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December 9, 2010

To : Members of the Faculty of Engineering Graduate Curriculum and Policy Committee

From : Medy Espiritu
Assistant Secretary and SynApps System Administrator

The next meeting of the Faculty of Engineering Graduate Curriculum and Policy Committee will be held on **Tuesday, December 14, 2010** at **1:30 p.m.** in **MUSC-318**.

Agenda: M.Eng. in Energy Systems *(enclosed)*

If you are unable to attend this meeting, please call extension 24204 or email *espiritu@mcmaster.ca*.

Thank you.

McMaster University

Brief for the Standard Appraisal
of the

Master of Engineering Program in Energy Systems

VOLUME I: The Program

Submitted to the
Ontario Council on Graduate Studies
November 2010

THE PROGRAM

1. INTRODUCTION

1.1. Brief listing of programs

The new master's program leads to the degree of Master of Engineering in Energy Systems. The requirements for degree completion include a pure course based option as well as a combined course and industrial project based option. The course and/or project requirements are consistent with other accredited Master of Engineering programs at McMaster. It is anticipated that the first offering will be fall 2011.

1.2. Objectives of the programs

Master's program: The objective of the program is to

- Provide an integrated program with a breadth of courses for students interested in energy systems and who wish to obtain a course based Master's degree.
- Provide a M.Eng. program that meets the increased demand for Highly Qualified Personel, HQP, in this industry.
- Enhance McMaster's capability to deliver high quality Master's level degrees in the targeted field of sustainable energy production and delivery.
- Increase enrolment in both undergraduate and graduate level programs by creating an advanced program directly related to energy field in the 21st century.

These objectives are achieved through course work at the graduate level taken across multiple engineering disciplines. Students may elect to undertake an industrial relevant project in lieu of part of this course requirement and such projects will be supervised and approved by Engineering Faculty.

1.3. Method used for the self-study as well as the preparation of the brief, including faculty and student input and involvement.

Suggestion: Input from a major workshop held with major companies in the Ontario Power Industry (e.g., OPG, Bruce Power, IESO, Kinectrics and others) gave clear indication that there was a high demand for training in such areas as energy transmission, generation, public policy, and life cycle management. This master's program was developed specifically to address that demand. This brief was prepared based on industry information presented at that workshop, and the program has been designed based on current industry requirements, to include training in the areas aforementioned. Final year bachelor students were consulted in terms of their potential interest in such a course based Master's and feedback from these groups indicated that enrolment figures should reach 10 to 15 students per year. Hence this proposed new program will meet the demands of industry as well as students in the multidisciplinary field of energy.

1.4. Fields in the programs

Not required for Master's program.

1.5. Review concerns expressed in previous appraisal and actions taken

Not applicable, as this is a new program.

1.6. Special matters and innovative features

This program is unique in Ontario in that it provides a single, advanced degree program which provides training in the areas of power production, generation equipment, transmission, distribution, conservation and public policy. While other degree programs within the province offer subsets of these technologies, no single program is available which provides a multidisciplinary approach addressing all the aspects related to energy systems.

2. THE FACULTY

2.1. List of faculty

Table 1 lists the faculty members involved in the graduate program, and indicates gender.

In all cases, the courses will be offered by existing faculty. In many cases, courses are already offered. However, the strength of this program will be in bringing new students interested in Energy Systems together and providing them with both a cohesive curriculum that spans multiple engineering disciplines and access to faculty in all areas of energy systems.

Table 1 lists the faculty members involved in the graduate program and indicates gender.

TABLE 1

N.B.: The intent of this Table is to establish the strength and the degree of involvement of the faculty complement participating in each field of the graduate program and whose CVs are provided in Volume II of the Brief. This is an important element in the assessment of program quality.

Faculty Name & Rank	**M/F**	**Home Unit [1]**	**Supervisory Privileges [2]**
Category 3			
Al-Mutawaly, N.	M	McMaster-Mohawk Bachelor of Technology Program	
Botton, G., Professor	M	Materials Sci. & Eng.	Full
Ching, C., Professor	M	Mechanical	Full
Cotton, J., Associate	M	Mechanical	Full

