University of Ontario
INSTITUTE OF TECHNOLOGY

Curriculum and Program Review Committee

Report to Academic Council

at its meeting of June 20, 2006

For Action

1. Faculty of Engineering and Applied Science Proposed Graduate Program in Electrical and Computer Engineering

The Curriculum and Program Review Committee recommends:

> That Academic Council approve the proposed Graduate Program in Electrical and Computer Engineering as set out in Appendix A.

Rationale:

The proposed Graduate Program in Electrical and Computer Engineering will lead to the degrees of Master of Applied Science (MASc) or Master of Engineering (MEng) in Electrical and Computer Engineering. The MASc program will consist of courses and a thesis. The MEng program will have two options: the MEng-Project which will consist of a combination of courses and a project, and the MEng-Course which will consist of only course work.

The demand for electrical and computer engineering graduate studies is evident from the increasing student enrolment in full-time electrical and computer engineering graduate programs across Ontario. Currently, there are a total of ten institutions offering graduate programs in electrical and computer engineering in Ontario. The rapid growth and success of the undergraduate engineering programs and graduate programs at UOIT clearly demonstrate that the Faculty of Engineering and Applied Science is ready and able to expand its graduate programs by offering MASc and MEng programs in Electrical and Computer Engineering.

These programs are new to UOIT and are planned to be launched in September 2007, pending necessary approvals.

A business plan is included as part of the proposal. The Registrar has also provided comments on this program and the two others that follow in Appendix B.

2. Faculty of Engineering Proposed Graduate Program in Automotive Engineering

The Curriculum and Program Review Committee recommends:

> That Academic Council approve the proposed Graduate Program in Automotive Engineering as set out in Appendix C.

Rationale:

The Faculty of Engineering and Applied Science proposes to offer graduate programs leading to a Master of Applied Science (MASc) or Master of Engineering (MEng) in Automotive Engineering. The MEng program will have two options: (1) MEng-Project with a combination of courses and a project, and (2) MEng-Course, which consists only of courses.

The automotive sector is of vital importance to the economies of Ontario and Canada. One in seven Canadians depends on the automotive sector for employment. The automotive industry is Canada's largest manufacturing sector. Currently, Canada's automakers are facing severe competition from overseas due to lower labour costs. Ontario's future prosperity depends heavily on economic growth in its automotive sector.

There are currently no other graduate Automotive Engineering programs in Canada. Training of future graduate students in Automotive Engineering is critical to provide a competitive advantage for Ontario's automakers. These graduate students would provide the advanced skills necessary to lead Ontario's automakers to future success.

These graduate programs are new programs offered at UOIT and are planned to be launched in September 2007, pending necessary approvals.

A business plan is included as part of the proposal and the Registrar's comments can be found in Appendix B.

3. Faculty of Social Science Proposed Graduate Program in Criminology

The Curriculum and Program Review Committee recommends:

> That Academic Council approve the proposed Graduate Program in Criminology as set out in Appendix D.

Rationale:

The Faculty of Social Science proposes to offer a new program leading to a M.A. degree in Criminology. The M.A. program will have two options: (1) a non-thesis option consisting of a combination of courses and a final major paper; and (2) a thesis option consisting of specified courses and a thesis.

There are two established programs in criminology in Ontario, and additional undergraduate degrees in criminology or criminology-related disciplines have recently been developed at eleven Ontario institutions, including UOIT.

This proposal is also predicated on enhanced research and scholarship opportunities, increased potential for grants, the tremendous growth in population within Durham Region, and the need for localized career development for existing practitioners.

This graduate program is a new program offered at UOIT and is planned to be launched in September 2007, pending necessary approvals.

A business plan is included as part of the proposal and the Registrar's comments can be found in Appendix B.

For Information

4. Course Numbering

The Committee reviewed an administrative procedure for the assignment of course numbers. Each Faculty will be invited to submit a protocol to the Registrar's office that outlines its preferred sequencing or logic requirement for its courses.

UNIVERSITY OF ONTARIO

INSTITUTE OF TECHNOLOGY

Brief for the Appraisal
of the
MASc and MEng
in
Electrical and Computer Engineering

Submitted to the

Ontario Council on Graduate Studies

June 22, 2006

Table of Contents

VOLUME I: THE PROGRAM

1 INTRODUCTION

1.1 Brief listing of programs

The master's programs lead to the degrees of Master of Applied Science (MASc) or Master of Engineering (MEng) in Electrical and Computer Engineering. The MASc program will consist of courses and a thesis. The MEng program will however have two options: MEng-Project which will consist of a combination of courses and a project and MEng-Course which will consist of only courses.

