



**School of Graduate Studies**

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To : Members of Graduate Council

From : Christina Bryce  
Assistant Graduate Secretary

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The next meeting of Graduate Council will be held on **Tuesday November 15<sup>th</sup> at 9:30 am in Council Chambers (GH-111)**

Listed below are the agenda items for discussion.

Please email [cbryce@mcmaster.ca](mailto:cbryce@mcmaster.ca) if you are unable to attend the meeting.

## **A G E N D A**

- I. Minutes of the meeting October 18<sup>th</sup>, 2016**
- II. Business arising**
- III. Report from the Associate Vice-President and Dean of Graduate Studies**
- IV. Report from the Graduate Associate Deans**
- V. Report from the Associate Registrar and Graduate Secretary**
- VI. Report from the Assistant Dean, Graduate Student Life and Research Training**
- VII. New Program Proposal – Master of Financial Math**
- VIII. Faculty of Business Graduate Curriculum and Policy Committee Report**
- IX. Faculty of Engineering Graduate Curriculum and Policy Committee Report**
- X. Faculty of Health Sciences Graduate Policy and Curriculum Committee Report**
- XI. Faculty of Humanities Graduate Curriculum and Policy Committee Report**
- XII. Faculty of Social Sciences Graduate Curriculum and Policy Committee Report**
- XIII. Concurrent Masters/Ph.D. Admission change - Section 2.1.2**
- XIV. New Scholarships and Changes to Existing Scholarships**
- XV. Additional Scholarship Committee Members**
- XVI. Doctoral Dissertation Discussion**
- XVII. CIHR Training Modules**



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Graduate Council  
October 18<sup>th</sup>, 9:30 am  
GH 111

Present: Dr. D. Welch, Ms. S. Baschiera, Ms. C. Bryce, Dr. N. Agarwal, Dr. P. Swett, Dr. T. Porter, Dr. M. Thompson, Dr. B. Gupta, Ms. S. Ramsammy, Dr. D. Pelinovsky, Dr. B. Doble, Dr. L. Thabane, Dr. G. McClelland, Dr. A. Guarne, Dr. A. Dean. Ms. N. Shen, Dr. A. Sills, Mr. R. Narro Perez, Ms. AM. Dragomir, Ms. R. Estok, Dr. A. Kitai, Ms. H. Yousefi, Ms. A. Orasch, Dr. E. Badone, Dr. A. Fudge Schormans, Dr. E. Grodek

Regrets: Dr. S. McCracken, Dr. M. Verma, Dr. T. Adams. Dr. A. Deza

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## A G E N D A

### **I. Minutes of the meeting September 20<sup>th</sup>, 2016**

The minutes of the meeting of September 20<sup>th</sup>, 2016 were approved on a motion by Dr. Sills, seconded by Dr. Gupta.

### **II. Business arising**

There was no business arising.

### **III. Report from the Associate Vice-President and Dean of Graduate Studies**

Dr. Welch reported that the School of Graduate Studies had undergone a review; three graduate deans from comparable universities had come in to review. There was an opportunity for everyone who interacts with SGS to meet with reviewers and exchange information. He noted that the report was not in yet but it is already clear that an area they need to work on improving is the admissions process. To that end, the SGS admissions officers and two people from each faculty selected by the associate deans will form a working group to face challenges head on. The goal is to be simpler, more efficient and less onerous. Dr. Welch said that he would bring any changes that arise to Graduate Council.

Dr. Welch introduced a new member of the SGS team – Sally Ramsammy who started on October 3<sup>rd</sup> and will take on the role of Director of Finance. Ms. Ramsammy introduced herself. She noted that she was a CPA/CMA

and had worked in the private sector for 15 years before working at the University of Guelph for 4 years and then the University of Waterloo as Finance Officer.

Dr. Welch noted that at the previous meeting there was a question if interest was charged back in the days of MAC VIP – he said he couldn't find someone that had the answer. It was the case back in those days that all tuition was due on September 1<sup>st</sup> but there were arrangements intact to even out the flow of money that are no longer available. He said that things in terms of students receiving their funding has been much better this term.

Dr. Welch explained that the way that province funds graduate studies in Ontario involves counting only in-time, domestic, Masters and Ph.D. students. He said it has long been the case that international students should be funded and that it is the case that many other provinces fund international students at the same rate as domestic. He noted that there had been issues in the past with trying to bring this forward. Last year the Ministry announced that a fraction of the growth envelop could be used to charge domestic fees for international Ph.D. students. He said that while the move was welcome, the change was quite small as the number across all international Ph.D. students that could be funded this way was 15. It was unclear whether it would continue this year. This week, two weeks before government count, the university was told they could do the same thing. The 15 students were chosen by the associate deans and their faculty. The allocation to faculties was made on the basis of the fraction of international students in faculty with the proviso that each faculty got at least one. They are hopeful that this will be expanded in the future. He noted that it was politically safe in the sense that the university hasn't hit their domestic Ph.D. targets so nobody can claim a domestic student has been denied admission relative to international students.

Dr. Welch reported that SGS is going to hold another set of recruiting workshops with programs to help assist with recruitment overall. The particular focus on domestic Ph.D.s last year led to an increase of 20% over the previous year. He said the first of these workshops would be held in November and noted that they had been a great success in terms of sharing what programs had done at McMaster.

A council member asked if the BIU consideration was for the full course of an international students study. Dr. Welch responded that it was just one year and noted that there were issues surrounding this. For that reason they have chosen fourth year Ph.D. students who wouldn't naturally be entitled to funding in the subsequent year.

#### **IV. Report from the Graduate Associate Deans**

Drs. Porter, Swett, Thompson and Agarwal had nothing to report. Dr. Gupta noted that he had previously reported on a planned alumni event led by students within the Faculty of Science. After lots of planning they were not quite ready to hold it in October. They had a discussion and decided to postpone it to winter reading

week. He noted that the Financial Math program approved at GCPC and that the Faculty had another program in big data in very early stages.

**V. Report from the Associate Registrar and Graduate Secretary**

Ms. Baschiera had nothing to report.

**VI. Report from the Assistant Dean, Graduate Student Life and Research Training**

Mr. Self followed up on a couple of items from the last meeting. He reported that 38 students had attended the Thesis Bootcamp. These students spent 3 days spent in the library working on moving their thesis forward. He acknowledged the contribution of the library as they provided full access to the Learning Commons on the second floor, which is a great space to work when it's quiet.

He noted that there was also a graduate study room on the 4<sup>th</sup> floor of Mills with key access for grad students and postdocs. Almost a thousand students over the last three years have utilized the space. He reported that there had been discussion on more designated quiet space.

His team helped to facilitate an immigration session where a lawyer came in to talk about issues surrounding immigration and permanent residency. Roughly 146 students attended the event.

He noted that his team provided quite a bit of new graduate student orientation in the fall and some in the winter. There was a suggestion that they do something in December, bearing in mind students with a January start, so they will be holding an event on December 15<sup>th</sup> and January 11<sup>th</sup>.

He also reported that coming up there will be an undergraduate student research poster session on November 3<sup>rd</sup>.

On November 15<sup>th</sup> there will be a session with Lawrence Hill in Celebration Hall. He will be discussing, in part, his experiences with the writing process and how it might help graduate students who are stuck on writing. He said that registration information would be going out shortly.

He also reported that 3 Minute Thesis registration would open on December 12<sup>th</sup>. An info session will be held on January 12<sup>th</sup> and they encourage any students who want to practice their pitch to join.

**VII. CAGS Doctoral Dissertation Document**

Dr. Welch noted that he was hoping that there would be a discussion topic at most graduate council meetings to get input on different issues. He came across the CAGS doctoral dissertation document and since they are promoting thoughtful responses to the document he brought it to the group for input.

Dr. Swett noted that she had sent around the little note to draw attention to page 6 of the CAGS document which contained a list of discussion questions. She noted that the questions were broken into the topics

(Content, Form and Evaluation) and said that in part what they're wondering is do we need to have stricter or looser guidelines around these items.

Dr. Porter commented that some of these considerations overlap with the issue of community engaged research and thought that there had been a lot of motion recently in identifying the elements of community engagement which can be elevated to research. He noted the important of drawing out the elements at the core of scholarly research.

A council member said that they have a fairly traditional thesis structure in engineering and wondered what has been happening in the Faculty of Humanities in terms of thesis innovation. Dr. Swett responded that the new Ph.D. in CMNCS has broadened their expectation in terms of what can be considered for the final thesis. Another council member involved in the development of the new Ph.D. expanded on this: she noted that many of her colleagues work in research creation, like video games or research installations that have a scholarly component. They have incorporated that as an option in the new Ph.D. There are three options for students to complete their thesis: a conventional dissertation, a sandwich thesis or a research creation model where they might produce something like a film or digital media product which would be accompanied by a conceptual framework. They created this having looked at a bunch of other programs within Canada. Going forward they envision students following some of these options. She noted that it wasn't raised as an issue by their external review team members or Quality Council. Dr. Thompson said that they have taken a step forward in terms of the thesis form but have also anchored it to a more traditional model with that conceptual document. He asked if they ever considered the research creation as a standalone option. The council member said that they had been relatively conservative and had based their decision on other models, all of which had a theoretical component. She suspected that was likely in part due to need for consistent evaluation criteria. A student needs to create product but also conceptualize it and explain it to the discipline.

Another council member commented that one of the challenges that they might run into is evaluation. She wondered if we have the capacity to evaluate these sorts of innovative projects.

Dr. Welch commented that the sandwich thesis was initially thrown out there as an option and the standards for it came later, particularly where individual contributions were concerned.

A council member highlighted the document where it noted that the traditional view of doctoral education has been analogous with an apprenticeship toward a guild membership. The member liked that the document acknowledged that this view had to be reconsidered in light of the shifting nature of the Ph.D. job market. The council member asked how the evaluation would work in relation to this concept for students who are not interested in research-intensive focus. He suggested it was important to look at the philosophical question of the goals of getting a Ph.D.

Another council member said they had been reading a lot lately about social and emotional learning. She said that 65% of kids who are entering grade school will obtain jobs that do not currently exist today. She noted that the way students are taught will need to change accordingly and will need to include an emphasis on empathy, creativity and collaboration.

A council member said that he had been pushing for SEPT to include a Ph.D. program. He thought that if the Ph.D. thesis model could be broadened, it would pull that sort of program into the realm of Ph.D. level work. Students could create technology and could work to integrate it into the broader world. Dr. Welch responded that McMaster does have the ability to change the regulations and that Graduate Council would be one of the fundamental groups who would vote on that. He noted that some universities don't have a defence. He said that McMaster always demand an artifact at the end of a Ph.D. student's course of study which seems pretty sensible but is perhaps not absolutely necessary.

A council member said that it is important to evolve with time and noted that academic institutions take a very long time to evolve. He suggested it was important to re-evaluate the whole process of how students are taught, particularly as students learn very different from how they used to. He noted that McMaster prides itself on collaboration but then students are evaluated as individuals. He suggested that faculty might need to go back and learn how to teach students in the context of the world that they live in.

Dr. Gupta commented that the degree is being awarded individually and so individual evaluation is important. He also noted the importance of being able to evaluate academic work critically after the fact to see if it was sound or flawed. He said that when things are more fluid, it can be more difficult to do this.

Dr. Agarwal commented that the key theme is flexibility. With respect to content and form McMaster already has, in varying degrees across faculties, flexibility. He noted an instance where he had chaired a Ph.D. defence from science where the candidate was disabled and the topic was adapting academic work to that setting and the thesis was extremely rigorously done. He said there is flexibility with content and form but not at the evaluation stage. He thought that the evaluation stage is where they need to look at whether there can be degrees of freedom that wouldn't dilute the quality or the academic rigour. This would correspond to the flexibility in content and form that already exists.

A council member said that there was interest in her program with more applied and community-based research. For example a student wanted to examine Hamilton institutions and Syrian refugees. Another wanted to review the sexist grammar of French language and how this translates to teaching in immersion schools. She wondered if there was flexibility in the current budget model to allow for supervision with people from other faculties. She said that in French they would like to be able to collaborate with colleagues in other faculties, social sciences for example and asked about regulations for an internal cotutelle.

Dr. Welch responded that the budget model doesn't really get expressed at the graduate level, even in terms of graduate teaching. That constraint is not currently an issue at least in one way. He said it certainly is possible for there to be supervision between departments/faculties by making the person an associate member of the department. In response to community engagement point he noted that the measurements about when something has been achieved in a thesis have generally been judged by sandwich or classical thesis but there have been times that they've produced a piece of music. He didn't see why there could be clear written guidelines to include community engagement as a metric to be evaluated.

A council member worried about changing the requirements and how much that related to educational inflation. In many cases, students are going to more school and still not getting a job. She said this might be another kind of unpaid internship where you produce something and get relatively little in return. Dr. Welch agreed that there could be a danger in being the flavour of the week, four years ago. Dr. Porter responded that this was a good point and that there's always pressures to turn graduate education to a more vocational aspect.

Dr. Welch commented that it seems that there needed to be some sort of process to think about the things associated with any sort of change in an orderly fashion and then identify some of these traditional barriers. He asked if the focus should be on the evaluation, scope of thesis, or making regulations more flexible.

A committee member responded that a lot of what's been suggested as points for consideration are things that may be done in other faculties. He suggested that it would be easier for the programs to evaluate what is appropriate for their discipline and noted the importance of asking them how they're doing business and to decide whether they need retraining to evaluate students properly.

Dr. Porter said it might be useful to do a survey to see what departments are already doing, what they would like to be doing and if they are constrained by current regulations. Dr. Welch responded that the associate deans should take it back to their programs.

Dr. Swett said it would be useful to actually look at our own regulations. Dr. Welch said that's something that can be done as a follow up, perhaps for discussion at the next meeting of graduate council.

A council member noted that they agreed about the importance of department level consideration.

Dr. Welch said that whatever the decision is made needs to be clear and easily interpreted.

Dr. Thompson asked if there were any governmental level edicts that McMaster needed to be concerned with. Dr. Welch responded that the university proposes what they'd like to do, including program learning outcomes, Quality Council and MTCU review and then approve. Dr. Thompson asked if there was a boundary, from Quality Council for example, for these sorts of changes that could be looked up to assist in decision making. Dr. Welch

responded that it was mainly a McMaster boundary and that as an institution there was a lot of space to make the degrees the way the institution wants them to be.

A council member said at Senate that the president had talked about how colleges are serving the needs of the community better than universities and noted that in that context McMaster can't go wrong to see how it can align with what the rest of the world expects from a universities.

A council member asked if they're going to survey departments (and agreed this was a good idea) shouldn't students also be surveyed to see if this would be a deciding factor in entry to a program. Dr. Welch responded that he didn't disagree with the need for student input but suggested that a meeting within faculties might be more appropriate. There's a lot of surveys going out to students and he wanted to make sure they weren't over-surveyed.

Dr. Swett asked if there were any concern from SGS reviewers about what McMaster does for the Ph.D. Dr. Welch responded that they were reviewing SGS in a different context and didn't expect to hear any input from them on that.

#### **VIII. QAC Membership**

Dr. Welch explained that QAC is the internal body that oversees quality assurance at McMaster. Drs. Bradley Doble, Dmitry Pelinovsky and Adrian Kitai are the GC members. A council member asked how they were chosen and why the names hadn't been listed in the package. Dr. Welch responded that six members were chosen between undergraduate and graduate council to ensure that there as coverage from all six faculties. He said that the names of QAC members would be included in the agenda going forward.

Dr. Sills moved and Dr. Gupta seconded, 'that Graduate Council approve the Graduate Council members of the Quality Assurance Committee.'

The motion was carried.

#### **IX. Fall 2016 Graduands**

A council member asked if the list of graduands could be sent electronically in the future. Dr. Welch agreed. Dr. Thabane moved and Dr. Swett seconded,

'that Graduate Council approve the list of the 2016 Fall Graduands, with amendments/corrections to be made as necessary by the Associate Graduate Registrar.'

The motion was carried.



McMaster  
University



**NEW PROGRAM PROPOSAL FOR  
MASTER OF FINANCIAL  
MATHEMATICS**

**Date: Sept. 26, 2016**

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## **PROGRAM**

### **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 Tchernitser, Managing Director, Risk Models, ERP, 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 Research Risk 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
    - e. Banking regulations governing financial institutions and quantitative risk assessment
  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:

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

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 1: Comparable Masters Programs in Canada

| School  | Degree                         | Focus of the program          | Current enrolment | Program Length | Tuition and Fees (2015-16) |
|---|--------------------------------|-------------------------------|-------------------|----------------|----------------------------|
| McMaster University<br>(DeGroote School of Business)          | Master of Finance              | Specialized finance education | 50-60             | 12 Months      | \$39690/\$39690            |
| University of Toronto<br>(Department of Mathematics)          | Master of Mathematical Finance | Mathematical finance          | 30                | 12 Months      | \$46,311/\$46,311          |
| University of Toronto<br>(Department of Statistical Sciences) | Master of Financial Insurance  | Mathematical finance          | 10-30             | 12 Months      | \$27,000/\$45,000          |

|   |   |                               |    |           |                   |
|---|---|-------------------------------|----|-----------|-------------------|
| University of Waterloo<br>(Department of Statistics and 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 |
| York University<br>(Schulich School of Business)  | Master of Finance   | Specialized finance education |    | 12 Months | \$38,568/\$45,000 |

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 DeGroot 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 3<sup>rd</sup> and 4<sup>th</sup> 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



culture.

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. While no work experience is expected of an applicant, work experience in the financial industry is also granted 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 post-graduate 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.