Hoyt, J., Professor	M	Materials Sci. & Eng.	Full
Judd, R., Professor	M	Mechanical	Full
Kish, J., Associate	M	Materials Sci. & Eng.	Full
Kleiman, R., Professor	M	Engineering Physics	Full
LaPierre, R., Associate	M	Engineering Physics	Full
Lightstone, M., Professor	F	Mechanical	Full
Luxat, J., Professor	M	Engineering Physics	Full
Novog, D., Associate	M	Engineering Physics	Full
Preston, J., Professor	M	Engineering Physics	Full
Tang, C., Assistant	M	McMaster-Mohawk Bachelor of Technology Program	
Tullis, S., Assistant	M	Mechanical	Full
Sorin, M., Professor	M	Walter G. Booth School of Engineering Practice	
Category 4			
Markettos, N., Industry Professor	M	Walter G. Booth School of Engineering Practice	

1. *This is the budget unit paying the salary: department, school, research centre or institute, or other.*
2. *Indicate the level of supervisory privileges held by each faculty member: e.g., full, master's only, co-supervision only, etc., if applicable to your institution's regulations or practices.*
3. *Either give the field name or a footnote reference to it.*
4. *List faculty members under the categories suggested, as applicable (it is expected that some categories may not apply to your institution).*

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.

2.2. External operating research funding

The M.Eng. in Energy Systems is a course based degree with a project option, and hence it is not dependent on operating research funding. Information on external operating research funding, therefore, is not required. In terms of students electing projects which are approved by the program administrator and supervised by faculty within engineering, any incidental project costs must be pre-approved by the supervisor and or Dean of the faculty.

2.3. Graduate supervision

Completed, and current, supervisorships of master's, doctoral, and post-doctoral students, by faculty member

TABLE 3

Completed and Current Numbers of Thesis[1] Supervisions by Faculty Member						
	Completed			**Current**		
Member	**Master's**	**PhD**	**PDF**	**Master's**	**PhD**	**PDF**
Category 3						
Al-Mutawaly, N.	0	0		0	0	
Botton, G., Professor	(10)	(5)		0	(4)	
Ching, C., Professor	(14)	(7)		(5)	(2)	
Cotton, J., Associate	(5)	(1)		(3)	(2)	
Hoyt, J., Professor	(5)	(3)		(4)	(2) co-supervisor	
Judd, R., Professor	(30)	(5)				
Kish, J., Associate	(1)			(5)	(2)	
Kleiman, R., Professor	(4)		(2)	(4)	(4)	(4)
LaPierre, R., Associate	(3)	(3)		(2)	(4)	
Lightstone, M., Professor	(19)	(4)		(5)	(4)	
Luxat, J., Professor	(6)			(5)	(3)	
Novog, D., Associate	(6)			(4)	(7)	
Preston, J., Professor	(29)	(15)	(3)	(3)	(2)	
Sorin, M., Professor	(9) co-supervisor			(2) co-supervisor		
Tang, C., Assistant	0	0		0	0	

Tullis, S., Assistant	(2)			(6)	(4)	
Category 4						
Markettos, N., Industry Professor	0	0		0	0	

2.4. Current teaching assignments

(Graduate and undergraduate), showing the number of courses taught by each faculty member

TABLE 4: Teaching Assignments of Program Faculty from the 2007/2008 through the 2009/2010 Academic Years

Teaching Assignments for 2007/2008[1]			
Faculty Member & Rank[2]	**Undergraduate**	**Graduate**[3]	**Comments**
Category 3			
Al-Mutawaly, N.			
Botton, G., Professor	MAT 4H03/6H03		
Ching, C., Professor	ME 3M03 (2) ME 4V03 ME 4M06 (4/38)	ME 709 (1.5 / 3)	
Cotton, J., Associate	ME 2W04 ME 4M06 (2/38) ME 4P03 (2/5)		
Hamed, M., Associate			
Hoyt, J., Professor	MAT 3E04		
Judd, R., Professor	ME 3R03 ME 706 ME 758		
Kish, J., Associate			Not yet on staff
Kleiman, R., Professor	Eng Phys 4U04 (1/2) Eng Phys 2QM3 Eng Phys 3MD3		
LaPierre, R., Associate	Eng Phys 2S03 (1/3)		
Lightstone, M., Professor	ME 4S03 ME 2C03 (1/7) ME 4M06 (2/38)	ME 756	

Luxat, J., Professor	Eng Phys 3D03 Eng Phys 4NE3		
Novog, D., Associate	Eng Phys 3O04 Eng Phys 4L04 Eng Phys 4U04 (1/2) Eng Phys 2S03 (1/3)		
Preston, J., Professor	Eng Phys 3F03 Eng Phys 4MD4 Eng Phys 2S03 (1/3)		
Sorin, M., Professor		SEP 754	
Tang, C., Assistant			Not yet on staff
Tullis, S., Assistant	ME 3F04 ME 4U03/6U03 ME 4M06 (2/38)	ME 709 (1.5 / 3)	
Category 4			
Markettos, N., Industry Professor			