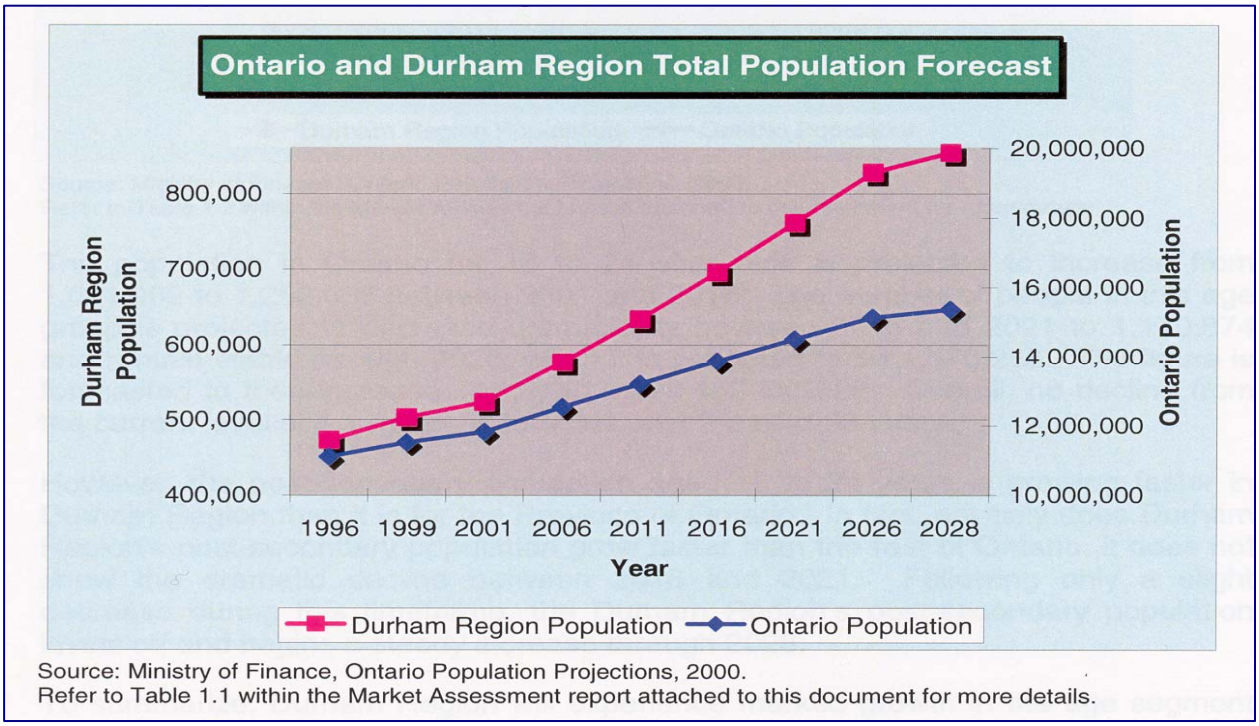
The master's programs are new programs to be offered at the University of Ontario Institute of Technology (UOIT). The programs are planned to be launched in September 2007, following all necessary approvals obtained by the Faculty of Engineering and Applied Science and its affiliated School of Energy Systems and Nuclear Science.

Brief History of UOIT

The Bill 109, an Act to establish the University of Ontario Institute of Technology, was passed by the Ontario Legislature on June 27, 2002, and the University of Ontario Institute of Technology became Canada's newest university, when it took in its first undergraduate engineering students in the fall of 2003.

The underlying reasons why a university was created in the Durham region are highlighted in Figure 1.1, which presents the significant growth in the Durham region population, and in Table 1.1, which shows the significant lack of university graduates in the Durham region, vis-à-vis the other regions of Ontario.

Figure 1.1 – Ontario and Durham Region Total Population Forecast



Source: Ministry of Finance, Ontario Population Projections, 2000.
Refer to Table 1.1 within the Market Assessment report attached to this document for more details.

Table 1.1 – Statistics on University Participation in Various Regions of Ontario

Municipality	University Participation (%)	College Participation (%)	Combined (%)
Provincial high : Ottawa-Carleton	46.5	7.4	53.9
Regional Mun. of Toronto	42.1	7.3	49.4
York Region	37.3	6.0	43.4
Peel Region	26.8	7.1	33.9
Halton Region	26.7	7.2	33.9
Durham Region	21.6	9.2	30.8

Engineering and graduate programs at UOIT

Undergraduate engineering degrees at UOIT are offered by both the Faculty of Engineering and Applied Science and its affiliated School of Energy Systems and Nuclear Science. The Faculty of Engineering and Applied Science first offered an undergraduate program in Manufacturing Engineering and the School of Energy Systems and Nuclear Science first offered an undergraduate program in Nuclear Engineering, both in the fall of 2003.