### Projected Intake and Enrolment

| Year     | 2017 | 2018 | 2019 | 2020 | 2021 |
|----------|------|------|------|------|------|
| Scenario | 16   | 17   | 18   | 19   | 20   |

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, a 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.



| <b>Program Learning Outcomes: By the end of the program, graduates with an MFM degree will...</b>  | <b>Masters Degree Level Expectations</b>                                  | <b>Teaching Activities and Learning Opportunities</b>  | <b>Assessment and Evidence</b>  |
|--|---|--|---|
| ..gain Industrial Knowledge of definitions and uses of key financial assets (T1)   | 1. Depth and Breadth of Knowledge   | All courses<br>Group activities<br>Guest speakers<br>Industrial events   | Graded assessments of in-course requirements: written and oral exams, projects, assignments                                   |
| ...develop skills in Financial Mathematics: mastery of theoretical concepts and problem solving in financial mathematics and probability theory (T2) | 1. Depth and Breadth of Knowledge<br>3. Level of Application of Knowledge | All courses<br>Assignments, projects, and examinations   | Graded assessments of in-course requirements written and oral exams, projects, assignments                                    |
| ...be adept at Financial Risk Quantification: ability to measure risk on a portfolio of complex positions (T3)                                       | 1. Depth and Breadth of Knowledge<br>3. Level of Application of Knowledge | Courses MFM702, MFM703, MFM705<br>Assignments and projects   | Graded assessments of in-course requirements written and oral exams, projects, assignments                                    |
| ...acquire ability in Computational Analysis: algorithmic thinking and the ability to use technology to analyze and problem solve (T4)               | 1. Depth and Breadth of Knowledge<br>3. Level of Application of Knowledge | Predominantly courses MFM708*, MFM709*, Stats721, but technology opportunities are provided in all courses.<br>C++ seminars and Visual Basic workshop<br>Projects, assignments | Graded assessments of in-course requirements written tests and exams, projects, assignments                                   |
| ...have foundations in Statistical Analysis: practical facility in financial statistics based on theoretical foundations (T5)                        | 1. Depth and Breadth of Knowledge<br>3. Level of Application of Knowledge | Predominantly Stats721, but is incorporated in other courses as well   | Graded assessments of in-course requirements written tests and exams, assignments   |
| ...understand role, structure and regulation of financial institutions (P1)  | 3. Level of Application of Knowledge                                      | MFM701, MFM702, MFM704, MFM705<br>Group activities<br>Guest speakers<br>Industrial events<br>Alumni interaction  | Oral examinations and in-class discussion and presentations.<br>Discussions in group activities, industrial and alumni events |

|  |   |  |  |
|--|---|--|--|
| ...be able to Interpret Technical Results: critical analysis of benefits and shortfalls of models being developed and implemented (P2) | 2. Research and Scholarship<br>3. Level of Application of Knowledge<br>6. Awareness of Limits of Knowledge                                    | All courses<br>Industrial project<br>Group activities<br>Guest speakers<br>Industrial events<br>Alumni interaction | Oral examinations and in-class discussion and presentations.<br>Project paper and presentation.<br>Discussions in group activities, industrial and alumni events   |
| ...apply Technical Concepts: the communication and application of mathematical modeling and analysis in a business context (P3)        | 2. Research and Scholarship<br>3. Level of Application of Knowledge<br>5. Level of Communication Skill<br>6. Awareness of Limits of Knowledge | MFM702, MFM705<br>Major Industrial Project<br>Guest speakers<br>Industrial events                                  | Oral examinations and in-class discussion and presentations.<br>Project paper and presentation.<br>Discussions in group activities, industrial and alumni events<br>Feedback from alumni and industry managers |
| ...expand Interpersonal and Communication Skills: facility in communicating in the professional realm (P4)                             | 4. Professional Capacity/autonomy<br>5. Level of Communication Skills   | MFM702, MFM705<br>Major Industrial Project<br>Industrial events<br>Alumni interaction                              | Oral examinations and in-class discussion and presentations.<br>Project presentation.<br>Discussions in group activities, industrial and alumni events<br>Feedback from alumni and industry managers           |
| ...demonstrate Professionalism: developing skills in areas from seeking employment to professional conduct in the industry (P5)        | 4. Professional Capacity/autonomy<br>5. Level of Communication Skills   | Group activities<br>Major Industrial Project<br>Guest speakers<br>Industrial events<br>Alumni interaction          | Discussions in group activities, industrial and alumni events<br>Feedback from alumni and industry managers<br>Performance on assignments and projects in a group environment                                  |

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<sup>2</sup> 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:

|    | Name                  | Rank                | Area             | Department    | Employer                              |
|----|-----------------------|---------------------|------------------|---------------|---------------------------------------|
| 1  | Dr. Thomas Hurd       | Professor           | Fin. Mathematics | Math & Stats  |                                       |
| 2  | Dr. Matheus Grasselli | Professor           | Fin. Mathematics | Math & Stats  |                                       |
| 3  | Dr. David Lozinski    | Assistant Professor | Fin. Mathematics | Math & Stats  |                                       |
| 4  | Dr. Traian Pirvu      | Associate Professor | Fin. Mathematics | Math & Stats  |                                       |
| 5  | Dr. Petar Jevtic      | Assistant Professor | Fin. Mathematics | Math & Stats  |                                       |
| 6  | Dr. Shui Feng         | Professor           | Statistics       | Math & Stats  |                                       |
| 7  | Dr. Paul McNicholas   | Professor           | Statistics       | Math & Stats  |                                       |
| 8  | Dr. Aaron Childs      | Associate Professor | Statistics       | Math & Stats  |                                       |
| 9  | Dr. Jeffery Racine    | Professor           | Econometrics     | Economics     |                                       |
| 10 | Dr. Richard Deaves    | Professor           | Finance          | DeGroote Bus. |                                       |
| 11 | Dr. Rosemary Luo      | Associate Professor | Finance          | DeGroote Bus. |                                       |
| 12 | Dr. Alex Levin        | Adjunct Professor   | Fin. Mathematics | Math & Stats  |                                       |
| 13 | Dr. Ian Buckley       | Adjunct Professor   | Fin. Mathematics | Math & Stats  | Canadian Securities Transition Office |

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.

**Industry Partners:**

|   | <b>Name</b>          | <b>Title</b>             | <b>Area</b>  | <b>Employer</b> |
|---|----------------------|--------------------------|--|-----------------|
| 1 | Dr. Niall Whelan     | Vice-President           | Market Risk Measurement  | Scotiabank      |
| 2 | Mr. Ray Westcott     | Vice President           | Capital Markets Risk Measurement & Reporting                               | CIBC            |
| 3 | Dr. Alex Tchernitser | Managing Director        | Risk Models, ERPM  | BMO             |
| 4 | Dr. Z. Sokolovic     | Associate Vice President | Market Risk Control, Risk Management                                       | TDBank          |
| 5 | Dr. Greg Nudelman    | Vice President           | Head of Model Validation and Management                                    | TDBank          |
| 6 | Dr. Anthony Vaz      | VP                       | Models, Methodology & Infrastructure, Market and Liquidity Risk Management | Manulife        |
| 7 | Dr. Houben Huang     | Vice President           | Model Risk & Validation  | BMO             |
| 8 | Mr. Jason Drysdale   | Senior Vice-President    | Enterprise Risk  | RBC             |

|    |                       |                               |                                |                               |
|----|-----------------------|-------------------------------|--------------------------------|-------------------------------|
| 9  | Dr. Alex Kreinin      | Head of Quantitative Research | Risk Analytics                 | IBM Risk Analytics            |
| 10 | Dr. Oleksandr Romanko | Senior Research Analyst       | Risk Analytics                 | IBM Risk Analytics            |
| 11 | Dr. Mark Engel        | Senior Vice President         | Risk and Capital Analytics     | Scotiabank                    |
| 12 | Dr. Dan Rosen         | Managing Director             | Risk and Analytics             | S&P Capital IQ                |
| 13 | Dr. Greg Frank        | Director                      | Model Validation Group         | Ontario Teachers Pension Plan |
| 14 | Mr. Bevan Ferriera    | Senior Manager                |                                | Deloitte                      |
| 15 | Mr. David Milne       | National Leader               | Quantitative Advisory Services | Ernst and Young               |

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 TAs 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):

|                                 |  |  |  |        |  |  |  |
|---------------------------------|--|--|--|--------|--|--|--|
| <b>Faculty Members by Field</b> |  |  |  |        |  |  |  |
|                                 |  |  |  | Fields |  |  |  |

| Faculty Name & Rank                    | M/F | Home Unit                          | Supervisory Privileges | Mathematics | Statistics | Finance | Economics |
|--|-----|------------------------------------|------------------------|-------------|------------|---------|-----------|
| Category 1                             |     |                                    |                        |             |            |         |           |
| Dr. Thomas Hurd- Professor             | M   | Math & Stats                       | Full                   | X           |            |         |           |
| Dr. Matheus Grasselli - Professor      | M   | Math & Stats                       | Full                   | X           |            |         |           |
| Dr. Traian Pirvu-Associate             | M   | Math & Stats                       | Full                   | X           |            |         |           |
| Dr. David Lozinski - Assistant         | M   | Math & Stats                       | Master's               | X           |            |         |           |
| Dr. Shui Feng - Professor              | M   | Math & Stats                       | Full                   |             | X          |         |           |
| Dr. Aaron Childs-Associate             | M   | Math & Stats                       | Full                   |             | X          |         |           |
| Category 2                             |     |                                    |                        |             |            |         |           |
| Dr. Petar Jevtic-Assistant             | M   | Math & Stats                       | Master's               | X           |            |         |           |
| Category 3                             |     |                                    |                        |             |            |         |           |
| Dr. Paul McNicholas – Professor        | M   | Math & Stats                       | Full                   |             | X          |         |           |
| Dr. Richard Deaves - Professor         | M   | DeGroot<br>Bus.                    | Full                   |             |            | X       |           |
| Dr. Rosemary Luo – Associate Professor | M   | DeGroot<br>Bus.                    | Full                   |             |            | X       |           |
| Dr. Jeff Racine-Professor              | M   | DeGroot<br>Bus.                    | Full                   |             |            |         | X         |
| Category 5                             |     |                                    |                        |             |            |         |           |
| Dr. Alex Levin - Adjunct               | M   | Math & Stats<br>RBC                | Master's               | X           |            | X       |           |
| Dr. Ian Buckley - Adjunct              | M   | Math & Stats<br>Standard&Po<br>ors | Master's               | X           |            | X       |           |

**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 [igap@mcmaster.ca](mailto:igap@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

To : Graduate Council

From : Christina Bryce  
Assistant Graduate Secretary

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At its meeting on October 3rd, 2016 the Faculty of Business Sciences Graduate Curriculum and Policy Committee approved the following recommendations.

Please note that these recommendations were approved at the October 27<sup>th</sup> meeting of the Faculty of Business.

**For Information of Graduate Council:**

- **eHealth**
  - **New Course**
    - 746 Healthcare Analytics
- **EMBA**
  - **Change to Unit Counts**
    - T710 EMBA Capstone Project
    - T714 Accounting/Finance Information for Decision Making
- **Health Management**
  - **New Course**
    - 798 Health Management Independent Experiential Study
- **M.B.A.**
  - **New Course**
    - L625 Foundations 2: Review & Relaunch
  - **Change to Course Title, Description and Unit Count**
    - L611 Foundations 1: Analysis
  - **Course Cancellations**
    - L612 Foundations 2: Data & Decisions
    - L613 Foundations 3: Applications
    - L614 Foundations 4: Reflection
    - L615 Foundations 5: Review & Relaunch
  - **Change to Unit Count**
    - L626 Integrating Project
- **Ph.D.**
  - **Change to Course Title and Description**
    - K793 Mobile Commerce: Technology, Theory and Applications

To : Graduate Council

From : Christina Bryce  
Assistant Graduate Secretary

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Via e-ballot on June 23rd and at its meeting on October 24th, 2016 the Faculty of Engineering Graduate Curriculum and Policy Committee approved the following recommendations.

Please note that these recommendations were submitted for approval at the November 10<sup>th</sup> meeting of the Faculty of Engineering.

**For Approval of Graduate Council:**

- **Chemical Engineering**
  - **Change to Admission Requirements**
- **Engineering Physics**
  - **Change to Course Requirements and Calendar Copy**
- **School of Engineering Practice and Technology**
  - **Change to Calendar Copy – Advanced Credit**
  - **Change to Course Requirements and Calendar Copy (M.E.M.E.)**

**For Information of Graduate Council:**

- **eHealth**
  - **New Course:** 746 Healthcare Analytics
- **Chemical Engineering**
  - **New Course:** 700 Chemical Engineering Seminar Series
  - **New Cross-listed course:** 712 Bio-Inspired Engineering
- **Computing and Software**
  - **Course Cancellation** 6DB3 Databases
- **Electrical and Computer Engineering**
  - **New Course:** 751 Advanced Microwave Engineering
  - **Course Description Changes:**
    - 734 Advanced Topics in Multimedia Coding and Communications
    - 744 System-on-a-Chip (SOC) Design and Test – Part 1: Methods
- **School of Engineering Practice and Technology**
  - **New Course:** 735 Additive Manufacturing

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

|   |   |  |                                      |
|---|---|--|--------------------------------------|
| <b>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</b>  |   |  |                                      |
| <p>1. This form must be completed for <b>ALL</b> changes involving degree program requirements/procedures. <b>All</b> sections of this form <b>must</b> be completed.</p> <p>2. An electronic version of this form (must be in MS WORD <b>not</b> PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).</p> <p>3. A representative from the department is <b>required to attend</b> the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.</p> |   |  |                                      |
| <b>DEPARTMENT</b>   | CHEMICAL ENGINEERING  |  |                                      |
| <b>NAME OF PROGRAM and PLAN</b>   | Chemical Engineering Research Program, M.A.Sc.<br>Chemical Engineering, Ph.D    |  |                                      |
| <b>DEGREE</b>   | Applies To:<br><b>Doctor of Philosophy</b><br><b>Masters of Applied Science</b> |  |                                      |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>  |   |  |                                      |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |   |  |                                      |
| CREATION OF NEW MILESTONE <input type="checkbox"/>  |   |  |                                      |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>   | X   | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b> | <b>CHANGE IN COURSE REQUIREMENTS</b> |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>  |   | <b>EXPLAIN:</b>                                      |                                      |
| <b>OTHER CHANGES</b>  |   | <b>EXPLAIN:</b>                                      |                                      |

**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

The existing English language minimum score requirements are:

- TOEFL: 85 (internet-based)
- TOEFL: 223 (computer-based)
- TOEFL: 563 (paper-based)
- IELTS: 6.5
- MELAB: 85

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

We are proposing to increase the language requirements for non-native speakers as follows:

- TOEFL: 88 (internet-based)
- TOEFL: 230 (computer-based)
- TOEFL: 570 (paper-based)
- IELTS: 7.0
- MELAB: 85

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

Some of our graduate students have English deficiencies that were resulting in productivity problems as well as teaching assistant performance issues. After conducting a review, we found that our standards were lower than those of every other major peer chemical engineering department in Canada except one (Western). Therefore, we propose to increase the language score requirement to be more in line with our competitors and help improve overall student quality. The following peer institutions use the same or more stringent requirements:

| Test             | Our Current Minimum | Proposed New Minimum | Peer Examples  |
|------------------|---------------------|----------------------|--|
| TOEFL (internet) | 85                  | 88                   | 88 (Queens)<br>90 (Waterloo, UBC, McGill)<br>92 (Alberta)<br>93 (Toronto, Ryerson) |
| TOEFL (paper)    | 563                 | 570                  | 575 (McGill)<br>580 (Toronto, Waterloo, Alberta)                                   |
| IELTS            | 6.5                 | 7.0                  | 7.0 (Toronto, Waterloo, Queens, Alberta, Calgary, McGill, Ryerson)                 |

Although there may be some drop in the number of applications to the department as a result, we do not expect this to affect overall quality of accepted students. Department records show that only 4% of international graduate applicants were accepted to the program in the 2015-2016 admissions cycle, and that only three students accepted to the program during this period would have not met these new English requirements.

The MELAB score is unchanged because according to the Cambridge Michigan Language Assessments Organization, our existing MELAB minimum of 85 corresponds to an internet-based TOEFL of about 101, which is still sufficiently rigorous and still used by many of our peer institutions.

|  |
|--|
| <p><b>PROVIDE IMPLEMENTATION DATE: (<i>Implementation date should be at the beginning of the academic year</i>)</b></p> <p>Applications for admissions beginning in January 2017</p>               |
| <p><b>ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.</b></p>  |
| <p><b>PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):</b></p> <p>N/A</p> |
| <p><b>CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:</b></p> <p>Name: Tom Adams      Email: tadams@mcmaster.ca      Extension: 24782      Date submitted: August 2016</p>                         |

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, [cbryce@mcmaster.ca](mailto:cbryce@mcmaster.ca)

SGS/2013



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

|  |                          |  |  |
|--|--------------------------|--|--|
| <b><u>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</u></b>  |                          |  |  |
| <p>1. This form must be completed for <b><u>ALL</u></b> changes involving degree program requirements/procedures. <b><u>All</u></b> sections of this form <b><u>must</u></b> be completed.</p> <p>2. An electronic version of this form (must be in MS WORD <b><u>not</u></b> PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).</p> <p>3. A representative from the department is <b><u>required to attend</u></b> the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.</p> |                          |  |  |
| <b>DEPARTMENT</b>  |                          | Engineering Physics                                  |  |
| <b>NAME OF PROGRAM and PLAN</b>  |                          | N/A  |  |
| <b>DEGREE</b>  | M.A.Sc.                  |  |  |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>   |                          |  |  |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No   |                          |  |  |
| CREATION OF NEW MILESTONE <input type="checkbox"/>   |                          |  |  |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>  | <input type="checkbox"/> | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b> | <input type="checkbox"/>   |
| <b>CHANGE IN COURSE REQUIREMENTS</b>   | <input type="checkbox"/> | <b>CHANGE IN COURSE REQUIREMENTS</b>                 | yes  |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>   |                          | yes  | <b>EXPLAIN:</b><br>Departmental Policy on selection of ENGPYS 4H04 for the Accelerated Option to M.A.Sc. |
| <b>OTHER CHANGES</b>   | <b>EXPLAIN:</b>          |  |  |

**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

An Accelerated Option is also available to students currently enrolled at McMaster as undergraduate students in the Engineering Physics Department whereby the M.A.Sc. degree may be completed in 12-16 months of full-time study. Application for entry into the Accelerated Option occurs in the final year of undergraduate studies. Applicants must have an overall average (CGPA) of at least B at the time they are applying for the option. The Accelerated Option requires students to complete at least one term of their thesis related project with a supervisor from the department prior to completion of their undergraduate degree. A 600-level course offered by the department is required under the Accelerated Option in the final undergraduate year for advanced graduate credit.

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

In addition to the existing procedure described above, the department recommends to allow students enrolled in the Accelerated Option, to count research conducted in EngPhys 4H04 towards the Accelerated Option and therefore towards partial fulfillment of the graduate M.A.Sc. thesis work.

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

See attached letter from Dr Ray LaPierre, the department Chair.

**PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)**

Jan. 1, 2017.

**ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.**

**PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):**

An Accelerated Option is also available to students currently enrolled at McMaster as undergraduate students in the Engineering Physics Department whereby the M.A.Sc. degree may be completed in 12-16 months of full-time study. Application for entry into the Accelerated Option occurs in the final year of undergraduate studies. Applicants must have an overall average (CGPA) of at least B at the time they are applying for the option. The Accelerated Option requires students to complete at least one term on a project related to their thesis, with a supervisor from the department prior to completion of their undergraduate degree. Also, a 600-level course offered by the department is required under the Accelerated Option in the final undergraduate year for advanced graduate credit. **For students enrolled in the Accelerated Option, research conducted in ENGPYS 4H04 may count towards the Accelerated Option and therefore towards partial fulfillment of the graduate M.A.Sc. thesis work.**



**CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:**

Name: Chang-qing Xu      Email: cqxu@mcmaster.ca

Extension: 24314          Date submitted: Sept.25, 2016

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

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

|   |                                     |   |                          |
|---|-------------------------------------|---|--------------------------|
| <b>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</b>  |                                     |   |                          |
| <p>1. This form must be completed for <b>ALL</b> changes involving degree program requirements/procedures. <b>All</b> sections of this form <b>must</b> be completed.</p> <p>2. An electronic version of this form (must be in MS WORD <b>not</b> PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).</p> <p>3. A representative from the department is <b>required to attend</b> the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.</p> |                                     |   |                          |
| <b>DEPARTMENT</b>   |                                     | W Booth School of Engineering Practice and Technology                       |                          |
| <b>NAME OF PROGRAM and PLAN</b>   |                                     | Master of Engineering Design (MED)  |                          |
| <b>DEGREE</b>   | M.Eng                               |   |                          |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>  |                                     |   |                          |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input type="checkbox"/> No   |                                     |   |                          |
| CREATION OF NEW MILESTONE <input type="checkbox"/>  |                                     |   |                          |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>   | <input type="checkbox"/>            | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b>                        | <input type="checkbox"/> |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>  | <input checked="" type="checkbox"/> | <b>EXPLAIN:</b><br>Allow listed 600-level courses as advanced credit in MED |                          |
| <b>OTHER CHANGES</b>  | <input type="checkbox"/>            | <b>EXPLAIN:</b>   |                          |

**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

Advanced credit is allowed for certain 600-level courses, the department wishes to expand this option

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

Allow the following courses to be eligible for advanced credit in MED

SEP 6AS3 Advanced System Components and Integration  
SEP 6AT3 Conceptual Design of Electric and Hybrid Electric Vehicles  
SEP 6BC3 Building Science  
SEP 6DM3 Data Mining  
SEP 6PD3 Power Distribution II  
SEP 6TB3 Biotechnology III/Advanced Biotechnology  
SEP 6PM3 Management of Technical Projects  
MANUF 6RM3 Robot Mechanics and Mechatronics

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

New 600-level courses were added to the curriculum in 2016 to enhance the SEPT graduate curriculum while also building pathways for undergraduate (BTech) students into SEPT graduate programs.

**PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)**

January 2017

**ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.**

Courses were added last year, however this step was missed in the process hence the request that this approval be expedited for January 2017

**PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):**

See attached

**CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:**

Name: Yvonne Maidment Email: maidmeny@mcmaster.ca Extension: 26403 Date submitted: October 10, 2016

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

SGS/2013

[http://academiccalendars.romcmaster.ca/preview\\_program.php?catoid=20&pooid=12470&returnto=3597](http://academiccalendars.romcmaster.ca/preview_program.php?catoid=20&pooid=12470&returnto=3597)

### Engineering Design, M. Eng. Design

← Return to: [Faculty of Engineering](#)

Innovative new designs and the ability to improve performance of existing systems have become a basis for a competitive advantage in the markets. Performance, environmental sustainability, safety, and efficiency are integral parts of the requirements in the design of industrial products, large-scale systems, or software solutions. Within this complex set of constraints, successful engineers and engineering managers must be able to lead transformation of an idea to a complete design by working in interdisciplinary teams. The Master of Engineering Design program provides its participants with technical expertise and leadership capabilities required to invent novel solutions and to lead technically oriented organizations. Strong emphasis on solving engineering problems from industrial practice is accomplished via industrial motivated and supported projects.

The M.Eng. Design program emphasizes development of competencies in:

Leadership, collaboration, and management skills to lead diverse teams.

Design thinking and innovations methodologies

Engineering disciplines leading to breakthrough design and operation of systems in:

Sustainable community infrastructure (renewable energy systems, environmental systems, sustainable products and systems design, local economy)

Process industries (refining, chemicals, specialty chemicals, pharmaceuticals, power, oil and gas production, and similar)

Manufacturing of industrial and consumer products

### Admission

In addition to the general requirements for entry into a graduate program in Engineering, students must hold a 4-year engineering undergraduate degree or equivalent, with at least a B- average (equivalent to a McMaster 7.0 GPA out of 12) in the final year in all courses in the discipline, or relating to the discipline, in which the applicant proposes to do graduate work. Students with a degree in Science, Technology and Mathematics background will also be considered.

Strong letters of recommendation are also required. Each applicant will also be interviewed as part of the admission process. Professional work experience will be highly desirable.

Candidates may be enrolled on a full- or part-time basis. Full-time students will complete the degree in twelve consecutive months of study. Students are admitted for September or January. Part-time students will normally be expected to complete the program in two years.

Prospective applicants who did not attain the required standing in their undergraduate degree, but who have at least four (4) years of relevant work experience, should discuss their situation with the Program Lead. If the experience is deemed sufficient, the Program Lead may then recommend an interview. Evidence of ability to do graduate work will still be required. (See Sections [2.1.1 Admission](#)

Requirements for Master's Degree and 2.1.5 Admission of Students with Related Work Experience or Course Work beyond the Bachelor's Degree in the Graduate Calendar.)

~~Students who take Leading Innovation and/or Entrepreneurial Opportunity Identification may be granted advanced standing for these required courses upon registration in SEP programs.~~

Students may receive advanced standing for up to two the following courses (note that a maximum of two 600-level courses can count towards a SEPT graduate program).

Only a student enrolled in their final year of a Bachelors of Engineering or Technology at McMaster University immediately entering a SEPT graduate program can be eligible for advanced credit. There can be no banking, no retroactive accommodations and no offer for students outside of Engineering to participate in advanced credit options.

SEP 6AS3 / Advanced System Components and Integration

SEP 6AT3 / Conceptual Design of Electric and Hybrid Electric Vehicles

SEP 6BC3 / Building Science

SEP 6DM3 / Data Mining

SEP 6PD3 /Power Distribution II

SEP 6EL3 / Leading Innovation

SEP 6E03 / Entrepreneurial Opportunity Identification

SEP 6TB3 /Biotechnology III/Advanced Biotechnology

SEP 6PM3 / Management of Technical Projects

MANUF 6RM3 / Robot Mechanics and Mechatronics

### Curriculum

Candidates will be required to complete satisfactorily the equivalent of at least three full courses, plus full-time students must successfully complete SEP 771.

The curriculum has five main components:

- 1. Leadership and Management Capabilities** courses that will enable M.Eng. Design graduates to deal with complex situations in the work environment, to lead teams, and to manage projects.
- 2. Interdisciplinary engineering courses** in product design, project management, and risk management.
- 3. Core technical courses** that provide expert knowledge in targeted technical areas.
- 4. Elective courses** that allow students to acquire broader expertise in the technical areas which are at the centre of their studies.
- 5. An industrially oriented project** that solves complex problems requiring synthesis of knowledge from several disciplines and presenting the students with an opportunity to develop the solution in an industrial environment.

### Process and Production Systems

Master of Engineering Design program in the field of Process and Production Systems provides advanced competencies for engineers and supervisors typically working in:

Process Design

Advanced Process Control

Plant Operations

Process Industry Oriented R&D

Control Systems and Software

The following course requirements need to be fulfilled by the candidate:

### Required Courses

Candidates are required to take the following:

[SEP 760 / Design Thinking](#)

[SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum](#) (Full-students only)

[SEP 772 / Innovation Studio](#)

[SEP 773 / Leadership for Innovation](#)

### Electives

Candidates are required to select four half courses which should be selected from graduate courses offered by departments within the Faculty of Engineering. Candidates are required to have their elective course selection approved by the program lead.

#### Process Design, Process Control, or Plant Operations

Recommended courses for candidates focusing on *Process Design, Process Control, or Plant Operations* include:

[SEP 751 / Process Design and Control for Operability](#)

[SEP 752 / SYSTEMS MODELING AND OPTIMIZATION](#)

[SEP 6C03 / Statistics for Engineers](#)

[SEP 754 / Process Design and Integration for Minimal Environmental Impact](#)

[CHEM ENG 752 / Optimization of Chemical Processes](#)

[CHEM ENG 765 / Multivariate Statistical Methods for Process Analysis and Monitoring](#)

#### Control Systems Engineering

Recommended courses for students with a background or interest in *Control Systems Engineering* are:

CAS \*6CD3 / Distributed Computer Systems

CAS\*6EB3 / Database Management System Design

[CAS 704 / Embedded, Real-Time Software Systems](#)

[CAS 703 / Software Design](#)

[CHEM ENG 6E03 / Digital Computer Process Control](#)

ECE\*726/ Local Area Networks in Manufacturing Environment

[ECE 732 / Non-linear Control Systems](#)

[ECE 771 / Algorithms for Parameter and State Estimation](#)

[ECE 772 / Neural Networks and Learning Machines](#)

#### Product Design

Innovation and creative system, solutions, or product design are emphasized through problem solving via interdisciplinary teams in a design studio environment, while learning about the use of materials in product design and design for manufacturing are led by the faculty who are also members of McMaster's advanced centres (including Centre for Automotive Materials, Manufacturing Research Institute, Institute for Polymer Production Technology and the Centre for Advanced Polymer Processing

and Design). The interdisciplinary nature of the program enables its participants to work on a variety of designs, such as industrial machinery, consumer products, automotive, etc.

The following course requirements need to be fulfilled by the candidates:

### **Mandatory Courses**

Candidates are required to take the following:

[SEP 760 / Design Thinking](#)

[SEP 763 / Special Topics in Engineering Design](#)

[SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum](#) (full-time students only)

[SEP 772 / Innovation Studio](#)

[SEP 773 / Leadership for Innovation](#)

### **Electives**

Candidates are required to take three half courses which should be selected from graduate courses offered by departments within the Faculty of Engineering. Candidates are required to have their elective course selection approved by the program lead.

[SEP 760 / Design Thinking](#)

[SEP 761 / Human-Centred Design](#)

### **Sustainable Community Infrastructure**

Candidates in this field of study cover various aspects of the design of sustainable communities, including:

Public realm spaces (parks, sidewalks, recreation facilities)

Storm water management

Housing and energy efficient buildings

Development of local business

Sustainable transportation systems

Sustainable energy generation

The following course requirements need to be fulfilled by the candidates:

### **Mandatory Courses**

Candidates are required to take:

[SEP 760 / Design Thinking](#)

[SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum](#) (full-time students only)

[SEP 772 / Innovation Studio](#)

[SEP 773 / Leadership for Innovation](#)

### **Electives**



Candidates are required to take four elective courses, which should be selected from graduate courses offered by departments within the Faculty of Engineering. Suggested courses in sustainable energy systems and manufacturing are:

[SEP 6103 / Sustainable Manufacturing Processes](#)

[SEP 705 / Green Engineering, Sustainability and Public Policy](#)

[SEP 746 / Design of Sustainable Community Infrastructure](#)

[SEP 747 / Energy Efficient Buildings](#)

[SEP 748 / Development of Sustainable Communities](#)

Candidates are required to have their elective course selection approved by the program lead.

← Return to: [Faculty of Engineering](#)



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

|   |                                     |   |                          |
|---|-------------------------------------|---|--------------------------|
| <b>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</b>  |                                     |   |                          |
| <p>1. This form must be completed for <b>ALL</b> changes involving degree program requirements/procedures. <b>All</b> sections of this form <b>must</b> be completed.</p> <p>2. An electronic version of this form (must be in MS WORD <b>not</b> PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).</p> <p>3. A representative from the department is <b>required to attend</b> the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.</p> |                                     |   |                          |
| <b>DEPARTMENT</b>   |                                     | W Booth School of Engineering Practice and Technology   |                          |
| <b>NAME OF PROGRAM and PLAN</b>   |                                     | Masters<br>Master of Engineering Entrepreneurship and Innovation (MEEI)                       |                          |
| <b>DEGREE</b>   | M.Eng                               |   |                          |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>  |                                     |   |                          |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input type="checkbox"/> No   |                                     |   |                          |
| CREATION OF NEW MILESTONE <input type="checkbox"/>  |                                     |   |                          |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>   | <input type="checkbox"/>            | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b>  | <input type="checkbox"/> |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>  | <input checked="" type="checkbox"/> | <b>EXPLAIN:</b><br>Allow listed 600-level courses as advanced credit in MEEI Graduate Program |                          |
| <b>OTHER CHANGES</b>  | <input type="checkbox"/>            | <b>EXPLAIN:</b>   |                          |

**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

Advanced credit is allowed for certain 600-level courses, the department wishes to expand this option

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

Allow the following courses for advanced credit in MEEI

SEP 6X03 The Regeneration Imperative

SEP 6PM3 Management of Technical Projects

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

New 600-level courses were added to the curriculum in 2016 to enhance the SEPT graduate curriculum while also building pathways for undergraduate (BTech) students into SEPT graduate programs.

**PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)**

September 2017

**ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.**

**PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):**

See attached

**CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:**

Name: Yvonne Maidment Email: maidmeny@mcmaster.ca Extension: 26403 Date submitted: October 10, 2016

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

SGS/2013

Graduate Calendar – MEEI

- [http://academiccalendars.romcmaster.ca/preview\\_program.php?catoid=20&poid=12471&returnto=3597](http://academiccalendars.romcmaster.ca/preview_program.php?catoid=20&poid=12471&returnto=3597)

## Engineering Entrepreneurship and Innovation, M.E.E.I.

← Return to: [Faculty of Engineering](#)

The Master of Engineering Entrepreneurship and Innovation program is a fast paced program aimed at highly motivated students.

### Admission

Applications for admission will be made directly through the Walter G. Booth School of Engineering Practice. In addition to the general requirements for entry into a graduate program in Engineering, candidates applying to the Master of Engineering Entrepreneurship and Innovation program must hold an Honours Bachelor's degree in engineering or closely related discipline (i.e. science, technology, math), with at least a B- average (equivalent to a McMaster 7.0 GPA out of 12) in the final year in all courses.

Strong letters of recommendation are also required. The delivery of the program relies heavily on the synergy created between members of student teams, and successful operation of the program requires that each cohort have an appropriate blend of skills and experience. Therefore, each applicant will be interviewed. A strong performance in the interview is a critical requirement for admission.

The program will accept full- or part-time students. The full program is expected to take 16 months full-time study or 28 months part-time. Candidates are admitted for September only.

Prospective applicants who did not attain the required standing in their undergraduate degree, but who have at least four (4) years of relevant work experience, should discuss their situation with the appropriate Program Lead. If the experience is deemed sufficient, the Program Lead may then recommend an interview. Evidence of ability to do graduate work will still be required. (See Sections [2.1.1 Admission Requirements for Master's Degree](#) and [2.1.5 Admission of Students with Related Work Experience or Course Work Beyond the Bachelor's Degree](#) in the Graduate Calendar.) A candidate is required to complete successfully two one-term advanced engineering courses and the four compulsory Engineering Entrepreneurship and Innovation module courses. Additionally, full-time students must successfully complete [SEP 771](#). A faculty advisor will assist the student in selecting relevant engineering courses. Students will normally be required to complete two graduate level (700-level) engineering courses in fulfillment of the requirements for Advanced Engineering Studies. Advanced engineering studies are an integral component of the program and are offered by various departments in the Faculty of Engineering and beyond. The objective is to acquire leading-edge engineering skills and apply them to the enterprise project.

~~Students who take Leading Innovation and/or Entrepreneurial Opportunity Identification may be granted advanced standing for these required courses upon registration in SEP programs.~~

Students may receive advanced standing for up to two of the following courses (note that a maximum of two 600-level courses can count towards a SEPT graduate program).

Only a student enrolled in their final year of a Bachelors of Engineering or Technology at McMaster University immediately entering a SEPT graduate program can be eligible for advanced credit. There can be no banking, no retroactive accommodations and no offer for students outside of Engineering to participate in advanced credit options.

[SEP 6EL3 / Leading Innovation](#)

[SEP 6E03 / Entrepreneurial Opportunity Identification](#)

[SEP 6X03 / The Regeneration Imperative](#)

[SEP 6PM3 / Management of Technical Projects](#)

### **Innovation and Entrepreneurial Skills Development**

Four compulsory enterprise modules will focus on providing the Master's degree candidate basic skills to select an idea with good potential, manage the innovation process, then create and manage the business outcome. The skills will broadly cover all the business life cycle from start, growth and sustainability. The modules will develop an understanding of both the innovation and the entrepreneurial processes through lectures, workshops and hands-on work and will enable the student to fully exploit the potential of the engineering enterprise project.

Each module is considered the equivalent of a half-course as defined by the School of Graduate Studies, but will contain elements of lecture, group work, presentation and other activities as defined in the course outline. The module courses will be delivered in an intensive format; and it is expected that students will take the module courses in sequenced numerical order. The module courses are:

[SEP 6E03 / Entrepreneurial Opportunity Identification](#)

[SEP 773 / Leadership for Innovation](#)

[SEP 753 / Enterprise Opportunity Development](#)

[SEP 755 / Business Launch and Development](#)

All full-time candidates are required to successfully complete:

[SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum](#)

[SEP 772 / Innovation Studio](#)

### **Engineering Enterprise Project**

The Engineering Enterprise Project will run throughout the entire study period and will result in both a business and a technical plan for an engineering prototype product (ideally with an actual prototype device or software produced) with an identified customer base and a plan outlining the way to commercialization. The project will bring together the two complementary streams of activities, one technical and the other entrepreneurial, to bring an idea to the proof of concept phase. The Entrepreneurial course stream, which will run coincidentally with the advanced engineering studies, will guide the technological work performed in the research laboratory so that the concept becomes, by the end of the degree, the nucleus of a business proposition. The Engineering Enterprise Project will have three phases, which will end with project gate assessments to determine the project's readiness to proceed to the next phase:

#### **Phase 1 - Project Preparation**

Market research to arrive at a proposed product or service with clear value proposition; define the market for the intended product or service revealing competitive threat, opportunities, and margins and volumes projections; draw up development plans for the product or service indicating the required

resources and estimated investment cost; seek the resources within the university and without; build a team of support that might include a partner.

### **Phase 2 - Technical Research and the Development of the Engineering Prototype**

Develop an engineering research plan, identifying key issues and opportunities (with the assistance of academic technical and business supervisors); conduct technical research and development; implement the engineering research plan within the research group in the host-engineering department; build a development network within the engineering research community; ready the technology for transfer to market; conduct initial market engagement to get customer feedback and reactions.

### **Phase 3 - Technology Transfer to Market:**

Apply for IP protection; develop a path-to-market strategy; develop a business case; present to funding institutions and explore business arrangements; plan for business start-up. Each phase has two equally important components, one technical and the other business:

The Phase 3 evaluation will be a defense of your project in an oral examination to your board (technical mentor, enterprise advisor, business advisor and your business mentor). Candidates are required to complete and pass through each phase in order to graduate.

### **Peer Evaluation and the Enterprise Project**

The ability to effectively work in a team environment is an important learning outcome of team-based project work on the Enterprise project, as in individual learning outcomes developed in a team environment. Candidates will be mentored on their progress in this aspect by their enterprise advisor based on input from their peers in the project team and from assessment of the enterprise advisor. Team member evaluations will be collected in confidence from team members by the enterprise advisor, or their designate, on a six-month basis. Every six months the Enterprise Advisor will review the performance of the individual candidate in the team with the candidate. The enterprise advisor will generate an assessment of performance. To successfully complete the program, the candidate must maintain an average rating of “Good” over the span of the enterprise project in team assessment and demonstrate individual achievement in team experienced learning outcomes.

← Return to: [Faculty of Engineering](#)

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

|  |   |   |                          |
|--|---|---|--------------------------|
| <b>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</b>   |   |   |                          |
| 1. This form must be completed for <b>ALL</b> changes involving degree program requirements/procedures. <b>All</b> sections of this form <b>must</b> be completed.<br>2. An electronic version of this form (must be in MS WORD <b>not</b> PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).<br>3. A representative from the department is <b>required to attend</b> the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed. |   |   |                          |
| <b>DEPARTMENT</b>  | W Booth School of Engineering Practice and Technology     |   |                          |
| <b>NAME OF PROGRAM and PLAN</b>  | Master of Engineering in Manufacturing Engineering (MEME) |   |                          |
| <b>DEGREE</b>  | M.Eng   |   |                          |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>   |   |   |                          |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input type="checkbox"/> No  |   |   |                          |
| CREATION OF NEW MILESTONE <input type="checkbox"/>   |   |   |                          |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>  | <input type="checkbox"/>                                  | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b>  | <input type="checkbox"/> |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>   | <input checked="" type="checkbox"/>                       | <b>EXPLAIN:</b><br>Allow listed 600-level courses as advanced credit in MEME Graduate Program |                          |
| <b>OTHER CHANGES</b>   | <b>EXPLAIN:</b>   |   |                          |



**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

Advanced credit is allowed for certain 600-level courses, the department wishes to expand this option.

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

Allow the following courses for advanced credit in MEME

SEP 6AS3 Advanced System Components and Integration  
SEP 6AT3 Conceptual Design of Electric and Hybrid Electric Vehicles  
SEP 6DM3 Data Mining  
MANUF 6RM3 Robot Mechanics and Mechatronics

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

New 600-level courses were added to the curriculum in 2016 to enhance the SEPT graduate curriculum while also building pathways for undergraduate (BTech) students into SEPT graduate programs.

**PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)**

January 2017

**ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.**

Courses were added last year, however this step was missed in the process hence the request that this approval be expedited for January 2017. This is also important as there are plans to expand the enrolment in this program commencing in January 2017.

**PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):**

See attached

**CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:**

Name: Yvonne Maidment Email: maidmeny@mcmaster.ca Extension: 26403 Date submitted: October 10, 2016

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

SGS/2013

Graduate Calendar –

MEME [http://academiccalendars.romcmaster.ca/preview\\_program.php?catoid=20&poid=12499&return-to=3597](http://academiccalendars.romcmaster.ca/preview_program.php?catoid=20&poid=12499&return-to=3597)

### Engineering in Manufacturing Engineering, M.E.M.E.

← Return to: [Faculty of Engineering](#)

The Master of Engineering in Manufacturing Engineering is a one and a half-year program aimed at highly motivated students seeking advanced training in the broad area of Manufacturing. Application for admission to the program may be made through the Walter G. Booth School of Engineering Practice. The program accepts full-time and part-time students.

In addition to the general requirements for entry into a graduate program in Engineering, students must hold an Honours Bachelor's degree in Engineering with at least a B average (equivalent to a McMaster 8.0/12 GPA) in the penultimate and final years.

Delivery of the program includes a strong emphasis on project-based experience within the Manufacturing Industry, which is obtained through an industry-based project during the coursework portion of the program. Requirements for these are outlined below. Due to the strong practical orientation of the project components of the program, successful completion requires that students have strong interpersonal and communication skills. To this end, each applicant will be interviewed. A strong performance in the interview is a critical requirement for admission.

Students may receive advanced standing for up to two of the following courses (note that a maximum of two 600-level courses can count towards a SEPT graduate program).

Only a student enrolled in their final year of a Bachelors of Engineering or Technology at McMaster University immediately entering a SEPT graduate program can be eligible for advanced credit. There can be no banking, no retroactive accommodations and no offer for students outside of Engineering to participate in advanced credit options.

[SEP 6AS3 / Advanced System Components and Integration](#)

[SEP 6AT3 / Conceptual Design of Electric and Hybrid Electric Vehicles](#)

[SEP 6DM3 / Data Mining](#)

[SEP 6PD3 / Power Distribution II](#)

[MANUF 6RM3 / Robot Mechanics and Mechatronics](#)

### Innovation and Entrepreneurial Skills Development

Four compulsory enterprise modules will focus on providing the Master's degree candidate basic skills to select an idea with good potential, manage the innovation process, then create and manage the business outcome. The skills will broadly cover all the business life cycle from start, growth and sustainability. The modules will develop an understanding of both the innovation and the entrepreneurial processes through lectures, workshops and hands-on work and will enable the student to fully exploit the potential of the engineering enterprise project.

Each module is considered the equivalent of a half-course as defined by the School of Graduate Studies, but will contain elements of lecture, group work, presentation and other activities as defined in the

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course outline. The module courses will be delivered in an intensive format; and it is expected that students will take the module courses in sequenced numerical order. The module courses are:

[SEP 6E03 / Entrepreneurial Opportunity Identification](#)

[SEP 773 / Leadership for Innovation](#)

[SEP 753 / Enterprise Opportunity Development](#)

[SEP 755 / Business Launch and Development](#)

All full-time candidates are required to successfully complete:

[SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum](#)

[SEP 772 / Innovation Studio](#)

### Project

Students must complete a suitable industry-based project. Projects will normally be performed individually or by groups of two to three students which could be multi-disciplinary in composition. Projects should address a specific problem found in a manufacturing facility related to trouble-shooting, re-design or optimization. The problem should not be focused on the design of new processes or products as that lies beyond the purview of this program. It is expected that the majority of the projects will be developed from work undertaken during co-op or graduate employment experience and students should look for opportunities to develop projects with their employers. Students are also encouraged to develop their own ideas and find industrial sponsors. Identification of this project is the responsibility of the student and must be provided to the program director at the time of applying to the program. Projects are ideally undertaken at local companies but may be conducted at locations inside Canada or abroad with the Director's approval and provided that none of the work on the project was done prior to admission into the program. Project groups or individuals will have an industry-based supervisor (stakeholder) with whom the student team can discuss progress, arrange trials etc. Students will also have an academic supervisor who will normally have some expertise in the subject area. It is expected that the teams will meet with their supervisors on a regular basis to discuss their progress.

Projects will have three "tollgate" stages. Student groups must submit a project proposal by the end of September to their academic and industrial supervisors for approval of scope, deliverables and timeline. The interim project report, outlining progress-to-date, is due at the end of the fall semester for approval by the academic and industrial supervisors. The final written project report is normally due at the end of the winter semester. However, if the supervisors agree that the project group has not made sufficient progress by this point, they are free to request further work to meet the standards of the program. The project team will orally defend their final project report to an examination board comprised of their industrial supervisor, academic supervisor and program Director (Chair) or designate.

← Return to: [Faculty of Engineering](#)





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

|   |                                     |   |                          |
|---|-------------------------------------|---|--------------------------|
| <b>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</b>  |                                     |   |                          |
| <p>1. This form must be completed for <b>ALL</b> changes involving degree program requirements/procedures. <b>All</b> sections of this form <b>must</b> be completed.</p> <p>2. An electronic version of this form (must be in MS WORD <b>not</b> PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).</p> <p>3. A representative from the department is <b>required to attend</b> the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.</p> |                                     |   |                          |
| <b>DEPARTMENT</b>   |                                     | W Booth School of Engineering Practice and Technology   |                          |
| <b>NAME OF PROGRAM and PLAN</b>   |                                     | Master of Engineering and Public Policy (MEPP)  |                          |
| <b>DEGREE</b>   | M.Eng                               |   |                          |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>  |                                     |   |                          |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input type="checkbox"/> No   |                                     |   |                          |
| CREATION OF NEW MILESTONE <input type="checkbox"/>  |                                     |   |                          |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>   | <input type="checkbox"/>            | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b>  | <input type="checkbox"/> |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>  | <input checked="" type="checkbox"/> | <b>EXPLAIN:</b><br>Allow listed 600-level courses as advanced credit in the MEPP Graduate Program |                          |
| <b>OTHER CHANGES</b>  | <input type="checkbox"/>            | <b>EXPLAIN:</b>   |                          |

**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

Advanced credit is allowed for certain 600-level courses, the department wishes to expand this option

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

Allow the following courses for advanced credit in MEPP

SEP 6X03 The Regeneration Imperative

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

New 600-level course was added to the curriculum in 2016 to enhance the program curriculum while also building pathways for undergraduate students into the MEPP graduate program.

**PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)**

September 2017

**ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.**

**PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):**

See attached

**CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:**

Name: Yvonne Maidment Email: maidmeny@mcmaster.ca Extension: 26403 Date submitted: October 10, 2016

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

SGS/2013



Graduate Calendar – MEPP -

[http://academiccalendars.romcmaster.ca/preview\\_program.php?catoid=20&poid=12476&returnto=3597](http://academiccalendars.romcmaster.ca/preview_program.php?catoid=20&poid=12476&returnto=3597)

## Engineering and Public Policy, M.E.P.P.

← Return to: [Faculty of Engineering](#)

In today's complex world engineers and scientists are called upon to design technical systems that provide goods and services to society in a safe, efficient and environmentally sound manner. In this context, engineers and scientists can serve as key advisors to and take the lead as decision makers in both the public and private sectors. Therefore, engineers and scientists need more than extensive technical skills; you need an enhanced understanding of public policy and the role of engineering and science in sustainable technological, social, ecological and economic systems.

A professional Master's degree in Engineering and Public Policy (MEPP) is offered within the Walter G. Booth School of Engineering Practice. Engineers and applied scientists from a wide cross-section of organizations who want professional graduate training will find our program goes well beyond a conventional technical Master's to develop candidates as leaders in the public policy area. The ideal candidate will have an undergraduate degree in engineering or applied science and 3-5 years of professional work experience.

### Admission

In addition to the general requirements for entry into a graduate program in Engineering, students must hold a 4-year engineering, science, technology or mathematics undergraduate degree, with at least a B-average (equivalent to a McMaster 7.0 GPA out of 12) in the final year in all courses in the discipline, or relating to the discipline, in which the applicant proposes to do graduate work. Each applicant will also be interviewed as part of the admission process. Professional work experience is desirable but not essential.

Candidates may be enrolled on a full- or part-time basis. Students are admitted for September or January.

Prospective applicants who did not attain the required standing in their undergraduate degree, but who have at least four (4) years of relevant work experience, should discuss their situation with the Program Lead. If the experience is deemed sufficient, the Program Lead will recommend an interview. Evidence of ability to do graduate work will be required. (See Sections [2.1.1 Admission Requirements](#) for Master's Degree and [2.1.3 Admission of Students with Related Work Experience or Course Work Beyond the Bachelor's Degree](#) in the Graduate Calendar.)

The Walter G. Booth School of Engineering Practice has the following program objectives for the Master's degree in Engineering and Public Policy (MEPP):

- to provide a high quality educational experience to graduate engineers and scientists in the areas of engineering, science and public policy;
- to foster applied research in the areas of engineering, science and public policy through the successful completion and dissemination of a research paper;
- to develop viable, working linkages between engineering, science and fields of study within social sciences and the humanities (public policy, economics, society, and others);

to nurture a diverse group of students who will be active participants within the broader range of activities in the Walter G. Booth School of Engineering Practice;  
to produce graduates who will provide inspired leadership in the engineering, science and public policy areas within the public, private and NGO sectors.

Candidates may be enrolled on a full- or part-time basis. Full-time students will complete the degree in twelve consecutive months of study, beginning in September or January. Part-time students will normally be expected to complete the program in two years.

~~Students who take Leading Innovation and/or Entrepreneurial Opportunity Identification may be granted advanced standing for these required courses upon registration in SEP programs.~~

Students may receive advanced standing for up to two of the following courses (note that a maximum of two 600-level courses can count towards a SEPT graduate program).

Only a student enrolled in their final year of a Bachelors Degree at McMaster University immediately entering a SEPT graduate program can be eligible for advanced credit. There can be no banking and no retroactive accommodations participate in advanced credit options.

[SEP 6EL3 / Leading Innovation](#)

[SEP 6E03 / Entrepreneurial Opportunity Identification](#)

[SEP 6X03 / The Regeneration Imperative](#)

## Curriculum

The curriculum has four main components:

Core courses that provide the content and methodological skills necessary for understanding and analyzing societal issues for which engineering and science can contribute to public policy solutions;

Focus elective courses that allow students to deepen their knowledge of a range of engineering, science and social science applications;

The completion of a substantive research paper on a problem at the interface of engineering, science and public policy;

Attendance and participation at an intensive workshop/seminar week on engineering and public policy.

### **Research Project - Inquiry/Thesis in Engineering and Public Policy**

Students select a research topic at the interface of engineering, science and public policy which is of interest to them and carries out inquiry-driven research; completes a formal research paper and prepares to publish their results for broad dissemination.

Candidates for the MEPP degree will follow a program consisting of the following:

### **Required Courses**

Four half-courses:

[SEP 701 / Theory and Practice of Policy Analysis: Frameworks and Models](#)

[SEP 702 / Systems Engineering and Public Policy](#)

[SEP 709 / Emerging Issues, Technology and Public Policy](#)

[SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum](#) (Full-time students only)

[SEP 772 / Innovation Studio](#)

[SEP 773 / Leadership for Innovation](#)

### **Focus Elective Courses**

Three half-courses are required for electives. Students may select from the following options:

[SEP 6I03 / Sustainable Manufacturing Processes](#)

[SEP 6X03 / THE REGENERATION IMPERATIVE: Liveable Cities Revitalization of Built and Natural Assets](#)

[SEP 703 / Applied Microeconomics and Environmental Economics](#)

[SEP 705 / Green Engineering, Sustainability and Public Policy](#)

[SEP 706 / Energy and Public Policy](#)

[SEP 707 / Communication Technology and Public Policy](#)

[SEP 708 / Special Topics in Engineering and Public Policy](#)

[SEP 710 / International Governance and Environmental Sustainability](#)

[SEP 756 / International Water Policy](#)

[POL SCI 784 / Quantitative Political and Policy Analysis](#)

[POL SCI 785 / Public Sector Management](#)

[POL SCI 786 / Organizational Theory and the Public Sector](#)

[POL SCI 790 / The Politics of Economic Policy in Market Economies](#)

### **Additional Courses**

Up to two graduate engineering half courses from departments within the Faculty of Engineering

Other courses in other departments and Faculties with approval of the Director of the program.

← Return to: [Faculty of Engineering](#)



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

|   |                                     |  |                          |
|---|-------------------------------------|--|--------------------------|
| <b>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</b>  |                                     |  |                          |
| <p>1. This form must be completed for <b>ALL</b> changes involving degree program requirements/procedures. <b>All</b> sections of this form <b>must</b> be completed.</p> <p>2. An electronic version of this form (must be in MS WORD <b>not</b> PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).</p> <p>3. A representative from the department is <b>required to attend</b> the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.</p> |                                     |  |                          |
| <b>DEPARTMENT</b>   |                                     | W Booth School of Engineering Practice and Technology  |                          |
| <b>NAME OF PROGRAM and PLAN</b>   |                                     | Masters<br>Master of Technology Entrepreneurship and Innovation (MTEI)                         |                          |
| <b>DEGREE</b>   | M.Eng                               |  |                          |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>  |                                     |  |                          |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input type="checkbox"/> No   |                                     |  |                          |
| CREATION OF NEW MILESTONE <input type="checkbox"/>  |                                     |  |                          |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>   | <input type="checkbox"/>            | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b>   | <input type="checkbox"/> |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>  | <input checked="" type="checkbox"/> | <b>EXPLAIN:</b><br>Allow listed 600-level courses as advanced credit in MTEI Graduate Programs |                          |
| <b>OTHER CHANGES</b>  | <input type="checkbox"/>            | <b>EXPLAIN:</b>  |                          |

**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

Advanced credit is allowed for certain 600-level courses, the department wishes to expand this option

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

Allow the following courses for advanced credit in MTEI

SEP 6X03 The Regeneration Imperative

SEP 6PM3 Management of Technical Projects

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

New 600-level courses were added to the curriculum in 2016 to enhance the SEPT graduate curriculum while also building pathways for undergraduate (BTech) students into SEPT graduate programs.

**PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)**

September 2017

**ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.**

**PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):**

See attached

**CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:**

Name: Yvonne Maidment Email: maidmeny@mcmaster.ca Extension: 26403 Date submitted: October 10, 2016

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

SGS/2013

Graduate Calendar –

MTEI [http://academiccalendars.romcmaster.ca/preview\\_program.php?catoid=20&poid=12539&returno=3597](http://academiccalendars.romcmaster.ca/preview_program.php?catoid=20&poid=12539&returno=3597)

## Technology Entrepreneurship and Innovation, M.T.E.I.

← Return to: [Faculty of Engineering Admission](#)

While students in the Technology Entrepreneurship and Innovation program are not expected to have any engineering or scientific background, they are expected to embrace creativity and innovation. Some basic familiarity with technology is expected, but the required technological depth will depend on the project itself and will be evaluated on a case-by-case basis. Considerable emphasis will be placed on team-based experiential learning in which all members of the team will learn from each other as they complete the project.

Applications for admission will be made directly through the Walter G. Booth School of Engineering Practice. In addition to the general requirements for entry into a graduate program in Engineering, candidates applying to the Master of Technology Entrepreneurship and Innovation program must hold an Honours Bachelor's degree from any discipline, with at least a B- average (equivalent to a McMaster 7.0 GPA out of 12) students in the final year in all courses in the discipline, or relating to the discipline, in which the applicant proposes to do graduate work.

Strong letters of recommendation are also required. The delivery of the program relies heavily on the synergy created between members of student teams, and successful operation of the program requires that each cohort have an appropriate blend of skills and experience. Therefore each applicant will be interviewed. A strong performance in the interview is a critical requirement for admission.

The program will accept full- or part-time students. The full program is expected to take 16 months full-time study or 28 months part-time. Candidates are admitted for September only.

Prospective applicants who did not attain the required standing in their undergraduate degree, but who have at least four (4) years of relevant work experience, should discuss their situation with the Program Lead. If the experience is deemed sufficient, the Program Lead may then recommend an interview. Evidence of ability to do graduate work will still be required (see sections [2.1.1 Admission Requirements for Master's Degree](#) and [2.1.5 Admission of Students with Related Work Experience or Course Work Beyond the Bachelor's Degree](#) in the Graduate Calendar.)

A candidate is required to complete successfully two one-term advanced graduate courses and the four compulsory Entrepreneurship and Innovation module courses. Additionally, full-time students must successfully complete [SEP 771](#). A faculty advisor will assist the student in selecting relevant graduate courses. Students will normally be required to complete two graduate level (700 -level) graduate courses in fulfillment of the requirements for Advanced Studies. Advanced studies are an integral component of the program and are offered by various departments in the Faculty of Engineering and beyond. The objective is to acquire leading-edge skills and apply them to the enterprise project.

~~Students who take Leading Innovation and/or Entrepreneurial Opportunity Identification may be granted advanced standing for these required courses upon registration in SEP programs.~~

In addition, students may receive advanced standing for the following courses (note that a maximum of two 600-level courses can count towards a SEPT graduate program).

Only a student enrolled in their final year of a degree at McMaster University immediately entering a SEPT graduate program can be eligible for advanced credit. There can be no banking, no retroactive accommodations of advanced credit options.

[SEP 6EL3 / Leading Innovation](#)

[SEP 6E03 / Entrepreneurial Opportunity Identification](#)

[SEP 6X03 / The Regeneration Imperative](#)

[SEP 6PM3 / Management of Technical Projects](#)

### **Innovation and Entrepreneurial Skills Development**

Four compulsory enterprise modules will focus on providing the Master's degree candidate with basic skills to select an idea with good potential, manage the innovation process, then create and manage the business outcome. The skills will broadly cover all the business cycle from start, growth and sustainability. The modules will develop an understanding of both the innovation and the entrepreneurial processes through lectures, workshops and hands-on work, and will enable the student to fully exploit the potential of the engineering enterprise project. Each module is considered the equivalent of a half-course as defined by the School of Graduate Studies, but will contain elements of lecture, group work, presentation and other activities as defined in the course outline. The module courses will be delivered in an intensive format; and it is expected that students will take the module courses in sequenced numerical order. The module courses are:

[SEP 6E03 / Entrepreneurial Opportunity Identification](#) (Module 1)

[SEP 773 / Leadership for Innovation](#)

[SEP 753 / Enterprise Opportunity Development](#)

[SEP 755 / Business Launch and Development](#)

All full-time candidates are required to successfully complete:

[SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum](#)

[SEP 772 / Innovation Studio](#)

### **Enterprise Project**

The Enterprise Project will run throughout the entire study period and will result in both a business and a technical plan for an engineering prototype product (ideally with an actual prototype device or software produced) with an identified customer base and a plan outlining the way to commercialization. The project will bring together complementary streams of activities to bring an idea to the proof of concept phase. The core Entrepreneurial course stream, will guide the technological work performed in the research laboratory so that the concept becomes, by the end of the degree, the nucleus of a business proposition. The Enterprise project development will be supported by two additional graduate level courses.

The Enterprise Project will have three phases, which will end with project gate assessments to determine the project's readiness to proceed to the next phase:

#### **Phase 1 - Project Preparation**



Market research to arrive at a proposed product or service with clear value proposition; define the market for the intended product or service revealing competitive threat, opportunities, and margins and volumes projections; draw up development plans for the product or service indicating the required resources and estimated investment cost; seek the resources within the university and without; build a team of support that might include a partner.