Teaching Assignments for 2008/2009[1]			
Faculty Member & Rank[2]	**Undergraduate**	**Graduate**[3]	**Comments**
Category 3			
Al-Mutawaly, N.	ENR TECH 3IN3 ENR TECH 3PD3 ENR TECH 3SG3		
Botton, G., Professor	MAT 1M03		
Ching, C., Professor	ME 3M03 (2) ME 4V03 ME 2C03 (1/7) ME 4M06 (2/36)	ME 709 (1.5 / 3)	
Cotton, J., Associate	ME 2W04 ME 4M06 (2/36) UG course prep		
Hamed, M., Associate			
Hoyt, J., Professor	MAT 1M03 MAT 3E04	MAT 701/702	
Judd, R., Professor	ME 3R03 ME 706 ME 758		

Kish, J., Associate	MAT 4D03/6D03		
Kleiman, R., Professor	Eng Phys 2QM3 Eng Phys 3MD3		
LaPierre, R., Associate	Eng Phys 2S03 (1/3)		
Lightstone, M., Professor	ME 4S03 ME 4M06 (2/36)	ME756	
Luxat, J., Professor	Eng Phys 3D03 Eng Phys 4NE3		
Novog, D., Associate	Eng Phys 2S03 (1/3) Eng Phys 3O04 Eng Phys 4L04 Eng Phys 4U04 (1/4)		
Preston, J., Professor	Eng Phys 3F03 Eng Phys 4MD4 Eng Phys 4U04 (1/4)		
Sorin, M., Professor		SEP 754	
Tang, C., Assistant			Not yet on staff
Tullis, S., Assistant	ME 3F04 ME 4U03/6U03 ME 4M06 (2/36)	ME 709 (1.5 / 3)	
Category 4			
Markettos, N., Industry Professor		SEP 706	

Teaching Assignments for 2009/2010[1]			
Faculty Member & Rank[2]	**Undergraduate**	**Graduate**[3]	**Comments**
Category 3			
Al-Mutawaly, N.	ENR TECH 3EP3 (x2) ENR TECH 3IE3 (x2) ENR TECH 3IN3 ENR TECH 3PD3 ENR TECH 4PQ3 (1/2) ENR TECH 3MI3		
Botton, G., Professor	MAT 4F03 (2) MAT 4H03 (1)		

Ching, C., Professor	ME 2C03 (1/7) ME 3M03 (2) ME 4M06 (2/18) ME 4V03	ME 708 (1.5/ 3) ME 709 (1.5 / 3)	
Cotton, J., Associate	ME 2C03 (1/7) ME 4M06 (2/18) ME 4O04 ME 4P03 (2)	ME 708 (1.5 / 3)	
Hamed, M., Associate			
Hoyt, J., Professor	MAT 3E04 (2) MAT 4N03 (1)	MAT 701/702 (3)	
Judd, R., Professor	ME3R03	ME706 ME758	
Kish, J., Associate	MAT1M03 (2) MAT 3E04 (2) MAT 3T04 (1)		
Kleiman, R., Professor	EP 3MD3 EP 2QM3 EP 2S03(1/2)	EP 719	
LaPierre, R., Associate	PHYS 3BA3 PHYS 3BB3 EP 4X03	EP 730	
Lightstone, M., Professor	ME 4M06 (2/18) ME 4S03	ME 756	
Luxat, J., Professor	EP 4NE3/6NE3	EP 713	
Novog, D., Associate	EP 3O04 EP 4L04/6L04 EP 4U04 (1/4)	EP 715	
Preston, J., Professor			Research leave
Sorin, M., Professor		SEP 754	
Tang, C., Assistant	ENR TECH 4PM3 ENR TECH 4PD3		
Tullis, S., Assistant	ME 3F04 ME 4M06 (2/18) ME 4U03	ME709 (1.5 / 3)	
Category 4			
Markettos, N., Industry Professor		SEP 706	

2.5. Commitment of faculty members from other graduate programs and/or from other institutions

The program will utilize only faculty from McMaster University.

3. PHYSICAL AND FINANCIAL RESOURCES

3.1. Library resources

Appendix C provides a report from the University's Chief Librarian. This report includes data for financial support over the past seven years.