In the fall of 2004, the Faculty of Engineering and Applied Science added an undergraduate program in Mechanical Engineering. In the fall of 2005, the Faculty of Engineering and Applied Science added undergraduate programs in Automotive, Electrical, and Software Engineering. UOIT offered its first master's program – Master of Information Technology Security (MITS) – in September 2005. UOIT's Master of Applied Science (MASc) and Master of Engineering (MEng) programs in Mechanical Engineering and its Master of Science (MSc) in Modelling and Computational Science have been approved to commence by the Ontario Council on Graduate Studies. The MASc and MEng programs are expected to begin in September 2006, while the MSc program is expected to start in January 2007. With the rapid growth and success of the undergraduate engineering programs and graduate programs at UOIT, the Faculty of Engineering and Applied Science are ready and able to expand their graduate programs by offering MASc and MEng programs in Electrical and Computer Engineering in September 2007. Table 1-2 summarizes the details of the graduate programs at UOIT.

Table 1-2 – UOIT Graduate Programs

Graduate Program	**Status**
Master of Information Technology Security	Was launched in September 2005
MASc and MEng in Mechanical Engineering	Planned for September 2006
MSc in Modelling and Computational Science	Planned for September 2006
MASc and MEng in Electrical and Computer Engineering	Planned for September 2007

Gradate engineering programs in Ontario

As of fall 2005, in Ontario there were 15 universities offering graduate programs in engineering. Table 1-3 lists the universities offering graduate programs in engineering.

Table 1-3 – Graduate Engineering Programs in Ontario as of 2005

University	Programs	Degrees
Brock University	Geological Engineering	MSc
Carleton University	Civil Engineering[1]	MASc/MEng/PhD
	Electrical Engineering[1]	MASc/MEng/PhD
	Environmental Engineering[1]	MASc/MEng/PhD
	Geological Engineering[1]	MSc/PhD
	Mechanical & Aerospace Engineering[1]	MASc/MEng/PhD
	Software Engineering ConGESE[2]	MEng
	Telecommunications Technology Management	MEng
University of Guelph	Engineering	MEng/MSc/PhD
Lakehead University	Environmental Engineering	MSc
	Engineering (Control)	MSc
	Geological Engineering	MSc
Laurentian University	Mineral Resources Engineering	MASc/MEng
	Geological Engineering	MSc/PhD
McMaster University	Chemical Engineering	MASc/MEng/PhD
	Civil Engineering	MASc/MEng/PhD
	Design & Manufacturing[3]	MEng
	Electrical & Computer Engineering	MASc/MEng/PhD
	Engineering Physics	MEng/PhD
	Geological Engineering	MSc/PhD
	Materials Science & Engineering	MASc/MSc/PhD
	Mechanical Engineering	MASc/MEng/PhD
	Software Engineering	MASc/MEng/PhD
University of Ontario Institute of Technology	Mechanical Engineering (planned for 2006)	MASc/MEng
University of Ottawa	Chemical Engineering	MASc/MEng/PhD
	Civil Engineering[1]	MASc/MEng/PhD
	Electrical Engineering[1]	MASc/MEng/PhD
	Engineering Management	MEng
	Environmental Engineering[1]	MASc/MEng/PhD
	Geological Engineering[1]	MSc/PhD
	Mechanical & Aerospace Engineering[1]	MASc/MEng/PhD
	Software Engineering ConGESE[2]	MEng
Queen's University	Chemical Engineering	MEng/MSc/PhD
	Civil Engineering	MEng/MSc/MSc(Eng)/PhD
	Design & Manufacturing[3]	MEng
	Electrical & Computer Engineering	MEng/MSc/MSc(Eng)/PhD
	Geoengineering[4]	MSc/MScE/PhD
	Materials & Metallurgical Engineering	MEng/MSc/MSc(Eng)/PhD
	Mechanical Engineering	MEng/MSc/MSc(Eng)/PhD
	Mining Engineering	MEng/MSc/MSc(Eng)/PhD
Royal Military College of Canada	Chemistry & Chemical Engineering	MSc/MEng/PhD
	Civil Engineering	MEng/PhD
	Defence Engineering & Management	MDEM
	Electrical & Computer Engineering	MEng/PhD
	Mechanical Engineering	MASc/MEng/PhD