### **Phase 2 - Technical Research and the Development of the Prototype**

Develop a research plan, identifying key issues and opportunities (with the assistance of academic technical and business supervisors); conduct technical research and development; implement the engineering research plan within the research group in the host-engineering department; build a development network within the engineering research community; ready the technology for transfer to market; conduct initial market engagement to get customer feedback and reactions.

### **Phase 3 - Technology Transfer to Market**

Apply for IP protection; develop a path-to-market strategy; develop a business case; present to funding institutions and explore business arrangements; plan for business start-up. Each phase has two equally important components, one technical and the other business:

#### **Phase I**

Concept initiation proposal; Technology development plan presentation and documentation

#### **Phase II**

Technical Proof-of-concept; Draft financial plan presentation and documentation

#### **Phase III**

Business Strategy and Go-to-market plan or a Venture feasibility presentation and documentation

The Phase III evaluation will be a defence of your project in an oral examination to your board (technical mentor, enterprise advisor, business advisor and your business mentor). Candidates are required to complete and pass through each phase in order to graduate.

### **Peer Evaluation and the Enterprise Project**

The ability to effectively work in a team environment is an important learning outcome of team-based project work on the Enterprise project, as in individual learning outcomes developed in a team environment. Candidates will be mentored on their progress in this aspect by their enterprise advisor based on input from their peers in the project team and from assessment of the enterprise advisor. Team member evaluations will be collected in confidence from team members by the enterprise advisor, or their designate, on a six-month basis. Every six months the Enterprise Advisor will review the performance of the individual candidate in the team with the candidate. The enterprise advisor will generate an assessment of performance. To successfully complete the program, the candidate must maintain an average rating of "Good" over the span of the enterprise project in team assessment and demonstrate individual achievement in team experienced learning outcomes.

← Return to: [Faculty of Engineering](#)

 [Return to: Faculty of Engineering](#)

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

|   |  |   |  |
|---|--|---|--|
| <b>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</b>  |  |   |  |
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| <b>DEPARTMENT</b>   | WBooth School of Engineering Practice and Technology |   |  |
| <b>NAME OF PROGRAM and PLAN</b>   | Manufacturing Engineering                            |   |  |
| <b>DEGREE</b>   | Master of Engineering in Manufacturing Engineering   |   |  |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>  |  |   |  |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |  |   |  |
| CREATION OF NEW MILESTONE <input type="checkbox"/>  |  |   |  |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>   | <input type="checkbox"/>                             | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b>  | <input type="checkbox"/>   |
|   |  |   | <b>CHANGE IN COURSE REQUIREMENTS</b> <input checked="" type="checkbox"/> |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>  | <input checked="" type="checkbox"/>                  | <b>EXPLAIN:</b><br>Description needs to be changed to reflect the proposed changes in course options. |  |
| <b>OTHER CHANGES</b>  | <input type="checkbox"/>                             | <b>EXPLAIN:</b>   |  |

**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

The current MEME program requires that only courses from Chemical, Materials, and Mechanical Engineering departments are eligible to be taken without special approval.

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

Proposal is to approve a list of courses outside of Chemical, Mechanical, or Materials departments which can be taken towards MEME degree without a special approval. Maximum of 2 courses outside of chemical, Mechanical, or Materials departments can be taken for credit towards MEE degree.

Complete list of courses to be approved as eligible to be taken towards MEME degree without special approval is attached on a separate sheet.

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

Broadening the range of options for Manufacturing related studies to offer greater opportunities for program growth.

**PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)**

The proposal is that the additional courses be approved for use as of January 1, 2017. This will enable simplification for the enrollment of a new cohort of students in January 2017.

**ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.**

It includes existing course in several Engineering departments and also two new (currently being proposed) courses from SEPT.

SEP 7x1 Additive Manufacturing

**PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):**

See attached

**CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:**

Name: Vladimir Mahalec Email: [mahalec@mcmaster.ca](mailto:mahalec@mcmaster.ca) Extension: 26386 Date submitted:

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, [cbryce@mcmaster.ca](mailto:cbryce@mcmaster.ca)

## Course Calendar Track Changes

[http://academiccalendars.romcmaster.ca/preview\\_program.php?catoid=20&poid=12499&returnto=3597](http://academiccalendars.romcmaster.ca/preview_program.php?catoid=20&poid=12499&returnto=3597)

All full-time candidates are required to successfully complete [SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum](#)

### Courses

#### Compulsory Courses:

[MANUF 701 / Project](#)

[SEP 771 / W Booth School of Engineering Practice and Technology Practitioner's Forum](#) (Full-time students only)

#### Additional Information for SEP 771

This is a seminar series presented by guest speakers, invited by the School, of relevance to all Centres. All full-time students are required to take this course in both fall and winter terms. Course grades are either 'pass' or 'fail'. In order to pass the course the student must attend a minimum of 80% of the seminars.

#### Optional Courses

Students will select any combination from the list below totaling six half courses, of which a maximum of two half courses can be taken at the 600 level. Two of these 600 level courses can be taken in the final undergraduate year for graduate credit. Other manufacturing-related courses may be substituted with permission of the Director. Note that not all courses are offered every year.

#### ~~Manufacturing Engineering Courses~~

~~[MANUF 6RM3 / Robot Mechanics and Mechatronics](#)~~

~~[MANUF 710 / SYSTEM ANALYSIS SIMULATION](#)~~

#### Chemical Engineering

[CHEM ENG 6B03 / Polymer Reaction Engineering](#)

[CHEM ENG 6C03 / Statistics for Engineers](#)

[CHEM ENG 6E03 / Digital Computer Process Control](#)

[CHEM ENG 6X03 / Polymer Processing](#)

[CHEM ENG 6Z03 / Interfacial Engineering](#)

[CHEM ENG 742 / Membrane Based Bioseparations](#)

[CHEM ENG 752 / Optimization of Chemical Processes](#)

[CHEM ENG 753 / Systems Modeling and Optimization](#)

[CHEM ENG 761 / Multivariable, Stochastic and Adaptive Control of Chemical Processes](#)

[CHEM ENG 764 / Process Control Design](#)

[CHEM ENG 765 / Multivariate Statistical Methods for Process Analysis and Monitoring](#)

[CHEM ENG 770 / Selected Topics in Polymer Science and Engineering](#)

[CHEM ENG 772 / Polymer Rheology](#)

[CHEM ENG 773 / Advanced Concepts of Polymer Extrusion](#)

[CHEM ENG 774 / Advances in Polymeric Materials](#)

[CHEM ENG 782 / Biopharmaceuticals](#)

[CHEM ENG 791 / Nanotechnology in Chemical Engineering](#)

#### Materials Science and Engineering

[MATLS 6C03 / Modern Iron and Steelmaking](#)  
[MATLS 6D03 / Corrosion](#)  
[MATLS 6H03 / Thin Film Science and Engineering](#)  
[MATLS 6I03 / Sustainable Manufacturing Processes](#)  
[MATLS 6P03 / Properties of Polymeric Materials](#)  
[MATLS 6R03 / Ceramic Science](#)  
[MATLS 6T03 / Properties and Processing of Composites](#)  
[ENGINEER 6T04 / Materials Selection in Design and Manufacturing](#)  
[MATLS 740 / Interfacial Phenomenon in Materials Science](#)  
[MATLS 743 / Advanced Topics in corrosion Science and Engineering](#)  
[MATLS 754 / Fracture Mechanics](#)  
[MATLS 755 / Deformation of Crystalline Solids](#)  
[MATLS 760 / Electronic Materials](#)  
[MATLS 765 / Selected Topics in Polymer Science & Engineering](#)  
[MATLS 771 / Principles of Heterogeneous Kinetics](#)  
[MATLS 773 / Properties of Metallurgical Slags](#)  
[MATLS 774 / Injection Metallurgy](#)  
[MATLS 775 / Physical and Mathematical Modelling in Materials Processing](#)  
[MATLS 780 / Metallic and Non-metallic Coatings](#)

### **Mechanical Engineering**

[MECH ENG 6B03 / Topics in Product Development](#)  
[MECH ENG 6K03 / Robotics](#)  
[MECH ENG 6L03 / Industrial Design](#)  
[MECH ENG 6Q03 / Mechanical Vibrations](#)  
[MECH ENG 6T03 / Finite Element Applications](#)  
[MECH ENG 6Z03 / CAD/CAM/CAE](#)  
[MECH ENG 702 / Advanced Dynamics of Machines](#)  
[MECH ENG 705 / Advanced Finite Element Analysis](#)  
[MECH ENG 710 / Machine Tool Analysis](#)  
[MECH ENG 714 / Solidification Processing](#)  
[MECH ENG 724 / Solid and Surface Modeling Techniques](#)  
[MECH ENG 728 / Manufacturing Processes I](#)  
[MECH ENG 729 / Manufacturing Systems](#)  
[MECH ENG 734 / Theory of Plasticity](#)  
[MECH ENG 738 / Manufacturing Processes II](#)  
[MECH ENG 743 / Advanced Mechatronics](#)  
[MECH ENG 751 / Advanced Mechanical Engineering Control Systems](#)  
[MECH ENG 752 / Advanced MEMS Fabrication and Microfluidics](#)

**A maximum of two courses can be selected from the following list:**

### **Electrical Engineering**

[ECE 736 / 3D Image Processing and Computer Vision](#)  
[ECE 744 / System on a Chip \(SOC\) Design and Test Part I Methods](#)  
[ECE 772 / Algorithms for Parameter State Estimation](#)  
[ECE 710/ Engineering Optimization](#)  
[ECE 732/ Nonlinear Control Systems](#)  
[ECE 778/ Introduction to Nanotechnology](#)

**Software Engineering**

SFWR ENG 6HC3 / The Human Computer Interface

**Computer Science**

COMP SCI 6TE3 / Continuous Optimization Algorithms

COMP SCI 6F03 / Distributed Computer Systems

**Computing and Software**

CAS 771 / Introduction to Big Data Systems and Applications

CAS 767 / Information Privacy and Security

**School of Engineering Practice and Technology**

SEP 6AS3 / Advanced System Components and Integration

SEP 6AT3 / Conceptual Design of Electric and Hybrid Electric Vehicles

SEP 6DM3 / Data Mining

SEP 748 / Development of Local Sustainable Communities

SEP 751 / Process Design and Control for Operability

SEP 752 / Systems Modeling and Optimization

SEP 754 / Process Design and Integration for Minimal Environmental Impact

SEP 780 / Advanced Robotics and Automation

SEP 7XX / Additive Manufacturing

**Manufacturing Engineering**

MANUF 6RM3 / Robot Mechanics and Mechatronics

MANUF 710 / SYSTEM ANALYSIS SIMULATION

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

|   |  |  |                          |
|---|--|--|--------------------------|
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| <b>DEPARTMENT</b>   | WBooth School of Engineering Practice and Technology |  |                          |
| <b>NAME OF PROGRAM and PLAN</b>   | Manufacturing Engineering                            |  |                          |
| <b>DEGREE</b>   | Master of Engineering in Manufacturing Engineering   |  |                          |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>  |  |  |                          |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |  |  |                          |
| CREATION OF NEW MILESTONE <input type="checkbox"/>  |  |  |                          |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>   | <input type="checkbox"/>                             | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b>   | <input type="checkbox"/> |
|   |  | <b>CHANGE IN COURSE REQUIREMENTS</b>   | x                        |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>  | x  | <b>EXPLAIN:</b><br>Description needs to be changed to reflect the proposed changes in project requirements |                          |
| <b>OTHER CHANGES</b>  | <b>EXPLAIN:</b>                                      |  |                          |



**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

Current MEME program requires 6 courses plus Master's project.

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

Proposal is to provide two options for MEME completion: (i) requires either completion of 6 graduate courses plus a Master's project, or (ii) completion of 8 graduate courses.

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

Existing requirement that all students in MEME must complete a project at an industrial company has severely limited enrollment of the students to MEME program. Most importantly, part time students have difficulties fulfilling requirements of their jobs, completing graduate level courses, and also completing a Master's project.

**PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)**

Option to complete MEME degree by taking either 8 courses or 6 courses plus Master's project is to take effect in Sept. 2017.

**ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.**

It includes existing course in several Engineering departments and also two new (currently being proposed) courses from SEPT.

SEP 7x1 Additive Manufacturing

**PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):**

See attached

**CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:**

Name: Vladimir Mahalec Email: [mahalec@mcmaster.ca](mailto:mahalec@mcmaster.ca) Extension: 26386 Date submitted:

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, [cbryce@mcmaster.ca](mailto:cbryce@mcmaster.ca)

## Course Calendar Program Listing – Track Changes

[http://academiccalendars.romcmaster.ca/preview\\_program.php?catoid=20&poid=12499&returnto=3597](http://academiccalendars.romcmaster.ca/preview_program.php?catoid=20&poid=12499&returnto=3597)

The Master of Engineering in Manufacturing Engineering is a one and a half-year program aimed at highly motivated students seeking advanced training in the broad area of Manufacturing. Application for admission to the program may be made through the Walter G. Booth School of Engineering Practice. The program accepts full-time and part-time students.

In addition to the general requirements for entry into a graduate program in Engineering, students must hold an Honours Bachelor's degree in Engineering with at least a B average (equivalent to a McMaster 8.0/12 GPA) in the penultimate and final years.

Delivery of the program includes a strong emphasis on project-based experience within the Manufacturing Industry, which is obtained through an industry-based project during the coursework portion of the program. Requirements for these are outlined below. Due to the strong practical orientation of the project components of the program, successful completion requires that students have strong interpersonal and communication skills. To this end, each applicant will be interviewed. A strong performance in the interview is a critical requirement for admission.

Students completing the Program on a course-only basis will be required to complete 8 courses from the approved list of courses. Course selection must be done in consultation with the program director.

Students completing the Program through course and project work will be required to complete six courses from the approved list of courses, plus successful completion of the project. Course and Project selection must be done in consultation with the program director.

### Project

Students must complete a suitable industry-based project. Projects will normally be performed individually or by groups of two to three students which could be multi-disciplinary in composition. Projects should address a specific problem found in a manufacturing facility related to trouble-shooting, re-design or optimization. The problem should not be focused on the design of new processes or products as that lies beyond the purview of this program. It is expected that the majority of the projects will be developed from work undertaken during co-op or graduate employment experience and students should look for opportunities to develop projects with their employers. Students are also encouraged to develop their own ideas and find industrial sponsors. Identification of this project is the responsibility of the student and must be provided to the program director at the time of applying to the program. Projects are ideally undertaken at local companies but may be conducted at locations inside Canada or abroad with the Director's approval and provided that none of the work on the project was done prior to admission into the program. Project groups or individuals will have an industry-based supervisor (stakeholder) with whom the student team can discuss progress, arrange trials etc. Students will also have an academic supervisor who will normally have some expertise in the subject area. It is expected that the teams will meet with their supervisors on a regular basis to discuss their progress.

Projects will have three "tollgate" stages. Student groups must submit a project proposal by the end of September to their academic and industrial supervisors for approval of scope, deliverables and timeline. The interim project report, outlining progress-to-date, is due at the end of the fall semester for approval by the academic and industrial supervisors. The final written project report is normally due at the end of

the winter semester. However, if the supervisors agree that the project group has not made sufficient progress by this point, they are free to request further work to meet the standards of the program. The project team will orally defend their final project report to an examination board comprised of their industrial supervisor, academic supervisor and program Director (Chair) or designate.

### Course Calendar Course Listing – Track Changes

[http://academiccalendars.romcmaster.ca/preview\\_program.php?catoid=20&poid=12499&returnto=3597](http://academiccalendars.romcmaster.ca/preview_program.php?catoid=20&poid=12499&returnto=3597)

Students are required to successfully complete a compulsory full year project course and six graduate half courses (or equivalent), of which at least four must be 700 level and up to two 600 level courses approved by the program director. Two of these 600 level courses can be taken in the final undergraduate year at McMaster for graduate credit provided they are listed as option courses.

Students who opt to complete the program on a course basis must complete eight courses in consultation with the program director.

Half courses are marked with an asterisk (\*) and quarter courses are marked with a pound sign (#). Students should note that not all option courses are offered every year.

To : Graduate Council

From : Christina Bryce  
Assistant Graduate Secretary

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At its meeting on September 14<sup>th</sup> and October 13<sup>th</sup> the Faculty of Health Sciences Graduate Policy and Curriculum Committee approved the following recommendations.

Please note that these recommendations were approved at the October 26<sup>th</sup> meeting of the Executive Committee of the Faculty of Health Sciences.

**For Approval of Graduate Council:**

- **Biomedical Discovery and Commercialization**
  - **Change to Calendar Copy**
  
- **Nursing**
  - **Change to Course Requirements**
  - **Change to Comprehensive Exam Procedure**

**For Information of Graduate Council:**

- **eHealth**
  - **New Course:** 746 Healthcare Analytics
  
- **Biochemistry**
  - **New Course:** 732 Writing for Science
  
- **Biomedical Discovery and Commercialization**
  - **Change to Course Descriptions:**
    - 702 Community Internship
    - 703 Scholarly Paper
  
- **Health Management**
  - **New Course:** 798 Health Management Independent Experiential Study
  
- **Health Policy**
  - **New Cross-listed Course:** 706 Introduction to health and Public Health Economics
  
- **Health Research Methodology**

- **Course Title, Description and Prerequisite Change:** 736 Health Care System Financing and Innovation
- **Nursing**
  - **Course Cancellations:**
    - 719 Foundations of Education in the Health Sciences
    - 728 Health Issues in International and Intercultural Health
  - **New Course:**
    - 715 Introduction to Quantitative Research Methods in Health Research

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

|   |  |  |   |                                      |    |
|---|--|--|---|--------------------------------------|----|
| <b>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</b>  |  |  |   |                                      |    |
| <p>1. This form must be completed for <b>ALL</b> changes involving degree program requirements/procedures. <b>All</b> sections of this form <b>must</b> be completed.</p> <p>2. An electronic version of this form (must be in MS WORD <b>not</b> PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).</p> <p>3. A representative from the department is <b>required to attend</b> the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.</p> |  |  |   |                                      |    |
| <b>DEPARTMENT</b>   |  | Biochemistry and Biomedical Sciences   |   |                                      |    |
| <b>NAME OF PROGRAM and PLAN</b>   |  | Biomedical Discovery and Commercialization [Program: GHSMB-Heath Sciences MBDC; Plan: BIOMEDMBDC – Biomedical Discovery and Commercialization] |   |                                      |    |
| <b>DEGREE</b>   | Master of Biomedical Discovery and Commercialization |  |   |                                      |    |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>  |  |  |   |                                      |    |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |  |  |   |                                      |    |
| CREATION OF NEW MILESTONE <input type="checkbox"/>  |  |  |   |                                      |    |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>   | no   | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b>   | no  | <b>CHANGE IN COURSE REQUIREMENTS</b> | no |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>  |  | Yes  | <b>EXPLAIN:</b><br>1-Referring to the graduate program as “MBDC” and removing the word “new”.<br>2-Community internship ranges from 4 to 8 months in duration.<br>3-The scholarly paper course runs concurrently with the community internship. |                                      |    |
| <b>OTHER CHANGES</b>  | no   | <b>EXPLAIN:</b><br>n/a   |   |                                      |    |

**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

n/a

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

n/a

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

1-All references to the graduate program will be MBDC. This distinguishes it from our undergraduate program, which we refer to as BDC. As the program is now up and running, the word "new" has been removed.

2-We received approval to offer an internship that ranges from 4 to 8 months in duration and have updated the calendar copy to reflect this.