3.2. Laboratory facilities

Laboratory facilities for research are not required for this course-based degree program. For courses with laboratory components, existing facilities and spaces will be used to accommodate students in the program.

3.3. Computer facilities

All faculty, graduate and undergraduate students are provided with an account on the McMaster University computing system that provides them with access to e-mail and the Internet. All departments in this proposal provide their own computer lab for student use. Faculty and University-wide labs are also available for student use. These labs provide e-mail and Internet access and office productivity (MS Word),

3.4. Space

Current faculty, laboratory, graduate student and general research office space, commitments/plans (if any) for next seven years.

The participating departments have the majority of their allocated space in the John Hodgins Engineering building.

Each faculty member participating in this program is assigned a private office with the appropriate furnishings (i.e. desk, computer desk and bookshelf), a telephone and internet access.

Students are not assigned carrel space for this course based degree.

3.5. Financial support of graduate students

The M.Eng. in Energy Systems is a course-based Master's program. Students will be required to pay tuition, and will not generally receive any financial support other than scholarships available in open competitions (i.e., NSERC or OGS), which the students will have to apply for themselves. A small number of exceptional students may receive Teaching Assistantships, but it is not expected that this will be the general case for students in this program.

4. PROGRAM REGULATIONS AND COURSES

4.1. The intellectual development and the educational experience of the student

McMaster University has a long and distinguished track record in energy matters. From its inception, the Faculty of Engineering at McMaster has provided extensive training and research in the field of energy, and many of its graduates are employed in this economic sector. The McMaster Institute for Energy Studies (MIES) was founded in 1980 in the Faculty of Engineering as an interdisciplinary institute for the study of energy extraction, transformation, generation, transportation and end-use. In the following decades the Institute also developed a focus on policy and economics.

Internally, MIES provides a forum for cooperation and interdisciplinary interactions between McMaster faculty members in the energy area, acts as a point of contact at McMaster for energy-related opportunities and provides a means to communicate those opportunities to the McMaster community. It encourages and fosters an interdisciplinary systems approach to the solution of energy problems in order to establish a credible capability for the assessment and evaluation of energy systems, thus providing authoritative advice to governments and industry. The MIES provides forums for seminars, student exchanges and interdisciplinary projects which would directly enrich the students' experience in the Master's program.

Currently, there are numerous undergraduate and graduate level courses in energy systems throughout the Engineering Physics, Mechanical Engineering, Material Science and Engineering, and Electrical Engineering departments as well as the School of Engineering Practice. These programs cover topics ranging from advanced thermodynamics of power production systems, nuclear power, safety, reliability, renewable energy production methods, distribution, and sustainability. Over 50 graduate students are enrolled in research related degrees in the field of energy, and hence a complimentary course based Master's degree is ideally situated in this Faculty.

Created out of a demand for engineers to manage increasingly complex issues, the Walter G. Booth School of Engineering Practice (SEP) and its Centres provide a new concept in engineering education. The school recognizes the need for life-long learning opportunities for engineers and scientists by providing a unique vehicle to enhance career horizons. The SEP will be home to the proposed program, due to its attention to professional development and public policy which are unique within the faculty. This proposed program would provide a single umbrella master's level engineering degree which covers all the facets of energy systems, their environmental impact, and delivery which is unique in Canada.

The program's curriculum provides the maximum flexibility to students who are either a) continuing on from an undergraduate degree, b) undergoing skills upgrading or specialization from industry, or c) are foreign trained professions seeking additional skilled training. The selection of courses provided in the program covers all areas of production, life cycle management, public policy, environmental impact, distribution and conservation. This breadth of material is unique to McMaster, and the majority of the courses already exist within the Departments in the Faculty of Engineering. Hence, students will be exposed to top-quality educational programs which have been developed over the past several decades by leading faculty in Energy Systems.

They will have the ability to interact through these courses with students working on research projects in the area which will further enhance their learning.

Beyond the courses, students may elect to undertake a relevant, industrial project to gain exposure to real world problems in the field of energy. These projects would be supervised directly by faculty and be industry driven, which means students eligible for the project component would be involved directly in relevant technologies.

4.2. Program regulations

Students enrolling in this program must meet the faculty requirements for admission into Graduate studies (currently a B- in an approved Engineering and/or Science program) as well as all other entrance requirements (language, etc…).