Ryerson University	Chemical Engineering	MASc/MEng
	Civil Engineering	MASc/MEng/PhD
	Electrical & Computer Engineering	MASc/MEng/PhD
	Elect. & Comp. Eng. – Computer Networks	MASc/MEng
	Environmental Applied Science & Management	MASc
	Mechanical Engineering	MASc/MEng/PhD
University of Toronto	Aerospace Science & Engineering	MASc/MEng/PhD
	Biomedical Engineering	MASc/PhD
	Chemical Engineering & Applied Chemistry	MASc/MEng/PhD
	Civil Engineering	MASc/MEng/PhD
	Clinical Biomedical Engineering	MHSc
	Design & Manufacturing[3]	MEngDM
	Electrical & Computer Engineering	MASc/MEng/PhD
	Engineering & Management	BASc/MBA
	Environmental Engineering[5]	MASc/MEng/PhD
	Environmental Studies[5]	MASc/MEng/PhD
	Geological Engineering	MASc/MSc/PhD
	Integrated Manufacturing[5]	MEng
	Knowledge Media Design[5]	MASc/PhD
	Materials Science & Engineering	MASc/MEng/PhD
	Mechanical & Industrial Engineering	MASc/MEng/PhD
	Software Engineering ConGESE[2]	MEng
	Telecommunications	MEng
	Wood Engineering[5]	MASc
University of Waterloo	Chemical Engineering	MASc/PhD
	Civil Engineering	MASc/MEng/PhD
	Design & Manufacturing[3]	MEng
	Electrical & Computer Engineering	MASc/MEng/PhD
	Geological Engineering	MSc/PhD
	Management of Technology	MASc
	Management Sciences	MASc/MMSc/PhD
	Mechanical Engineering	MASc/MEng/PhD
	Software Engineering ConGESE[2]	MASc
	Systems Design Engineering	MASc/MEng/PhD
University of Western Ontario	Biomedical Engineering	MESc/PhD
	Design & Manufacturing[3]	MEng
	Geological Engineering	MSc/PhD
	Engineering Science	MESc/MEng/PhD
University of Windsor	Civil Engineering	MASc/MEng/PhD
	Electrical Engineering	MASc/MEng/PhD
	Engineering Materials	MASc/MEng/PhD
	Environmental Engineering	MASc/MEng/PhD
	Geological Engineering	MSc/PhD
	Industrial Engineering	MASc/MEng
	Manufacturing Systems	PhD
	Mechanical Engineering	MASc/MEng/PhD

Sources: Advanced Design and Manufacturing Institute (ADMI), Canadian Council of Professional Engineers (CCPE), Consortium for Graduate Education in Software Engineering (ConGESE), and Ontario Council on Graduate Studies (OCGS).

[1] *Joint program between Carleton University and the University of Ottawa (The Ottawa-Carleton Institute for Electrical and Computer Engineering (OCIECE))*
[2] *ConGESE: Consortium for Graduate Education in Software Engineering – Joint program between Carleton University, University of Ottawa, Queen's University, University of Toronto, University of Waterloo, University of Western Ontario, and York University. Note that only schools that offer ConGESE master's degrees through engineering departments are noted in the table.*
[3] *ADMI: Advanced Design and Manufacturing Institute - Joint program between McMaster University, Queen's University, University of Toronto, University of Waterloo, and University of Western Ontario.*
[4] *Joint program between Queen's University and Royal Military College of Canada.*
[5] *Collaborative program between two or more graduate units at the University of Toronto.*

Referring to Table 1-3, the universities in Ontario that currently offer graduate programs specifically in Electrical and Computer Engineering are Carleton University, University of Ottawa, McMaster University, Queen's University, Royal Military College of Canada, Ryerson University, University of Toronto, University of Waterloo, and University of Windsor. The University of Western Ontario also offers graduate studies in Electrical and Computer Engineering, but its program is listed under the general title of Engineering Science. There are therefore a total of ten institutions offering graduate programs in Electrical and Computer Engineering in Ontario.

Figure 1-2 indicates the cities in Ontario offering graduate programs in Electrical and Computer Engineering. Note that Kingston, Toronto, and Ottawa each have two universities offering graduate engineering programs.