3-The scholarly paper course has been extended from 4 to 6 months (January-June) to account for it being offered concurrently with the internship course. We have updated the calendar copy to reflect this.

**PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)**

2017/2018 Calendar Year

**ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.**

no

**PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):**

Please see calendar copy.

**CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:**

Name: Dr. Brian Coombes Email: Coombes@mcmaster.ca Extension:22159 Date submitted: Sept 27/16

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

SGS/2013



## **Biomedical Discovery and Commercialization**

The ~~new~~ Master of Biomedical Discovery and Commercialization (MBDC) Program is a one-year course-based Master's that provides students with the scientific and technical knowledge and understanding that underlies breakthrough discoveries in the biomedical sciences and drug discovery. The program also provides an understanding of business fundamentals that are necessary to market such discoveries. The program is offered full-time and preference will be given to those applicants who completed the Honours Bachelor of Health Sciences in Biomedical Discovery and Commercialization Program at McMaster University.

One of the most important features of the program, the integration of business and science, is achieved through the Team Project, Scholarly Paper and two M.B.A. level Business courses. Experiential learning is obtained through a ~~four-month~~ **to eight-month** community internship that provides students with an opportunity for creative exploration of Biomedical Research and Commercialization. The internship also provides students with an invaluable opportunity to expand their professional network and to develop and refine a sound career plan.

Program Director: Eric Brown, Ph.D.  
Program Manager: Nancy McKenzie, Ph.D.  
Enquiries: 905 525-9140 Ext. 27335  
E-mail: [bdcprogram@mcmaster.ca](mailto:bdcprogram@mcmaster.ca)  
Fax: 905 522-9033  
Website: <http://www.bdcprogram-mcmaster.ca>

## **Master of Biomedical Discovery and Commercialization, M.B.D.C.**

### **Admission**

Admission and program requirements conform to the general University regulations at the front of this Calendar. For additional information regarding the MBDC application (e.g., important deadlines and how to apply online) please refer to the following website:

<http://gs.mcmaster.ca/programs/biomedical-discovery-and-commercialization>.

Applicants applying from outside the BDC undergraduate program will have their course work assessed for equivalencies before being considered further. Short-listed applicants who did not complete the Honours Bachelor of Health Sciences in Biomedical Discovery and Commercialization Program, but who have an equivalent Bachelor's degree from an accredited university, will be subject to an interview process.

## **Course Requirements**

The candidate must complete three full, 700-level BIOMEDDC graduate courses (BIOMEDDC 701, 702, 703), and two half, 700-level M.B.A courses (BUSINESS B733 and one of BUSINESS B730 or BUSINESS C727). All graded courses require at least a B- standing.

The required courses for the Master of BDC Program are as follows:

### **Fall**

- BIOMEDDC 701 / Team Project
- BUSINESS {B733} / Multidisciplinary Entrepreneurship

One of:

- BUSINESS B730 / Strategic Management of Technology
- BUSINESS C727 / Pharma/Biotech Business Issues

### **Winter; Spring/Summer**

- BIOMEDDC 702 / Community Internship

### **Summer**

- BIOMEDDC 703 / Scholarly Paper



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

|   |  |   |  |
|---|--|---|--|
| <b>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</b>  |  |   |  |
| <p>1. This form must be completed for <b>ALL</b> changes involving degree program requirements/procedures. <b>All</b> sections of this form <b>must</b> be completed.</p> <p>2. An electronic version of this form (must be in MS WORD <b>not</b> PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).</p> <p>3. A representative from the department is <b>required to attend</b> the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.</p> |  |   |  |
| <b>DEPARTMENT</b>   | School of Nursing                      |   |  |
| <b>NAME OF PROGRAM and PLAN</b>   | Nursing Graduate Program               |   |  |
| <b>DEGREE</b>   | Masters (Course based and NP programs) |   |  |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>  |  |   |  |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |  |   |  |
| CREATION OF NEW MILESTONE <input type="checkbox"/>  |  |   |  |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>   |  | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b>  | <b>CHANGE IN COURSE REQUIREMENTS</b> x |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>  | x                                      | <b>EXPLAIN:</b><br><ul style="list-style-type: none"> <li>- MSc Course based students will take NUR 715 – in place of HTHRSM 721</li> <li>- MSc Course PHCNP students will take NUR 715 – in place of HTHRSM 771</li> </ul> |  |
| <b>OTHER CHANGES</b>  | <b>EXPLAIN:</b>                        |   |  |

**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

- In the current course calendar, it states students are required to take HTHRSM 721 or HTHRSM 771.

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

Nursing Graduate Students in MSc Course Based and MSc Course Based PHCNP program will be taking the new course NUR 715. This course change received Dean's approval, but the changes to the degree requirements have not received full GPCC approval yet.

The change in required curriculum is:

- MSc Course based students will take NUR 715 – in place of HTHRSM 721
- MSc Course PHCNP students will take NUR 715 – in place of HTHRSM 771

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

This course is more relevant for MSc students in the nursing program

**PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)**

September 2016

**ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.**

Deans approval for students to take this course for September 2016

**PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):**

## **B. M.Sc. by Course Work**

### **Program Requirements**

A course-based M.Sc. degree option in Nursing is offered on a full-time or part-time basis. The admission requirements are the same as for the M.Sc. thesis option 1-4 (see above). Each student will have a Faculty Advisor assigned by the Assistant Dean. Each student will be required to complete a minimum of seven graduate

half courses which must include the four required courses below. The remaining courses will be chosen by the student with the approval of his/her faculty advisor and usually center around a theme. With the permission of the course instructor and faculty advisor, a student's minimum course requirements may include up to two 600-level graduate half courses. In addition, each student must write a 15 to 20-page scholarly paper ([NURSING 714](#)) on a topic approved by two examiners approved by the Assistant Dean.

- [NURSING 701 / Theoretical Basis of Nursing Practice](#)
- [NURSING 711 / Advanced Practicum in Nursing](#)
- [NURSING 745 / Qualitative Research Methods](#)
- ~~[HTHRS M 721 / Fundamentals of Health Research and Evaluation Methods](#)~~
- [NURSING 715 Introduction to Quantitative Research Methods in Health Research](#)

### Primary Health Care Nurse Practitioner Certificate

For those wishing to obtain a Primary Health Care Nurse Practitioner certificate and a course-based M.Sc. degree, admission requirements are the same as for other course-based M.Sc. students with the additional requirement of two years' full-time nursing practice within the past five years. Students complete three core courses, write the 15-20 page scholarly paper, and complete the seven courses offered through the NP Consortium. Since the seven PHCNP courses are offered every year, they can be completed in 12 months of full-time study. The program typically requires 3 years to complete. Once the PHCNP courses have been completed successfully, students are eligible to write their RN (Extended Class) exams.

### Course Requirements

- ~~[HTHRS M 771 / Fundamentals of Health Research and Evaluation Methods \(Online\)](#)~~
- [NURSING 715 Introduction to Quantitative Research Methods in Health Research](#)
- [NURSING 712 / Evidence-Based Health Care](#)
- [NURSING 745 / Qualitative Research Methods](#)
- [NURSING 714 / Scholarly Paper](#)
- [NURSING 761 / Pathophysiology for NPs](#)
- [NURSING 762 / Advanced Health Assessment and Diagnosis I](#)
- [NURSING 763 / Advanced Health Assessment and Diagnosis II](#)
- [NURSING 764 / Therapeutics in Primary Health Care I](#)
- [NURSING 765 / Therapeutics in Primary Health Care II](#)
- [NURSING 766 / Roles and Responsibilities](#)
- [NURSING 767 / Integrative Practicum](#)

← Return to: [Faculty of Health Sciences](#)

### CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:

Name: Nancy Carter      Email: [carternm@mcmaster.ca](mailto:carternm@mcmaster.ca)      Extension: 22259      Date submitted: August 31, 2016

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, [cbryce@mcmaster.ca](mailto:cbryce@mcmaster.ca)

SGS/2013

## NURSING COMPREHENSIVE EXAMINATION PROCESS

Revision October 2016

### PURPOSE OF THE COMPREHENSIVE EXAMINATION

1. It is a university regulation that students must pass the comprehensive examination as part of the requirements for a doctoral degree. Normally after the required courses are completed and normally before beginning data collection for the thesis, students in the nursing doctoral program will complete the comprehensive examination process.
2. The purpose of the Comprehensive Examination is to evaluate the doctoral student's ability to acquire and critically appraise and synthesize information on an argued thesis topic, to apply and integrate a conceptual framework or theory as a basis for examination of the variables under study, derived logically from the evidence review, to formulate a hypothesis or research question addressing an outstanding question in the field, and to design a proposal to carry out the proposed research. The comprehensive examination process should ideally result in publishable papers.
3. The comprehensive examination consists of two components evaluated together: 1) A written thesis proposal, including introduction and background, problem statement and research questions, comprehensive literature review, conceptual framing or theoretical background, research design and methods, plan for data analyses, feasibility and timeline; and 2) An oral defense of the proposal which includes an examination committee. The rationale for these two components (written and oral) is that to be successful in the PhD program, students must be able to develop a detailed proposal that is with sound logic of argument; and that is rigorous, appropriately situated or framed, conceptually; innovative; feasible; and defensible.

### TIMING OF THE EXAMINATION

1. Normally, full time students are expected to complete the comprehensive examination between the 12th and 18th month, and for part time students, by the 24th to 36th month following the start of their doctoral studies. Usually, students complete the required courses before beginning the comprehensive examination process. Failure to successfully complete the comprehensive examination within 24 months for full time students, and within 36 for part time students, will require withdrawal from the program. The student must have had at least one official Supervisory committee meeting and an educational plan submitted to the Office of Nursing Graduate Studies before beginning the comprehensive process.

#### Timeline to Examination

2. The Supervisory committee is responsible for determining readiness of the proposal to be put forward for examination. Regular Supervisory committee meetings should be planned to monitor progress of proposal development and to provide regular feedback. The minimum requirement for meetings is one per term. It is expected that students are meeting regularly with their Supervisors, between committee meetings, as they work on their proposals.

3. By the 18th month of the full time student's program, at the latest, or 24th month of the part time student's program, the Supervisory committee must propose a tentative, projected date for oral defense of the thesis proposal to the Assistant Dean of the Nursing Graduate Program. The Supervisory committee will recommend potential examiners (two are needed) to the Assistant Dean for approval. The proposal will be due to the approved examiners three weeks prior to the date of the defense, once booked.
4. Once the date of the defense has been set, if a fails to complete the proposal in time the student will be considered to have failed the first attempt at the defense. After a second failure to submit the proposal on time, the student will be considered to have failed the comprehensive exam and will be asked to withdraw from the PhD Program.

#### SELECTION OF THESIS TOPIC

1. After careful consideration, the Student and Supervisory Committee must agree on the topic of the thesis proposal that will be of interest and value to the Student and which merits independent study. Topic selection and committee approval must be completed within the first 9 months from the start of the program for full time students and within the first 12 months from the start of the program for part time students.
2. The topic will constitute the focus of the PhD thesis-related work. The proposal can be situated within larger research programs of Supervisors but the proposal may not be identical to any of the grants held or submitted by Supervisors in the department.
3. Responsibility for ensuring that the proposed research is genuinely novel rests initially with the Student and Supervisor. If students' work is situated within a program of research of the Supervisor, clear justification for this course of action must be provided, in addition to detailed explanation about how the students' contributions will be unique.

#### THE WRITTEN PROPOSAL

1. The written thesis proposal elements should include:
  - a) A clear introductory statement of the problem to be researched. The reason for proposing the particular research the role of nursing and potential impact must be stated. (Length: up to a maximum 5 pages)
  - b) A comprehensive, critical appraisal, review and synthesis of the relevant theoretical and empirical literature in the specific area of the thesis. (Length: up to a maximum 20 pages)
  - c) Application and integration of a conceptual framework or theory (Length: up to a maximum 5 pages)
  - d) A detailed statement of the problem to be researched, including research questions to be addressed or hypotheses to be tested. The nature of this section will depend upon the style of work of the thesis and will, for example, generally be worked out in greater detail for a statistical study than for research employing methods of participant observation. (Length: up to a maximum of 5 pages.)
  - e) A detailed description of the research methods to be employed in the thesis, with sound justification and related ethical considerations, and the manner in which they will be employed. (Length: up to a maximum of 10 pages)

- f) A tentative schedule of work, indicating when each part of the thesis is to be completed.  
(Length: 1 page)
- g) Identification of potential sources of funding
- h) Research "instruments," such as questionnaires or interview schedules, should be appended to the proposal. A tentative chapter outline, with chapter titles and one-sentence descriptions.

## THE ORAL DEFENSE OF THE PROPOSAL

1. The student will be expected to present and defend the thesis proposal. This includes providing reasoned arguments in support of the area under study, a demonstration of ability to use the information acquired in the literature search and defend the hypotheses or research questions formulated, and rationalization of the weaknesses and strengths of the study methods and identify appropriate strategies to address limitations.
2. Students should plan to arrive at least 30 minutes prior to the oral examination.
3. The oral examination will consist of the following steps:
  - a) A notice will be placed on the door of the examination room noting that an examination is in progress and that no one is allowed to enter the room once the examination has begun.
  - b) Before commencing the oral examination, the Chair will brief the Examiners in closed session on the examination process and evaluations.
  - c) The Chair then brings the candidate and observers (including the Supervisor if present) into the room, introduces the candidate and the examination committee. The Chair reviews the guidelines about observers and consequences: they may not participate in the oral examination; they are present only as observers. Should any observer ask a question or make a comment during the examination, they will be asked to leave the room.
  - d) The Chair will ask the candidate to present the proposal. This should last no more than 20 minutes. Visual aids may be used and notes consulted. The session will be closed after the presentation is delivered.
  - e) The Chair will then instruct the candidate to defend the proposal by responding to questions posed by the examiners and the Supervisory committee. The examiners and members will pose questions in sequence, beginning with the examiners. Normally two rounds of questioning will be allowed and not more than two hours, in total, should be spent on the defense process. Since the prime purpose of the examination is to assess the student's ability to synthesize and critically evaluate knowledge, the questions should reflect this purpose.
  - f) One of the Chair's roles is to ensure that the examination takes place in a constructive atmosphere. The Chair does not question the candidate but may rephrase questions asked by the Examiners.
  - g) The candidate and observers (if present) withdraw from the examination room after the proposal has been examined so that the examiners can independently rate the presentation.
  - h) After the examination, the Chair secures the written votes of the Examiners and committee members on the form provided; the Chair is without vote. (Criteria for



Evaluation of the Oral Presentation are in Appendix). To pass, no more than one negative vote is permitted; abstentions are not allowed. In the case of two or more negative vote(s), the student will be given a second opportunity to take the examination, which must occur within two weeks of the failure. In order to receive a “Pass with Distinction”, there must be unanimous agreement among all Examiners.

- i) The candidate is invited back into the room, at which time the Chair summarizes the oral feedback.
4. Within one week after the oral examination, the Chair prepares a written summary of the evaluation of the written and oral examination and sends it to the candidate and his/her Supervisor, the Examiners, and the Assistant Dean of the Graduate Nursing Program, with a copy to the School of Graduate Studies.

#### ROLE OF THE SUPERVISORY COMMITTEE

1. Regular Supervisory committee meetings should be planned to monitor progress of proposal development and to provide regular feedback. The minimum requirement for meetings is one per term. It is expected that students are meetings regularly with their Supervisors, between committee meetings as they work on their proposals.
2. The Supervisory committee determines readiness for oral examination of the proposal.

#### COMPOSITION AND DUTIES OF THE EXAMINATION COMMITTEE (ORAL DEFENSE)

1. The examining committee will consist of two examiners external to the Supervisory committee, all members of the Supervisory committee and the Supervisor. The Assistant Dean will secure and appropriate external examiners, after taking into consideration those suggested by the Supervisory Committee. The final selection will be based upon the expertise and availability of the faculty suggested by the Supervisory committee. In the case of a re-examination, the different external examiners will be secured.
2. Quorum will be constituted by the Supervisor plus another committee member and an external examiner.
3. During the oral examination, each examiner is expected to ask questions related to the topic of the thesis proposal, and the strengths and weaknesses of the study plan. Examiners should ask questions that probe the depth of the student’s knowledge and require the student to use critical thinking and reasoning.
4. The grading of the Comprehensive Exam is Pass, Pass with Distinction or Fail. Consensus must be reached by the examiners. In the event that a second examination is required, this must be completed within 24 months of registration.
5. Only two attempts at the Comprehensive Examination are permitted under any circumstances. If a student fails both attempts at the Comprehensive Examination, the student will be requested to withdraw from the PhD Program. However, a student who has transferred from the MSc Program may be permitted to complete their MSc degree, if a petition for special consideration to permit this is supported by the Supervisor and the Assistant Dean, Graduate Studies, Nursing and approved by the Associate Dean of Graduate Studies (Health Sciences).

## COMPOSITION OF THE RE-EXAMINATION COMMITTEE

In the event that a candidate's first attempt is considered unsatisfactory, either the Assistant Dean, Nursing Graduate Program, or a senior faculty member delegate, must attend the candidate's second proposal defense attempt as no further attempts can be permitted. In either case, he/she will not take part in the examination and will not vote on the candidate's performance. He/she may be asked by the Examination Committee to comment during discussions of the 2<sup>nd</sup> examination outcome.

## THE EXAMINATION CHAIR (ORAL DEFENSE)

1. The Assistant Dean, Nursing Graduate Program will assign a chair of the oral defense. The chair will ensure that the rules governing the conduct of the proposal defense are observed by both the examiners and the student.
2. The Chair must ensure that the defense takes place in a constructive atmosphere, and that the Examiners' questions are both pertinent (i.e. fall within the boundaries of the topic) and sufficiently probing. The Chair may also question the candidate. He/she may wish to rephrase questions/answers for clarification or bring a line of questioning to a close if the limits of a student's knowledge or understanding have been reached. The Chair also makes brief notes of the examiners' questions and of the student's responses.

## STUDENT RESOURCES FOR WRITING

If English is as a second language, there are resources available to support the student from the Student Success Center. <http://studentsuccess.mcmaster.ca/academic-skills/esl.html>

For all students who have difficulty with academic writing they are encouraged to access the support available to them on campus. <http://studentsuccess.mcmaster.ca/academic-skills/writing-support-services.html>

An Editor can be used for correcting grammatical changes and APA formatting, but not to change the content of the paper.

## ACADEMIC DISHONESTY

For guidance on how to proceed in the case of suspected academic dishonesty, please consult the Office of Academic Integrity and the complete policy at <http://www.mcmaster.ca/academicintegrity/>. The Associate Deans of Graduate Studies are available for confidential consultations on matters related to academic integrity.

Appendix: TIMING OF ORAL DEFENSE OF THESIS PROPOSAL

Student's Name:

\_\_\_\_\_ Date: \_\_\_\_\_

Please note: There are no meetings or examinations scheduled for the month of August.

\_\_\_\_\_

Signature of Supervisor

\_\_\_\_\_

Signature of Student

THIS FORM MUST BE RETURNED TO THE NURSING GRADUATE PROGRAM OFFICE  
3H48

BY:

Appendix: ORAL COMPREHENSIVE EXAMINATION EVALUATION

Student's  
name:

EXAMINATION  
DATE:

Examiner:

1. Demonstrates the ability to acquire, synthesize and critically evaluate nursing knowledge.
2. Responds to questions raised by the Examiner's review of the proposal
3. Demonstrates an understanding of the fundamentals of the topic of the written component
4. Demonstrates critical analysis of each issue
5. Demonstrates the ability to present and defend an argument.