For students in approved Engineering programs at McMaster, they may apply for entry into the program while in their third year and would be conditionally accepted based on their performance up to that time. For existing McMaster Faculty of Engineering students:

i. During the final year of undergraduate studies, McMaster Engineering students meeting the academic requirements (i.e., at least a B-) and approved by their department, may elect to take 2 of their 4th year technical electives at the 600 Level.

ii. Students would be required to have a B- at the end of third year, or Department Chair approval, in order to apply to the program.

iii. Students would graduate with a Bachelor's degree upon successful completion of their 4th year courses. Depending on their final year marks, eligible students would be able to apply to the master's degree program through the normal processes.

iv. Students meeting the requirements for graduate enrolment and accepted into graduate studies would then be given course credit for the 600 level courses already completed.

A number of existing McMaster departments offer similar accelerated master's degree programs of a similar model by utilizing the 600 Level courses taken in the 4th year of an undergraduate degree, including: Mechatronics Engineering, Manufacturing Engineering, Engineering Practice, Medical Physics and Radiation Biology, Electrical and Biomedical Engineering.

Students enrolling into this program from a BTech degree will require a minimum A-, consistent with other masters admission requirements for students from the BTech program.

Courses will typically be evaluated using a mixture of examinations, projects and other course work such as presentations. For students choosing the project option in lieu of two courses, a written document and an oral presentation and discussion of the results will be used as evaluation. Each student will be exposed to a breadth of

training in the field on Energy as well as the different research aspects important in this field.

Part-time studies

Students enrolled part would be expected to complete the course based portion of the program within 2 to 3 years from admission. This is dependent on the individual student's ability to participate in courses, and the schedule for the courses being offered.

Admission

Degree requirements – Master's

The M.Eng. in Energy Systems will consist of at least 4 courses at the 700 Level with a total of 8 half-courses, and will be administered by the School of Engineering Practice. The research requirements for the program will be met within the context of the courses delivered to the student over the 8 credits required, as well as through attendance at MIES symposia and seminars and through the presentation of projects within their courses.

With approval of the administrator, students may elect to undertake a relevant, industrial project as an alternative to two of their required courses. This approval is dependent on finding a suitable project and academic advisor within their department. Students wishing to complete the project component should consult with the program administrator as soon as possible, and within 4 months, of entering the program.

Distance delivery

The Faculty of Engineering has had significant success in hosting distance learning graduate level courses, both through UNENE and through other mainstream course offerings. This new program utilizes some of these distance based courses in other existing approved programs. These distance learning options conform with the OCGS bylaws and have greatly increased the numbers of professional students enrolled in the program as part time nuclear students. Growth expected is in part time graduate students, professional skills upgrading, and in training of foreign experienced engineers. Access and utilization of the faculties' remote learning expertise increase the benefits of this program to a wider geographical area.

If the program is delivered in part or in whole by distance education, provide information on the guidelines in Section 31 of the OCGS By-Laws and Procedures Governing Appraisals.

4.3. Part-time studies

There is no difference in the degree completion requirements for part-time students.

4.4. Total graduate courses listed and level

Table 4.3.1 lists the graduate courses offered during each of the past three years with the graduate enrolments. Note that these are just the courses in each of the three participating departments that are directly relevant to energy studies. Many other graduate courses are routinely offered within these departments, and students may also take courses in other departments depending on their interests.

Courses denoted with a 6/4 prefix are eligible for both undergraduate and graduate credit. It is anticipated additional courses will be created as the program develops. In particular, courses in the following areas are being considered:

- **Energy Production, Consumption and Society (600 Level)** – a new course covering the engineering aspects (physics of operation, costs, limits, life cycle, applications) of renewable energy systems including wind (vertical and horizontal axis), geothermal, solar (photovoltaics and thermal), tidal and nuclear closed fuel cycles along with the societal impacts of energy use.
- **Economics of Energy Production and Delivery (600 Level)** – a new course which will analyze the various economics of energy production and delivery. Analysis of distributed power systems, small hydro, co-generation, energy market forces, grid infrastructure, maintenance and stability. Geopolitical and international aspects of energy production import and export.
- **Advanced Nuclear Materials and Characterization (700 Level)** – advanced course on materials used in the existing and next generation of nuclear reactors, their materials properties, radiation and environmental damage, creep, cracking, and tools used in characterization.
- **Engineering Aspects of Power Plant Environmental Assessments (700 Level)** – fundamentals and engineering approach to environmental assessments for power production and delivery. Review of current practices and government regulations. Project related to environmental assessments in the Hamilton/Ontario region.

It is anticipated that the above new courses could be delivered with the existing Faculty compliment.

Table 7 lists the graduate courses offered during each of the past three years with the enrolments.