Figure 1-2: Map of cities offering graduate programs in Electrical and Computer Engineering in Ontario (Large Circles ●) as well as the Location of the University of Ontario Institute of Technology in Oshawa
Source: Yahoo! Maps (http://maps.yahoo.com/)

Graduate program demand

The demand for Electrical and Computer Engineering graduate studies is evident based on the increasing student enrolment in full-time Electrical and Computer Engineering graduate programs across Ontario. Table 1-4 shows the total enrolment for Electrical and Computer Engineering programs in Ontario in terms of the number of full-time and part-time doctoral and master's students. The table shows that since the academic year 2000-2001, there has been a very slight reduction in enrolments in part-time master's and doctoral programs. However, there has been a significant year-to-year increase in enrolment in both full-time master's and doctoral programs. In fact, there has been a massive increase in the number of full-time students in both master's and doctoral programs over the past five years. Growths of 205% and 173% for doctoral and master's program clearly indicate a significant and consistent demand for graduate studies in Electrical and Computer Engineering in Ontario.

Table 1-4- Enrolment in Electrical and Computer Engineering Graduate Programs in Ontario: 2000-2005

Program	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	Growth: 2000-2005
Doctoral Full-Time	322	353	437	572	662	205%
Doctoral Part-Time	55	44	44	42	46	-16%
Master's Full-Time	527	688	750	790	814	154%
Master's Part-Time	278	295	341	295	277	~0%
Doctoral & Master's Full-Time	849	1041	1187	1362	1476	173%
Doctoral & Master's Part-Time	333	339	385	337	323	-3%

Source: Ontario Council on Graduate Studies (OCGS) Macroindicator Data 2004-2005 (data includes Carleton/Ottawa, McMaster, Queens, Ryerson, Toronto, Waterloo, Windsor universities)

Due to recent events in the United States, there has been a shift in international graduate student applications from the United States to Canada. Noting Canada is the highest per capita immigrant-receiving nation in the world, many immigrants are very interested in upgrading their technical skills and pursuing higher education in order to obtain high-paying employment and have a high standard of living. These trends are adding to the demand for increased graduate student spaces in Ontario, where about half of the new immigrants to Canada decide to reside.

Government policies are also increasing the demand for graduate programs in Electrical and Computer Engineering. The Government of Canada has outlined a number of goals and targets in its Innovation Strategy, as reported by Industry Canada in 2002, including:

Goals – Addressing the knowledge performance challenge

- Vastly increase public and private investments in knowledge infrastructure to improve Canada's R&D performance.

Targets

- By 2010, rank among the top five countries in the world in terms of R&D performance.
- By 2010, at least double the federal government's current investments in R&D.

Goals – Addressing the skills challenge

- Develop the most skilled and talented labour force in the world.

Targets

- Through to 2010, increase the admission of master's and doctorate students at Canadian universities by an average of 5 percent per year.
- By 2004, significantly improve Canada's performance in the recruitment of foreign talent, including foreign students, by means of both the permanent immigrant and the temporary foreign workers programs.
- Over the next five years, increase the number of adults pursuing learning opportunities by 1 million.

Goals – Addressing the innovation environment challenge

- Governments at all levels work together to stimulate the creation of more clusters of innovation at the community level.
- Federal, provincial/territorial and municipal governments cooperate and supplement their current efforts to unleash the full innovation potential of communities across Canada, guided by community-based assessments of local strengths, weaknesses and opportunities.

Targets

- By 2010, develop at least 10 internationally recognized technology clusters.
- By 2010, significantly improve the innovation performance of communities across Canada.

The proposed graduate programs in Electrical and Computer Engineering at UOIT are poised to help meet the above goals and targets.

The Council of Ontario Universities (COU) formed a Task Force on Future Requirements for Graduate Education in Ontario in 2003. The Task Force determined that the Government of Ontario should establish a 10-year goal of doubling graduate enrolment in Ontario's universities to meet the demand for increased graduates. The programs proposed by UOIT and the location of the university make it a logical choice for expanding Electrical and Computer Engineering graduate school capacity in Ontario. Within the Greater Toronto Area (GTA), there are currently only two universities offering graduate programs in Electrical and Computer Engineering: Ryerson University and the University of Toronto (see Figure 1-3).

According to Statistics Canada, the population of the GTA as of the 2001 census was 4,682,897 and that of greater Montréal area was 3,426,350. However, Montreal has four universities that offer graduate programs in Electrical and Computer Engineering: Concordia University, École de Technologie Supérieure, École Polytechnique, and McGill University. Comparing the GTA to greater Montréal area on the basis of population, the GTA lacks Electrical and Computer Engineering graduate school capacity. The addition of a graduate program in Electrical and Computer Engineering at UOIT will help increase the graduate school capacity in Electrical and Computer Engineering within the GTA.

