business, the Faculty of Humanities provided its students with the opportunity to complement their studies in a Humanities discipline with core Commerce courses (e.g. finance, human resources, marketing). The “Specialized Minor in Commerce” initiative provides Humanities students with enough core business courses to complete an MBA with one more year of study, instead of the normal two years.

7. Financial Sustainability

Financial Health and Sustainability Metrics

Performance Metrics

<table>
<thead>
<tr>
<th>Performance</th>
<th>2013-14</th>
<th>2014-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Income / Loss Ratio (%)</td>
<td>8.9%</td>
<td>7.93%</td>
</tr>
<tr>
<td>Net Operating Revenues Ratio (%)</td>
<td>12.5%</td>
<td>14.75%</td>
</tr>
</tbody>
</table>

Optional Comments on Performance Metrics Data (up to 600 words approx).

The net income ratio and net operating revenues ratio remain positive and strong despite lower investment income recognized in the year. This positive result relates to McMaster’s diversified consolidated income profile whereby 50% of McMaster’s sources of revenues come from education linked funding (Basic Income Units and Tuition) and the remainder of revenue sources are from research activities, ancillary operations, investments, donations and other grants, and substantial other income from non-degree educational activities and programs, contract revenues, patent royalties, nuclear reactor sales, athletics membership and user fees, and investments in spin-off operations in which McMaster retains an equity position. Overall, with substantially diversified revenues McMaster’s income is less volatile when any one income item underperforms. McMaster’s diversified income is noted as a key strength by its credit rating agencies.

Liquidity Metric

<table>
<thead>
<tr>
<th>Liquidity</th>
<th>2013-14</th>
<th>2014-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Reserve Ratio (days)</td>
<td>120</td>
<td>129</td>
</tr>
</tbody>
</table>

Optional Comments on Liquidity Metric (up to 600 words approx).

Note: Due to financial statement restatements the 2013-14 and 2014-15 results have been adjusted from figures originally provided by the Ministry to tie to more recent audited results. Overall, McMaster continues to have a strong or healthy liquidity profile. The current year improvement relates to the increase in expendable resources affected by the debenture proceeds. The proceeds of the debenture, although linked to two key initial capital projects and associated cash flow needs,
are placed into McMaster’s Central Bank. McMaster manages a central bank approach to funding internal projects while also managing all short term cash needs. The central bank approach enables McMaster to have an integrated planning approach to the Capital Plan and Asset Management Plan linked to Multi-year Financial Projections and Debt Management analysis. McMaster monitors its primary reserve ratio in relation to overall university planning projections, typically resulting in a ratio of greater than 0.3x or greater than 110 days.

**Leverage Metric**

<table>
<thead>
<tr>
<th>Leverage</th>
<th>2013-14</th>
<th>2014-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest Burden Ratio</td>
<td>1.05%</td>
<td>1.01%</td>
</tr>
<tr>
<td>Viability Ratio</td>
<td>2.0</td>
<td>2.2</td>
</tr>
</tbody>
</table>

**Optional**

Comments on Leverage Metric (up to 600 words approx).

The interest burden ratio slightly increased over the prior year due to the net interest impact associated with the late 2015 debenture. Only a partial year of interest expense was incurred by McMaster, which was offset to some extent by the debenture proceeds being invested until capital expenditures proceed. The 2016-17 results will have a full year’s debenture net interest expense increasing the burden but still within an acceptable range. The viability ratio declined in relation to the increase in debt McMaster undertook with its debenture. Overall, McMaster includes this ratio in its integrated multi-year financial projection and debt management report (updated annually).

**Additional Information**

Additional comments on the overall Financial Health & Sustainability Metrics Result (up to 600 words approx.).