Comments:

Overall Rating

Summary of strengths and limitations:

Student's Signature

Examiner's Signature



**School of Graduate Studies** 1280 Main Street West Phone 905.525.9140  
Hamilton, Ontario, Canada Ext. 23679  
L8S 4L8 <http://graduate.mcmaster.ca>

To : Graduate Council  
From : Christina Bryce  
Assistant Graduate Secretary

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At its meeting on October 28th, 2016, the Faculty of Humanities Graduate Curriculum and Policy Committee approved the following graduate curriculum recommendations.

Please note that these recommendations were submitted for approval at the November 8<sup>th</sup> meeting of the Faculty of Humanities

**FOR APPROVAL OF GRADUATE COUNCIL:**

- **Communication, New Media and Cultural Studies**
  - **New Program Calendar Copy**
  
- **English and Cultural Studies**
  - **Change to Calendar Copy**

**FOR INFORMATION OF GRADUATE COUNCIL:**

- **Communication, New Media and Cultural Studies**
  - **New Courses**
    - 700 Doctoral Seminar in Communication, New Media, and Cultural Studies 1
    - 701 Doctoral Seminar in Communication, New Media, and Cultural Studies 2
  
- **English and Cultural Studies**
  - **Course Cancellations**
    - 700 Emotion and Culture
    - 705 Comparative Studies in Nineteenth Century Literature I
    - 706 Fictionality, Historiography, and the Afterlife of the Event
    - 707 Northrop Frye and the Social Function of Literature
    - 712 Childhood in Cultural Theory and Popular Culture
    - 720 Looking Within: Films about Filmmaking
    - 728 Comparative Studies in Nineteenth-Century Literature II
    - 745 Theorizing Care: Dependency, Representation, Ethics
    - 748 The Invention of Britain

## Calendar Copy

### Ph.D. in Communication, New Media and Cultural Studies

The Departments of Communication Studies and Multimedia and of English and Cultural Studies offer a program leading to a Ph.D. degree in Communication, New Media and Cultural Studies. Completed applications should be submitted by the deadline posted on the website. Programs begin annually in September.

Enquiries: 905 525-9140 Ext. 27575

E-mail: [gradcnm@mcmaster.ca](mailto:gradcnm@mcmaster.ca)

Website: <http://csmm.mcmaster.ca/cnmcs>

#### Faculty / Fall 2016

##### Distinguished University Professor

**Lorraine York**, B.A., M.A., Ph.D. (McMaster) / Senator William McMaster Chair in Canadian Literature and Culture

##### Professors

**Sarah Brophy**, B.A. (Wilfrid Laurier), M.A., Ph.D. (McMaster)

**Daniel Coleman**, B.Ed., M.A. (Regina), Ph.D. (Alberta)

**Henry Giroux**, B.S. (Maine), M.A. (Appalachian State), Ph.D. (Carnegie-Mellon) / Chair for Scholarship in the Public Interest

**Donald Goellnicht**, B.A. (Queen's), M.A., Ph.D. (McMaster)

**Robert S. Hamilton**, M.F.A. (SAIC), M.F.A. (Jan van Eyck Academie)

**Susan Searls Giroux**, B.A., M.A.T. (Miami), Ph.D. (Pennsylvania State) / Associate Vice-President, Faculty

**Peter Walmsley**, B.A., M.A. (Toronto), Ph.D. (Cambridge) / Chair of English and Cultural Studies

##### Associate Professors

**Nadine Attewell**, B.A. (Toronto), M.A., Ph.D. (Cornell)

**Christina Baade**, B.Mus. (Northwestern), M.Mus., Ph.D. (Wisconsin-Madison) / University Scholar

**Sara Bannerman**, B. Mus. (Queen's), M.A., Ph.D. (Carleton) / Canada Research Chair in Communication Policy & Governance, Co-Director, Ph.D. in CNMCS

**Amber Dean**, B.A. (Alberta), M.A. (Simon Fraser), Ph.D. (Alberta) / Co-Director, Ph.D. in CNMCS

**Paula Gardner**, B.A. (SUNY), M.A. (NSSR), Ph.D. (UMass) / Asper Chair in Communications

**Catherine Graham**, B.A., M.A., Ph.D. (McGill)

**Faiza Hirji**, B.A. (Simon Fraser), M.A., Ph.D. (Carleton)

**Janice Hladki**, B.A. (York), M.A., Ph.D. (Toronto)

**Andrew Mactavish**, B.A. (Mount St. Vincent), M.A. (Dalhousie), Ph.D. (Alberta)

**Susie O'Brien**, B.A. (Queen's), M.A. (Queensland), Ph.D. (Queen's)

**David Ogborn**, B.A., B.Sc. (Mary), B.Mus. (Manitoba), M.Mus. (Toronto), Mus.Doc. (Toronto)

**Liss Platt**, B.F.A. (Connecticut), M.F.A. (California)

**Christine Quail**, B.A., M.A. (Pennsylvania), Ph.D. (Oregon)

**Anne Savage**, B.A. (Calgary), Ph.D. (London)

**Philip Savage**, B.A. (Carleton), M.A. (Simon Fraser), Ph.D. (York)

**Alexandre Sévigny**, B.A. (York), M.A., Ph.D. (Toronto)

**Eugenia A. Zuroski**, B.A. (Columbia), M.A., Ph.D. (Brown)

### **Assistant Professors**

**Terence Flynn**, B.A. (Carleton), M.S., Ph.D. (Syracuse)

**David Harris Smith**, M.F.A. (York), Ph.D. (York)

## **Communication, New Media and Cultural Studies, Ph.D.**

The Ph.D. Degree Program normally entails four years of study. The admission requirement is a completed M.A., M.Sc., M.F.A., or Master of Communication Management (M.C.M.) degree in a relevant field (e.g. Communication Studies, Cultural Studies, New Media). We also welcome applications from students with a Master's degree in a related field (e.g. Music, Digital Humanities, Visual Culture, Visual and Fine Arts, Sociology, Anthropology, Women's and Gender Studies, English, Philosophy, Interdisciplinary Studies, etc.) who have focussed on research germane to the program, and can demonstrate, in their letters of application, how their graduate work to date has prepared them for a Ph.D. in Communication, New Media, and Cultural Studies. While students must have expertise in at least one of New Media, Communication, or Cultural Studies, the committee will look particularly favourably on students who have demonstrated fluency in two or more program areas. A successful applicant from an MA program with a coursework component will have grades of at least A- in two-thirds of their courses. Students whose training has not included graded coursework are encouraged to submit a dossier of work completed during their Master's program.

### **Requirements**

#### **Coursework**

Students of the program must complete 18 units of approved coursework by the end of the second year, including: 4 courses, for a total of 12 units, to be completed in year 1; and two 3-unit doctoral seminars, taken in year 1 and year 2. At the discretion of the program's Advisory Committee, those students lacking relevant experience in a minimum of two of the program's three disciplines will be required to take 1-2 theory and methodology courses offered by ECS (CULTR ST 732) or CSMM (CMST&MM 700, 707 and/or 712), as part of the 4 courses to be completed in year 1. With the permission of the CNMCS Ph.D. Advisory Committee, students may take 3 units of electives from graduate courses offered by programs other than CNMCS.

#### **Comprehensive Examination**

Students in the program will be required to take the Comprehensive Examination in the area of their intended thesis research. This will involve writing two papers, a Field Survey and a Topic Paper, and defending both in an oral examination. The Field Survey should show broad expertise in the wider field

of knowledge the candidate's research will engage, i.e. one or more of the fields of Communication Studies, Cultural Studies, or New Media/Media Arts. The Topic Paper describes how the candidate's thesis intervenes in the chosen field(s) and the particular contribution it will make. Both papers are to be researched and written concurrently by the candidate, are to be between 25 and 30 double-spaced pages in length, and are due in February of the second year of study. The Oral Examination of both papers will follow within 10 days of submission. The candidate's mark in the Comprehensive Examination will be calculated on the average of the grades for the Field Survey, the Topic Paper, and the Oral Examination.

### Qualifying Dossier

Over the course of their graduate study, students in the program will develop a qualifying dossier in consultation with their supervisory committee. Possible components of the qualifying dossier, of which the student will complete at least six, include:

- a grant application;
- presentation of a conference paper or artist talk;
- a revision and submission of an article or artistic piece for peer-reviewed publication or juried exhibition;
- a research ethics proposal;
- a syllabus and a teaching philosophy statement;
- an op-ed or other knowledge translation project (e.g., a blog, performance, artwork, website, new media project, etc.)
- Education 750 (offered by MIIETL)
- participation in four professionalization workshops (academic or non-academic), offered by ECS, CSMM, or the Faculty of Humanities
- a published book review/exhibition review in a scholarly journal
- a community-engagement project
- a guest lecture
- participation in conference organizing

Work completed as part of course requirements may be included in the dossier at the discretion of the supervisory committee.

### Thesis

The candidate will complete a thesis in one of the following forms:

- A **traditional thesis**, which will normally be between 200 and 250 pages (not including bibliography);
- A **research-creation** or **project-based thesis**, which will consist of a body of work and written commentary on that work of between 100 and 150 pages; such a thesis may involve arts-based research, or it may involve the creation of such things as tool kits, social interventions, learning platforms, databases, new media archives, documentary films, or podcasts;
- A **sandwich thesis**, which, in accordance with McMaster's Thesis Preparation Guide, must consist of a minimum of three scholarly works on a unified theme, either previously published or



exhibited, submitted for peer-review, or prepared for publication/exhibition but not yet submitted (in CNMCS, these works may include journal articles submitted for peer review, or art/media/performance pieces submitted for peer-adjudication); these works must be accompanied by substantial introductory and concluding chapters, addressing the methodologies, theories and approaches that unify and inform the research. If the sandwich thesis is used for a series of research creation projects, the student will present an explanatory narrative that connects the projects and argues for their significance. The typical length of a sandwich thesis will be about 200 pages, plus bibliography.

By January 15 of year 1 of the program, students will submit a short proposal (1000 words plus bibliography) for the thesis, identifying the area of their intended thesis research, for the approval of the Admissions and Review Committee. The proposal should be signed by a proposed supervisor and first reader. Should the committee feel a proposal needs further development, the student will be asked to revise and resubmit it within three months.

With the guidance of their supervisory committee and their peers in the year 2 doctoral seminar, students will develop a long proposal (10-15 pages plus bibliography), to be submitted for approval by June 30 of year 2.

Years 3 and 4 of the degree will be dedicated to the completion of the thesis, which must be defended in an oral examination.

## **Courses**

CNMCS \*700 / Doctoral Seminar in Communication, New Media and Cultural Studies 1  
CNMCS \*701 / Doctoral Seminar in Communication, New Media and Cultural Studies 2  
CMST&MM \*701 / Media, Gender and Performance  
CMST&MM \*702 / Media and Social Issues  
CMST&MM \*703 / New Media Studio Topics  
CMST&MM \*704 / Media, Discourse and Reality  
CMST&MM \*705 / Digital Media and Cultural Exchange  
CMST&MM \*706 / Technologies of Communication  
CMST&MM \*707 / Theoretical Issues in Media, Culture and Communication  
CMST&MM \*708 / Selected Topics in Communication and New Media  
CMST&MM \*709 / Independent Study  
CMST&MM \*710 / International Communication  
CMST&MM \*711 / Sound as Art and Research  
CMST&MM \*713 / Media Effects and Society  
CSMT&MM \*714 / Feminism, Technology and Science  
CMST&MM \*715 / Cultural Memory, the Media and "Us"  
CMST&MM \*716 / Critical Perspectives on Documentary  
CMST&MM \*717 / Youth, New Media and Culture  
CMST&MM \*731 / Crisis Management and Communication  
CULTR ST \*732 / Foundations in Cultural Studies and Critical Theory  
CULTR ST \*702 / Film Theorizes Social and Cultural Differences  
CULTR ST \*703 / Cultural Production and Cultural Studies  
CULTR ST \*705 / Music, Gender and Sexuality

CULTR ST \*706 / Fictionality, Historiography, and the Afterlife of the Event  
CULTR ST \*707 / Acts of Global Citizenship  
CULTR ST \*708 / Selfie/Culture  
CULTR ST \*711 / Celebrity/Culture  
CULTR ST \*713 / Cosmopolitanism and Nationalism in the Eighteenth Century  
CULTR ST \*716 / Bob Dylan and American Culture: Memory, Consciousness and Meaning  
CULTR ST \*719 / Public Intellectuals and Their Work: Intellectual Practices in Culture Studies and Politics  
CULTR ST \*722 / Activist Bodies in the Public Sphere  
CULTR ST \*723 / Surveillance and Digital Society  
CULTR ST \*724 / Reproduction, Citizenship, and the Nation/State  
CULTR ST \*726 / Race, Labour, and Migration in the Early Twentieth-Century Transatlantic Imaginary  
CULTR ST \*727 / The New Constellation of Race: Sovereignty, Citizenship, Social Death  
CULTR ST \*729 / Cultural Studies and the Politics of Cultural Pedagogy  
CULTR ST \*730 / Indigenous Literature of North America  
CULTR ST \*731 / Anxiety Disorders: The Cultural Politics of Risk  
CULTR ST \*742 / Mapping South Asian Masculinities  
CULTR ST \*744 / Gender, Violence and Visual Culture  
CULTR ST \*749 / Getting and Spending: The Birth of Consumer Culture  
CULTR ST \*750 / Gothic, Sensation and Victorian Discourses of the Body  
CULTR ST \*754 / The Cultures of Modernism  
CULTR ST \*755 / Neoliberalism and the Limits of the Social  
CULTR ST \*756 / The Secret Life of Things in the Eighteenth Century  
CULTR ST \*757 / Gender, Civility, and Courtliness in Early Modern Europe  
CULTR ST \*759 / Victorian Natures  
CULTR ST \*762 / Queer Historicisms and British Cultural Memory  
CULTR ST \*765 / Biopolitics: An Introduction  
CULTR ST \*766 / Feminist, Queer, and Trans Theory  
CULTR ST \*767 / Regarding Animals: Theories of Non-Human Life  
CULTR ST \*769 / Science Fiction: Mindworlds and the Boundaries of the Human  
CULTR ST \*779 / The Times We Live In  
CULTR ST \*784 / Decolonizing Bodies  
CULTR ST \*787 / Post-colonial Ecologies  
CULTR ST \*789 / Studies in Asian North American Literature, Culture and Identity  
CULTR ST \*790 / MJ Postmortem: New Critical Reflections  
CULTR ST \*791 / Rethinking Politics: Thinking Past War, Democracy, and Terror  
CULTR ST \*793 / Oh Behave! Post-war Sexualities  
CULTR ST \*795 / Living with HIV/AIDS: On the Discourses of the Pandemic  
CULTR ST \*797 / Politics for Our Times

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

|  |   |  |                                      |
|--|---|--|--------------------------------------|
| <b><u>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</u></b>  |   |  |                                      |
| <p>1. This form must be completed for <b><u>ALL</u></b> changes involving degree program requirements/procedures. <b><u>All</u></b> sections of this form <b><u>must</u></b> be completed.</p> <p>2. An electronic version of this form (must be in MS WORD <b><u>not</u></b> PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).</p> <p>3. A representative from the department is <b><u>required to attend</u></b> the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.</p> |   |  |                                      |
| <b>DEPARTMENT</b>  |   | English & Cultural Studies   |                                      |
| <b>NAME OF PROGRAM and PLAN</b>  |   | English PhD Program  |                                      |
| <b>DEGREE</b>  | PhD   |  |                                      |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>   |   |  |                                      |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No   |   |  |                                      |
| CREATION OF NEW MILESTONE <input type="checkbox"/>   |   |  |                                      |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>  |   | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b>   | <b>CHANGE IN COURSE REQUIREMENTS</b> |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>   |   | <b>EXPLAIN:</b><br>Change to the Program Requirements layout of the English PhD program. Please see attachment starting on page 3. |                                      |
| <b>OTHER CHANGES</b>   | <b>EXPLAIN:</b><br>Inclusion of regulation re: electives outside the department, thesis proposal submission requirements, in order to synchronize Grad Calendar with Department Grad Student Handbook |  |                                      |

**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

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

Additional information detailing the Coursework, Thesis Proposal, Comprehension Examination and small wording changes to the Research Methods & Bibliography Requirements sections for the PhD.

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

Make all program requirements visible to students in new tracking program by including a more complete description in the calendar

**PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)**

Change to be made in the Fall 2017 Calendar

**ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.**

**PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):**

**CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:**

Name: Dr. Peter Walmsley Email: walmsley@mcmaster.ca Extension: 23728 Date submitted: Oct. 14, 2016

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

## English, Ph.D

← Return to: [Areas of Study](#)

The Ph.D. Degree Program normally entails four years of study. The admission requirement is an M.A. with marks of at least A- in two thirds of their Masters level courses. In recent years, successful candidates typically achieved an average of A (at least 85%) in their upper-level undergraduate and M.A. coursework.

## Program Requirements

### Coursework

In the first year of the program, Ph.D. candidates will successfully complete six one-term graduate courses or their equivalent. Up to two one-term courses may be taken outside the department, subject to the permission of offering departments.

### Thesis Proposal

By January 15<sup>th</sup> of the first year of the program, students must identify an area of specialization and submit a 1000-word thesis proposal (with a bibliography attached) signed by a potential supervisor and reader for approval by the Graduate Studies Committee.

By June 27<sup>th</sup> of the second year, students must submit a detailed thesis proposal of 2000 words, signed by their supervisory committee to the Graduate Studies Committee.

### Comprehensive Examination

The University regulations require that Ph.D. candidates take a Comprehensive Examination; in the English Department, this examination takes place in the second year of study. Eleven areas of study have been defined by the Department of English and Cultural Studies:

Medieval Literature  
Early Modern English Literature  
Eighteenth-Century British Literature  
Nineteenth-Century British Literature  
Twentieth-Century British and Irish Literature  
American Literature  
Canadian Literature  
Postcolonial Literature  
Critical Theory  
Cultural Studies  
Indigenous Literatures and Cultures

A Ph.D. candidate in English is required to take the Comprehensive Examination in the area, chosen from the above list, of her or his intended dissertation research. This will involve writing two papers, a Field Survey and a Topic Paper, and defending both in an oral examination. The Field Survey should show broad expertise in the wider field of knowledge the candidate's research will engage. The Topic Paper describes how the candidate's dissertation

intervenes in that field and the particular contribution it will make. A reading list for the Comprehensive Examination, approved by all members of the supervisory committee, must be submitted to the Graduate Studies Committee by February 28<sup>th</sup> in the first year of the program. Both papers are to be researched and written concurrently by the candidate, are to be between 25 and 30 double-spaced pages in length, and are due no later than February 28<sup>th</sup> of the second year of study (i.e. at the beginning of the 5<sup>th</sup> term). The Oral Examination of both papers will follow within 10 days of submission. The candidate's mark in the Comprehensive Examination will be calculated on the average of the grades for the Field Survey, the Topic Paper, and the Oral Examination.

## **Research Methods & Bibliography**

In addition, each Ph.D. candidate is required to participate in a set of workshops in May of their second year. The aim of this course is to provide students with the opportunity to discuss a range of contemporary research models and methodologies in literary and cultural studies. Students must attend all of the workshops in order to receive a passing grade.

## **Language Requirement**

The Department also has a second-language requirement for the Ph.D. degree. Candidates who have not passed a full university course in a language other than English must complete such a course or pass a translation examination with the aid of a dictionary.

## **Scholarly Thesis**

During the third and fourth year of the program, the candidate will write a scholarly thesis normally of between 200 and 250 pages (not including bibliography), and will defend it at an oral examination.