According to Statistics Canada, Oshawa is the fastest growing city in the country and the Conference Board of Canada predicts Oshawa will lead Canada in economic growth through to 2009. In addition, the location of UOIT within the GTA is also ideal. Figure 1-4 shows the location of graduate engineering programs in the GTA and neighboring cities. Figure 1-4 shows that there are no engineering graduate schools in the eastern half of the GTA or in any neighboring cities east of the GTA. All of the graduate schools in the region are located in the centre of the GTA or in neighboring cities west of the GTA. The location of UOIT makes it an excellent choice for bringing increased engineering graduate school capacity to the eastern half of the GTA and neighbouring cities and towns, and municipalities.

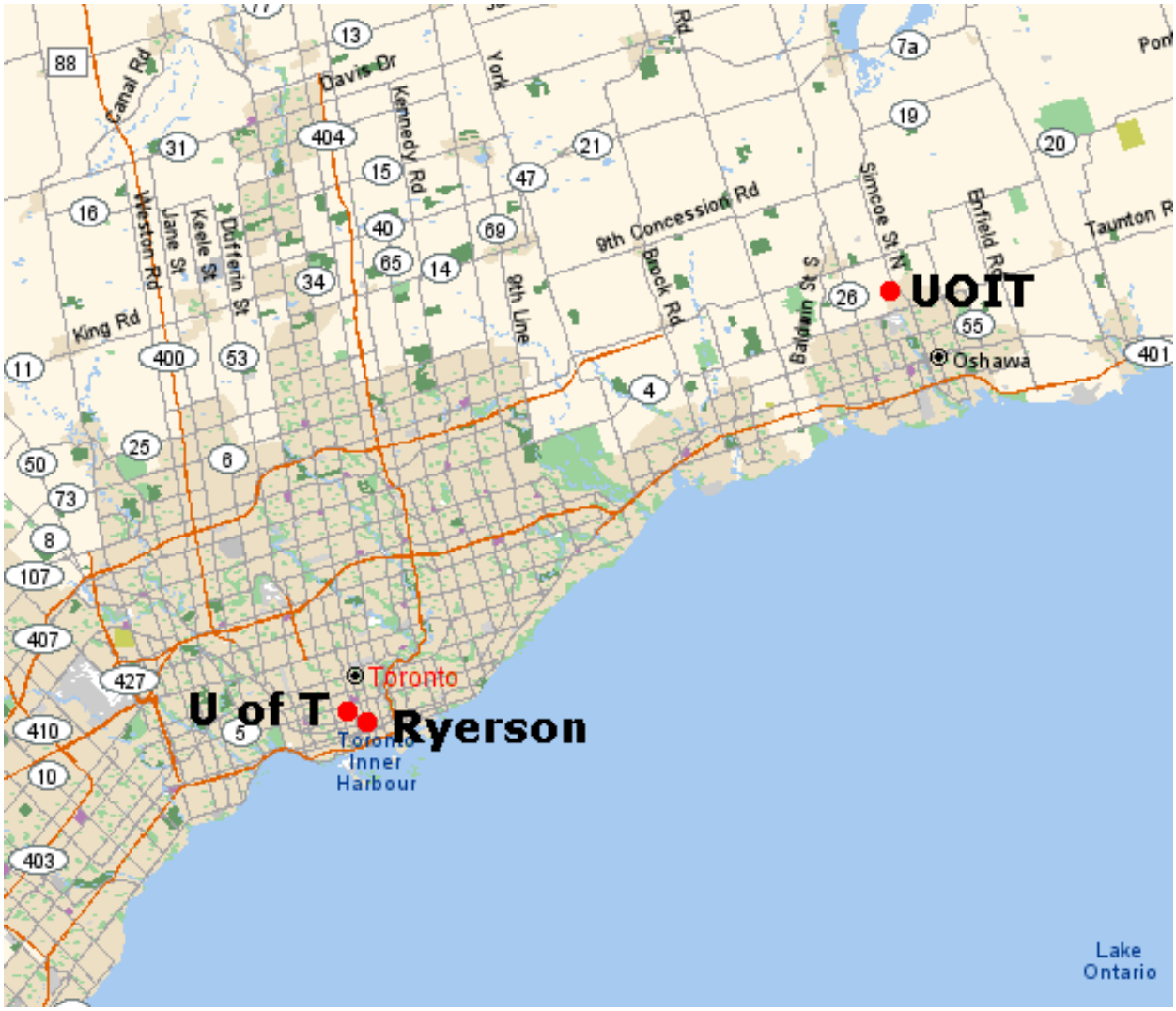


Figure 1-3: Map of the central and eastern portions of the Greater Toronto Area (GTA) showing the locations of Ryerson University, the University of Toronto, and the University of Ontario Institute of Technology (UOIT)
Source: Yahoo! Maps (http://maps.yahoo.com/)