TABLE 7 (*Enrolment UG/G)

Course[1]	Faculty member(s) responsible	Enrollment[3]		
		2007/8	2008/9	2009/10

Engineering Physics Graduate Courses				
EP 4L04/6L04 Industrial Monitoring and Detection Techniques	D. Novog	14/1	16/1	27/0
EP 4NE3/6NE3 Advanced Nuclear Engineering	J. Luxat	13/9	12/3	24/4
EP 713 Nuclear Safety Analysis and Reactor Accidents	J. Luxat	14	Not offered	14
EP 715 Advanced Nuclear Reactor Thermalhydraulics	D. Novog	12	Not offered	6
EP 719 MEMS Devices: Design, Fabrication, and Applications	R. Kleiman	Not offered	Not offered	Not offered
EP 730 Thin Film Characterization	R. LaPierre	12	Not offered	14
Materials Science and Engineering Graduate Courses				
MAT 4D03/6D03 Materials and the Environment	J. Kish	not offered	41/4	not offered
MAT 4H03/6H03 Thin Film Science and Engineering	G. Botton	17/not offered	not offered	23/not offered
MAT 701/702 Graduate Seminar	J. Hoyt	10/5	12/5	17/8
Mechanical Engineering Graduate Courses				
ME 4U03/6U03 Compressible Flow and Turbomachinery	S. Tullis	0	1	2
ME 706 Advanced Heat Transfer	R. Judd	7	13	8
ME 708 Two Phase Flow and Heat Transfer	C. Ching/J.Cotton	0	0	6
ME 709 Introduction to Turbulent Flows	C. Ching	4	6	4
ME 709 Introduction to Turbulent Flows	S. Tullis			
ME 756 Computational Fluid Dynamics	M. Lightstone	12	15	13
ME 758 Graduate Seminars in Mechanical Engineering	R. Judd	60	52	56
Engineering and Public Policy				
SEP 706 Energy and Public Policy	N. Markettos			
SEP 754 Process Design and Integration for Minimal Environmental Impact	M. Sorin			

1. *Indicate by * if the course is an undergraduate course occasionally taken by graduate students for graduate credit; by ** if the undergraduate course is habitually taken by graduate for graduate credit; and by *** if the course is a graduate course occasionally taken by undergraduate students.*
2. *List faculty member(s) responsible for the delivery of each course. If assignment changes each year for the same course, modify the table to reflect this fact.*
3. *In each case indicate graduate/undergraduate enrolment (G/U).*

Consistent with the McMaster 400/600 level classification in place within Engineering, some of the courses in this program have mixed undergraduate and graduate student representation. The course present advanced undergraduate material (i.e., the 400 series or course beginning with a 4) and the graduate level material (i.e., course beginning with a 6) with the requirements for graduate students to either complete an additional research project or report to obtain credit.

4.5. Collateral and supporting departments

List only those involvements that are substantial, indicating the nature of the co-involvement (ie. graduate supervision, joint research, graduate teaching, etc.).

5. OUTCOMES

5.1. Enrolment and graduations

Not applicable to new program

5.2. Employment

Not applicable to new program

5.3. Publications

Not applicable to new program

5.4. Projected graduate intake and enrolments

Projected intakes and enrolment is shown in the following tables for the next 7 years.

TABLE 12

PROJECTED INTAKE AND ENROLMENTS Masters (M) And Doctoral (D) Programs										
YEAR	**FULL-TIME**				**PART-TIME**				**TOTAL ENROLMENT**	
	Intake		**Enrolments**		**Intake**		**Enrolments**		**M**	**D**
	M	**D**	**M**	**D**	**M**	**D**	**M**	**D**		
2011	2	-	2	-	1	-	1	-	3	-

2012	6	-	6	-	2	-	3	-	9	-
2013	10	-	10	-	5	-	8	-	18	-
2014	12	-	12	-	6	-	13	-	25	-
2015	12	-	12	-	6	-	17	-	29	-
2016	12	-	12	-	6	-	18	-	30	-
2017	12	-	12	-	6	-	18	-	30	-

The projected enrolment of full-time non-visa students over the next 7 years is 2 ,5, 8, 10, 10, 10, 10 students (based on informal exit polling of undergraduate students from the Department) and they are expected to complete the program within 12 months. The number of part-time students is expected to be 1, 2, 5, 6, 6, 6, 6 students with the expected degree completion within 3 years). The number of visa students in the program is expected to be approximately 2 to 4 over the 7-year period with the expected completion within 12 months of enrolment.