## English Courses Chart

|  |
|--|
| <b>Areas of Study</b>  |
| <b>Studies in Medieval Literature:</b> 710, *714, *718, *740   |
| <b>Studies in Early Modern Literature:</b> *736, *737, *753, *757, *763  |
| <b>Studies in Eighteenth-Century British Literature:</b> *713, *741, *747, *749, *756, *758  |
| <b>Studies in Nineteenth-Century British Literature:</b> *750, *759  |
| <b>Studies in Twentieth-Century British and Irish Literature:</b> *762, *793   |
| <b>Studies in American Literature:</b> *772, *798  |
| <b>Studies in Canadian Literature:</b> *707, *760, *761, *771, 783   |
| <b>Studies in Postcolonial Literature:</b> *742, *784, *785, *787, *788, *789  |
| <b>Studies in Cultural Studies and Critical Theory:</b> *701, *704, *706, *709, *711, *713, *715, *716, *717, *718, *719, *722, *723, *724, *725, *726, *727, *729, *730, *731, *739, *744, *754, *755, *756, *757, *758, *765, *766, *767, *769, *774, *779, *790, *791, *795, *797 |



**School of Graduate Studies**

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

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

To : Graduate Council

From : Christina Bryce  
Assistant Graduate Secretary

---

At its meeting on October 11th, 2016 the Faculty of Social Sciences Graduate Curriculum and Policy Committee approved the following recommendations.

Please note that these recommendations were approved at the October 20<sup>th</sup> meeting of the Faculty of Social Sciences.

**For Approval of Graduate Council:**

- **Anthropology**
  - **Creation of new Milestone and Change to Calendar Copy**
- **Social Work**
  - **Change to Program Requirements and Calendar Copy**

**For Information of Graduate Council:**

- **Anthropology**
  - **New Course**
    - 733 Archaeologies of Identity
  - **Course Cancellations**
    - 712 Being and Belonging: The Family in Global Perspective
    - 730 Applied Archaeological Sciences
    - 745 Topics in Bioarchaeology
    - 747 Biological Anthropology Ancient Biomolecules and Bioarchaeological Chemistry
    - 748 Object Worlds: The Circulation and Value of Material Culture
- **Social Work**
  - **New Course**
    - 739 Critical Approaches to Social Work Knowledge & Research Methods
  - **Course Cancellations**
    - 737 Critical Approaches to Social Work Knowledge
    - 738 Research Methods for Social Work
- **Sociology**
  - **Change to Course Title:**
    - 759 Sociology of Gender



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

|   |                          |  |                                      |
|---|--------------------------|--|--------------------------------------|
| <b>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</b>  |                          |  |                                      |
| <p>1. This form must be completed for <b>ALL</b> changes involving degree program requirements/procedures. <b>All</b> sections of this form <b>must</b> be completed.</p> <p>2. An electronic version of this form (must be in MS WORD <b>not</b> PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).</p> <p>3. A representative from the department is <b>required to attend</b> the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.</p> |                          |  |                                      |
| <b>DEPARTMENT</b>   |                          | Anthropology   |                                      |
| <b>NAME OF PROGRAM and PLAN</b>   |                          | Anthropology   |                                      |
| <b>DEGREE</b>   | <b>MA and PhD</b>        |  |                                      |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>  |                          |  |                                      |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |                          |  |                                      |
| CREATION OF NEW MILESTONE <input checked="" type="checkbox"/>   |                          |  |                                      |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>   | <input type="checkbox"/> | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b>   | <input type="checkbox"/>             |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>  |                          | <input checked="" type="checkbox"/>  | <b>CHANGE IN COURSE REQUIREMENTS</b> |
|   |                          | <p><b>EXPLAIN:</b></p> <p>Currently at the end of the first paragraph of the MA and PhD program descriptions it reads: "All M.A. students are normally required to complete the department graduate research workshops." We would like to change the wording to read: "All M.A. students are normally required to complete the department's Professional Development Workshop."</p> <p>The same sentence, substituting PhD for M.A. would be included in the description of the PhD Program.</p> |                                      |

|   |   |  |
|---|---|--|
| <b>OTHER CHANGES</b>  | X | <b>EXPLAIN:</b><br><p>We would like to make our Professional Development Workshop a milestone. It is a required workshop for all MA and PhD students to attend in the first year of their program.</p> |
| <b>DESCRIBE THE <u>EXISTING</u> REQUIREMENT/PROCEDURE:</b><br><p>The existing requirement/procedure is described in the calendar as stated above.</p> |   |  |

|  |
|--|
| <b>PROVIDE A DETAILED DESCRIPTION OF THE RECOMMENDED CHANGE (<i>Attach additional pages if space is not sufficient.</i>)</b><br><p>We would like this requirement to become a milestone so that it will be tracked in Mosaic and will appear on the graduate student's transcript.</p>   |
| <b>RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):</b><br><p>We are about to undergo an IQAP review in 2017. In preparation for the review we have included the Professional Development Workshop as both an activity and an assessment tool in the following PLOs: Enhance Collaboration skills (GDLEs 4, 6) and Prepare and Deliver a Presentation for a Public or Professional Audience (GDLEs 3,4,6).</p>                             |
| <b>PROVIDE IMPLEMENTATION DATE: (<i>Implementation date should be at the beginning of the academic year</i>)</b><br><p>2017-18 academic year</p>   |
| <b>ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.</b><br><p>No</p>  |
| <b>PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):</b><br><p>Anthropology M.A.<br/> <p>Twelve months' residence or the equivalent in part-time study is required. While students completing their M.A. by Major Research Paper can expect to fulfill all requirements within 12 months, those electing to write a thesis normally extend their period of residence to 24 months. All M.A. students are normally required to complete the department</p> </p> |

Professional Development graduate research Wworkshop in the first 12 months of their program.

Anthropology Ph.D

The Ph.D. student will be required to obtain a minimum average of B+ in all graduate coursework required for the Ph.D. The minimum course requirement for students entering with a completed M.A. in Anthropology is normally four graduate half-courses beyond the level of the M.A. Students promoted from within our M.A. program (after completing coursework but before completing the thesis or MRP), may be exempt from taking any further courses if they have sufficient training for their program of study. The supervisor will make this decision in consultation with the student and Chair or Graduate Director. In the rare cases in which Ph.D. students are admitted directly from a Bachelor's degree, they will normally be required to take four half-courses at the graduate level. This course requirement will normally be met by taking seminars within the department. Reading courses or courses outside the department may be substituted for seminars on the recommendation of the student's supervisor and approved by the Graduate Committee. All Ph.D. students are normally required to complete the department Professional Development graduate research Wworkshop in the first 12 months of their program.

**CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:**

Name: Tina Moffat      Email: moffatcs      Extension: 23906      Date submitted: Oct 3/16

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

SGS/2013



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

|  |                                     |   |                          |
|--|-------------------------------------|---|--------------------------|
| <b><u>IMPORTANT: PLEASE READ THE FOLLOWING NOTES BEFORE COMPLETING THIS FORM:</u></b>  |                                     |   |                          |
| <p>1. This form must be completed for <b><u>ALL</u></b> changes involving degree program requirements/procedures. <b><u>All</u></b> sections of this form <b><u>must</u></b> be completed.</p> <p>2. An electronic version of this form (must be in MS WORD <b><u>not</u></b> PDF) should be emailed to the Assistant Secretary, School of Graduate Studies (cbryce@mcmaster.ca).</p> <p>3. A representative from the department is <b><u>required to attend</u></b> the Faculty Curriculum and Policy Committee meeting during which this recommendation for change in graduate curriculum will be discussed.</p> |                                     |   |                          |
| <b>DEPARTMENT</b>  |                                     | School of Social Work                                     |                          |
| <b>NAME OF PROGRAM and PLAN</b>  |                                     | Social Work PhD (SOCWRKPHD)                               |                          |
| <b>DEGREE</b>  | PhD                                 |   |                          |
| <b>NATURE OF RECOMMENDATION (PLEASE CHECK APPROPRIATE BOX)</b>   |                                     |   |                          |
| Is this change a result of an IQAP review? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No   |                                     |   |                          |
| CREATION OF NEW MILESTONE <input type="checkbox"/>   |                                     |   |                          |
| <b>CHANGE IN ADMISSION REQUIREMENTS</b>  | <input type="checkbox"/>            | <b>CHANGE IN COMPREHENSIVE EXAMINATION PROCEDURE</b>      | <input type="checkbox"/> |
| <b>CHANGE IN THE DESCRIPTION OF A SECTION IN THE GRADUATE CALENDAR</b>   | <input checked="" type="checkbox"/> | <b>EXPLAIN:</b><br>Change to PhD curriculum requirements. |                          |
| <b>OTHER CHANGES</b>   | <b>EXPLAIN:</b>                     |   |                          |

**DESCRIBE THE EXISTING REQUIREMENT/PROCEDURE:**

A Ph.D. candidate admitted without Master's level courses in epistemology (737) and in critical analysis of practice/policy (700 or 701) will be expected to complete these courses in addition to the requirements of the doctoral program.

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

We recommend that the requirement of epistemology and critical analysis of practice/policy courses may be reviewed on a 'case-by-case' basis and may be waived in some circumstances.

**RATIONALE FOR THE RECOMMENDED CHANGE (How does the requirement fit into the department's program and/or tie to existing Program Learning Outcomes from the program's IQAP cyclical review?):**

N/A

**PROVIDE IMPLEMENTATION DATE: (*Implementation date should be at the beginning of the academic year*)**

September 1, 2017

**ARE THERE ANY OTHER DETAILS OF THE RECOMMENDED CHANGE THAT THE CURRICULUM AND POLICY COMMITTEE SHOULD BE AWARE OF? IF YES, EXPLAIN.**

Since we are cancelling SW737, we will be offering epistemology course as "SW722: Special Topics" where needed. The instructor of proposed new course, SW739 (combines SW737 & SW738) will cover epistemology section for PhD students who need to fulfill this requirement under the special topics course number.

**PROVIDE A DESCRIPTION OF THE RECOMMENDED CHANGE TO BE INCLUDED IN THE CALENDAR (please include a tracked changes version of the calendar section affected if applicable):**

# Social Work, Ph.D

←Return to: [Faculty of Social Sciences](#)

## Ph.D. Degree

The School of Social Work offers a Ph.D. degree in Social Work in the field of Social Justice.

### Admission

To be eligible for admission to the Ph.D. program, applicants are normally required to have:

- a. a completed MSW degree with an average of at least an A-. (Applicants with Master's degrees in other subjects must be able to demonstrate substantial knowledge of the social service/ social welfare field and have experience of working in justice and equity-seeking services or organizations);

- b. a completed graduate level course in social research methods; and
- c. demonstrated interest and experience in critical approaches to policies, practices and knowledge-building in social work.

Applicants will be evaluated on the basis of their qualifications and the alignment of their interests with the research interests and availability of faculty.

Applications should be made to the School of Social Work prior to January 15th for admission the following September.

## **Curriculum**

The curriculum has three main components:

### **Requirements**

A Ph.D. candidate admitted without Master's level courses in epistemology ([\\*737 or equivalent](#)) and in critical analysis of practice/policy ([\\*700 or \\*701 or equivalent](#)) ~~will~~may be expected to complete these courses in addition to the requirements of the doctoral program.

Candidates may be required to complete courses beyond the minimum course requirements of the program in order that they achieve the breadth of perspective required by the program and are sufficiently prepared for their research.

### **Course requirements**

Candidates for the Ph.D. are required to complete a minimum of six post-MSW courses.

- [SOC WORK 770 / Social Work and Social Justice: Theoretical Tensions](#)
- [SOC WORK 771 / Research for Social Change](#)
- [SOC WORK 772 / Qualitative Methods for Social Work](#)
- **or** a methods course selected from another department (e.g. quantitative, historical, mixed methods)
- [SOC WORK 773 / Doctoral Research Seminar](#)

### **Two elective courses**

Students will be encouraged to take at least one of their elective courses in another department in order to profit from the interdisciplinary opportunities at McMaster.

## **Comprehensive Examination**

The comprehensive examination is designed to evaluate the breadth of students' knowledge of debates and developments in contemporary scholarship in social work and social justice. Ph.D. candidates are required to situate their anticipated research topics in a wide and critical review of related theory and research, and to demonstrate their capacity for the integration of ideas and

their skills in scholarly inquiry and writing.

**Thesis**

Students will be required to submit a thesis and defend it during a final oral examination.

**CONTACT INFORMATION FOR THE RECOMMENDED CHANGE:**

Name: Dr. Ann Fudge Schormans Email: [fschorm@mcmaster.ca](mailto:fschorm@mcmaster.ca) Extension: 23790 Date submitted: Sep 28/16

If you have any questions regarding this form, please contact the Assistant Secretary, School of Graduate Studies, [cbryce@mcmaster.ca](mailto:cbryce@mcmaster.ca)

SGS/2013

### 2.1.2 Admission Requirements for Ph.D. Degree

Applicants may be admitted to a regular Ph.D. program at one of three stages in their academic work: (1) after completion of a Master's program; (2) Directly from a Master's program at McMaster without completing the Master's degree; (3) in exceptional cases, directly from a Bachelor's program. Students still enrolled in a Master's with thesis program beyond 22 months must complete the degree requirements including the thesis prior to admission to the Ph.D. program.

1. For applicants who hold a Master's degree, the primary requirements are distinction in their previous graduate work (equivalent to at least a McMaster B+), and strong letters of reference.
2. Students enrolled in a Master's program at McMaster University may be transferred to the Ph.D. program prior to completion of the Master's degree. Not sooner than two terms and no later than 22 months after initial registration in the Master's program here, students may request to be reclassified as Ph.D. students. After proper review, the department will recommend one of the following:
  - a. admission to Ph.D. studies following completion of the requirements for the Master's degree;
  - b. admission to Ph.D. studies without completion of a Master's program;
  - c. admission to Ph.D. studies but with concurrent completion of all requirements for a Master's degree within ~~two months~~ one term from the date of reclassification;
  - d. refusal of admission to Ph.D. studies.

For students in (b), the recommendation for admission to Ph.D. must identify which if any courses taken as a Master's student can be credited toward the requirements for the Doctoral program.

A student in (b) may re-register as a candidate for the Master's degree, provided that work to date has met the standards for the Master's program.

Students in (c) who do not complete the requirements for the Master's degree within ~~the two months~~ one term will lose their status as a Ph.D. candidate and be returned to Master's status.

3. In certain programs, applicants with a first degree only, may be admitted directly to Ph.D. studies. Such students must show sufficient promise, including at least an A average. Within one calendar year the progress of students admitted to Ph.D. studies directly from a Bachelor's degree will be reviewed by their supervisory committee and the program. The program then will recommend one of the following:
  - a. proceed with Ph.D. studies;
  - b. not proceed with Ph.D. studies but re-register as a Master's candidate;
  - c. withdraw from the University.

A student admitted to a Ph.D. program who re-registers as a candidate for a Master's degree must meet all of the requirements for the Master's degree in order for it to be awarded.



Transfers to a Ph.D. program take effect at the start of the next term, or are retroactive to September 1st for students whose request to transfer is received by the School of Graduate Studies by the end of the second week of October. Students are encouraged to transfer before the fall term.

## **Graduate Awards to be approved at November Grad Council Meeting**

### **NAME OF FUND: Hamilton Scleroderma Group Ontario Graduate Scholarship**

#### **TERMS OF REFERENCE FOR FUND:**

*Established in 2016 by the Hamilton Scleroderma Group at St. Joseph's Healthcare Hamilton to contribute to the Ontario Graduate Scholarship Program. To be awarded by the School of Graduate Studies to a student enrolled in the Faculty of Health Sciences. Preference to be given to students studying with a focus in Scleroderma, other connective tissue disorders or fibrosis.*

### **NAME OF FUND: The Beverley McPetrie Bursary.**

#### **TERMS OF REFERENCE FOR FUND:**

*Established in 2016 by Beverley McPetrie, BSCN (Class of '61), to encourage students to achieve their goals and be passionate in their work. To be awarded by the school of Graduate studies to students enrolled in the Graduate Nursing Program who demonstrate financial need. Preference to be given to students pursuing the Primary Health Care Nurse Practitioner designation.*

### **NAME OF FUND: Michael Kamin Hart Memorial Scholarship**

*The lead donor (Michael Hart's father) and the IIDR have requested that the terms now be expanded to include an award for research staff members. Thus the terms would become (changes highlighted):*

#### **TERMS OF REFERENCE FOR FUND:**

*Established in 2011 by the Michael G. DeGroot Institute for Infectious Disease Research along with family, friends and donors in memory of Michael Kamin Hart, who was a student within the Institute. Aligned with Michael's academic trajectory, to be awarded to:*

- (a) an undergraduate summer student in either their third or fourth year of study who plans to go on to graduate work at McMaster; and*
- (b) an MSc student; and*
- (c) a PhD student; and*
- (d) a research staff member*

*The recipients must be associated with the Michael G. DeGroot Institute for Infectious Disease Research and have demonstrated academic excellence.*

*To be awarded on the recommendation of the Executive Committee of the Michael G. DeGroot Institute for Infectious Disease Research.*

**NOTE:** *Fund administration to move from SGS to FHS due to multiple groups of recipients.*

## **Scholarships Committee 2016-2017**

### Additional Members

Sorin Mitrea    Political Science student    mitreasi@mcmaster.ca  
Blair Wilson,    Social Work student    wilsob13@mcmaster.ca

### Replacement

Dr. Catherine Connelly from Business will be replaced by Dr. Willi Wiesner from Business.

# NEW CORE COMPETENCY MODULES for researchers & peer reviewers



## Integrating Sex & Gender in Biomedical Research

### DID YOU KNOW?

**Different immune cells mediate mechanical pain hypersensitivity in male and female mice.<sup>1</sup>** *Could you be missing important sex differences by excluding female cells and animals?*

**Female mice and rats are not more variable than males. In some instances, they could even be less variable.<sup>2,3</sup>**

**An increasing number of REBs and regulators are questioning the exclusion of female physiology from pre-clinical research and what this means for informed consent in subsequent clinical studies.<sup>4</sup>**

**Funding organizations around the world are starting to require the integration of sex as a biological variable in applications.<sup>5</sup>** *Will your research be left behind?*



2



## Integrating Sex & Gender in Primary Data Collection

### DID YOU KNOW?

**Men and women face different barriers to participating in research and may respond better to different recruitment strategies.<sup>6</sup>** *Are you addressing these challenges in the methodology section of your protocol?*

**Self-reported data in studies may change depending on whether interviews are conducted by male or female researchers.<sup>7</sup>** *Have you considered ways to avoid gender bias in your research?*

**More and more scientific journals are changing their editorial policies to require that the sex and/or gender of research cells, tissues, animals and human participants be reported.<sup>8</sup>** *Could not accounting for sex or gender make it more difficult for you to publish?*



3



## Integrating Sex & Gender in the Analysis of Data Collected from Humans

### DID YOU KNOW?

**In a recent study, investigators found that gender, independent of sex, predicts poor outcomes of early heart disease.<sup>9,10,11</sup>** *Do you use sex- and gender- related variables in your data analysis?*

**More men work in goods-producing sectors like construction and manufacturing, while more women work in service sectors like health care and caregiving.<sup>12,13</sup>** *How might gender roles and the gendered nature of work impact exposures and health outcomes?*

**Research suggests prescription drug patterns differ between men and women.<sup>14</sup>** *Are you measuring the effects of sex- and gender- related variables on drug efficacy and adverse drug reactions?*

[www.discoversexandgender.ca](http://www.discoversexandgender.ca)



CIHR  
IRSC

Institute of Gender  
and Health  
Institut de la santé des  
femmes et des hommes

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