In addition to being in a strategic location based on the population of the GTA, the location of UOIT is also ideal for taking advantage of a number of major industrial companies in the eastern half of the GTA whose areas are very relevant to the Electrical and Computer Engineering programs being proposed by UOIT. They include General Motors of Canada, Siemens, and Ontario Power Generation, including two major nuclear power plants in Darlington and Pickering. Also, there are

many large companies, such as Nortel Networks, Research in Motion, in addition to numerous small and medium size firms across southern Ontario, with the sole focus on Information and Communications Technology (ICT), a very major thrust in Electrical and Computer Engineering.

Figure 1-4: A map of universities offering graduate engineering programs within the GTA and neighboring cities and the location of the UOIT (note that the University of Guelph does not offer a graduate program in Electrical and Computer Engineering). *Source: Yahoo! Maps (http://maps.yahoo.com/)*

According to Industry Canada, between 1997 and October 2005, the ICT sector grew by 8.4% per year, more than twice as fast as the Canadian economy (3.6%). This faster growth of the sector also means that the ICT industries have accounted for 10.8% of the national growth since 1997. Also, according to Industry Canada, employment in the ICT sector is characterized by a high level of education. In fact, in 2004, 38% of all workers had a university degree, compared to a national average of 21%. Noting that Ontario accounted for about 48% of all ICT sector revenues in Canada in 2003, there exists a very strong need for graduate programs in Electrical and Computer Engineering in the GTA to educate highly qualified personnel in the ICT arena.

According to 2006 Government of Ontario Budget, by 2020, Ontario will need to refurbish, rebuild, replace or conserve approximately 25,000 MW of generation, representing approximately 80% of Ontario's current capacity, to meet the province's demand. The government has initiated one of the most ambitious building programs in North America for new electricity generation. It is based on a comprehensive energy plan focused on long-term, stability and sustainability. The government's aggressive move and comprehensive energy plan is in line with the fact that energy has been a key research area to be pursued by UOIT from its inception in 2003. At the Faculty of Engineering and Applied Science, faculty members with strong research record are being hired to build a strong research nucleolus in this important field, as well as to purse the creation of Research chairs in this area using empowerment from Industry and individuals, CRC allocation, and NSERC industrial Chairs.

Mission

The mission of the Faculty of Engineering and Applied Science is to contribute to society through excellence in education, scholarship, and service. We will provide for our graduate students a rigorous education and endeavor to instill in them the attitudes, values, and vision that will prepare them for a lifetime of continued learning and leadership in their chosen careers. We engage in scholarship of discovery, application, and integration.

1.2 Objectives of the Programs

There are four objectives common to the graduate programs:

- Depth – To provide students with an understanding of the fundamental knowledge prerequisites for the practice of, or for advanced study in communications and signal processing, computer systems and software engineering, control systems and robotics, electronics and mechatronics, and electric, power and transmission systems.
- Breadth – To provide students with the broad and advanced education necessary for productive careers in the public or private sectors and in academia.
- Professionalism – To develop skills necessary for clear communication and responsible teamwork, and to inspire professional attitudes and ethics, so that students are prepared for modern work environments with diverse needs and for lifelong learning and enrichment.
- Learning Environment – To provide an environment that will enable students to pursue their goals through innovative graduate programs that are rigorous, challenging, and supportive.

The objective of the MASc program is to prepare students for a career as an R&D engineer. It is expected that graduates of the program will be able to work as R&D engineers in advanced technology companies or government agencies or continue in their education and pursue a doctorate degree at renowned world-wide institutions of higher learning. The objective of the MASc program is achieved through a combination of course work, supervised research, a research seminar, and a research thesis.

The objective of the MEng program is to provide the opportunity for engineers in industry to upgrade and expand their skills, including developing research skills. Graduates of the program will be able to apply what they have learned in a variety of applications in industry, government, and academia. The objective of the MEng program is achieved through either a combination of course work and a project or solely course work, depending on which option the student selects. Note that all MEng students will be involved in research through research projects included in most of the courses.