McMaster has a long-standing tracking process for the metrics selected by the Ministry, amongst others. The metrics selected are all historical looking metrics; in addition to McMaster’s existing practice of tracking and reporting these metrics to committees of the Board of Governors the credit rating agency results are also used. The Credit Rating results are considered an outcome rating of a number of metrics (historical looking), and financial outlook information (forward looking) results in one future oriented composite index financial health indicator. Overall, it seems that the metrics selected by the Ministry are reasonable indicators to explain past financial health results. The metrics for the three years covered in this report highlight McMaster’s financial health, strength and resilience given a worsened investment return in 2015-16 affecting income and employee future benefits. All of the metrics being tracked are strong for McMaster, not only in comparison to Ontario peers, but also in relation to typical financial health indicator thresholds defined by Prager, Sealy and Co. LLC. for higher education institutions across North America.

**Highlights**

Please provide one or more highlights that demonstrate McMaster University’s commitment to improved or continued financial sustainability. (up to 600 words approx.)
Annual monitoring of McMaster’s strategic and capital project capacity along with multi-year financial projections linked to revenue and expenses projections enables ongoing financial health and sustainability planning, whereby McMaster can elect to promote or defer certain projects to ensure it maintains and keeps certain financial health indicators in check with its own internally set targets. McMaster raised debt in 2015-16 linked to two key capital project initiatives that are planned to open in 2020-21 or sooner. Both projects include an ancillary component (residences) and have supporting business cases for internal capital loan repayment. McMaster’s central bank approach to financing internal projects allows for strong business case development examining return on investments and payback periods. Further, the integrated planning approach used by McMaster along with the central bank process, generates internal sources of capital reinvestment used to support educational space enhancement or retrofit projects and used as matching funds for Federal and Provincial initiatives. It is important to stress that McMaster’s integrated planning approach focuses on financial health and sustainability by packaging project bundles into scenarios so senior leaders can understand the financial health implication of the strategic choices they make. Overall, McMaster’s existing approach to financial health has contributed to improved financial sustainability, as recognized by its improved credit rating.

Other Additional Financial Health Provided by McMaster

The ministry encourages McMaster University to augment the current list of financial health and sustainability metrics with other metrics. Reporting this data is optional. McMaster University may add up to four additional metrics in the space provided below.

<table>
<thead>
<tr>
<th>Metric</th>
<th>2013-14</th>
<th>2014-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 S&amp;P Credit Rating</td>
<td>AA/Stable</td>
<td>AA/Stable</td>
</tr>
<tr>
<td>2 DBRS Credit Rating</td>
<td>AA (Low) Stable</td>
<td>AA (Low) Stable</td>
</tr>
<tr>
<td>3 Interest Coverage</td>
<td>14.5x</td>
<td>13.6x</td>
</tr>
</tbody>
</table>

**Additional Information**

Comments related to McMaster University’s other reported metrics (up to 600 words approx).

Further supporting McMaster’s financial health position are its financial (forward looking) credit ratings. Most notable is the improved S&P credit rating received in June 2016 which increased McMaster’s rating to AA/Stable. The rating is an indication of strong financial health connected with reasonable financial plans to deal with employee related cost containment and funding, revenue diversification and management, capital asset and deferred maintenance planning, and investment and pension asset diversification and planning. Other metrics in addition to the Ministry selected metrics and the credit ratings include interest coverage tracked by McMaster’s Debt Management Policy, with an objective of maintaining this coverage as greater than 2.75x.
8. Attestation

By submitting this report to the ministry:

McMaster University confirms that all information being submitted to the ministry as part of the 2015-2016 SMA Report Back is accurate and has received approval from McMaster University’s Executive Head.

Checkbox

For additional information regarding McMaster University’s 2015-2016 SMA Report Back please contact Information:

Name: Jacy Lee, Associate Vice-President Institutional Research and Analysis
Telephone: 905-525-9140 Ext: 23530
Email: avpira@mcmaster.ca

Please indicate the address on McMaster University’s website where a PDF copy of this 2015-2016 SMA Report Back will be posted once it has been approved by the ministry

Website

https://ira.mcmaster.ca/category/accountability/