1.3 Method used for the self-study

This appraisal was prepared by the Graduate Committee of the Faculty of Engineering and Applied Science in collaboration with its affiliated School of Energy Systems and Nuclear Science. Virtually all faculty members made contributions to the preparation of this brief. Input from industry professionals and academics at other institutions has been sought. The appraisal has gone through thorough reviews by the Curriculum Committee and the Faculty Council of the Faculty of Engineering and Applied Science and School of Energy Systems and Nuclear Science as well as by the Associate Provost for Research, the Dean of Graduate Studies, the Curriculum and Program Review Committee, and the Academic Council of UOIT.

1.4 Fields in the programs

As this is an application for only a master's program, it is not required by OCGS to list areas of specialization; there are no declared fields in these programs.

1.5 Review concerns expressed in previous appraisal and actions taken

As this is an application for a new program, this section is not applicable.

1.6 Special matters and innovative features

The University of Ontario Institute of Technology, as the only laptop-based university in Ontario, provides students access to its Mobile Learning Environment. Every graduate student at UOIT will have access to library resources, email, and the Internet, and to other online services.

2 THE FACULTY

2.1 List of faculty members by field

Table 2-1 lists the faculty members involved in the graduate program and identifies their research field, gender, home unit, and supervisory privileges. Expected retirements within the next seven years are also noted in Table 2-1.

Currently there are 15 core faculty members involved in the programs. There are 4 Category-1 core faculty members, 9 Category-3 core faculty members, 1 Category-4 core faculty member, and 1 Category-5 core faculty member. It is anticipated that upon OCGS approval of these programs some of the cross-appointed faculty members will make FEAS their sole home Faculty (i.e. from Category-3 to Category-1).

Table 2-1: Faculty Members by Field

					Fields[3]
Faculty Name & Rank	**M/F**	**Ret. Date**	**Home Unit [2]**	**Supervisory Privileges**	
Category [1]					
Ramiro Liscano – Associate Professor	M		FEAS	Full	**X**
Richard Marceau – Full Professor	M		UOIT	Full	**X**
Jing Ren – Assistant Professor	F		FEAS	Full	**X**
Shahram Shahbazpanahi – Assistant Professor	M		FEAS	Full	**X**
Category [3]					
George Bereznai – Full Professor	M	2007	SESNS	Full	**X**
Ebrahim Esmailzadeh – Full Professor	M		FEAS	Full	**X**
Ali Grami – Associate Professor	M		FBIT/FEAS	Full	**X**
Mark Green – Full Professor	M		FS	Full	**X**
Patrick Hung – Assistant Professor	M		FBIT	Full	**X**
Lixuan Lu – Assistant Professor	F		FEAS/SESNS	Full	**X**
Clemens Martin – Assistant Professor	M		FBIT/FEAS	Full	**X**
Scott Nokleby – Assistant Professor	M		FEAS	Full	**X**
Miguel Vargas Martin – Assistant Professor	M		FBIT/FEAS	Full	**X**
Category [4]					
Michael Bennett	M		FEAS	Full	**X**
Category [5]					
R. Gorantla – Adjunct Associate Professor	M		FEAS	Full	**X**

[1] 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.
Category 6: non-core faculty members who participate in the teaching of graduate courses.

[2] FEAS: Faculty of Engineering and Applied Science
SESNS: School of Energy Systems and Nuclear Engineering
FBIT: Faculty of Business and Information Technology
FS: Faculty of Science

[3] There are no declared fields in the programs.

It must be noted that UOIT is a new university, and began to offer undergraduate programs in Electrical Engineering and Software Engineering in the fall 2005, with the first graduating class in the spring 2009. The university recognizes that it is imperative for the Faculty of Engineering and Applied Science to increase the number of faculty members involved in these programs rapidly over the next few years so as to be able to fully meet Canadian Engineering Accreditation Board (CEAB) requirements, in terms of faculty to student ratio. Also, having master's programs in ECE can significantly help our undergraduate programs in Electrical and Software Engineering, for almost all of the students in our master's programs will be hired to be teaching assistants in our undergraduate programs.

Table 2-2 shows the plan for new faculty hires. The faculty hired will be at all levels to ensure a healthy balance between full professors, associate professors, and assistant professors across all areas of interests. It is anticipated that with graduate programs in Electrical and Computer Engineering in place, more senior faculty members can be hired. It is expected that, in the steady state, the areas of expertise of the Electrical and Computer Engineering faculty members will include Communications and Signal Processing, Control Systems, Electronics and Mechatronics, Photonics, Computer and Software Engineering, Applied Electromagnetics and Power Systems.

Table 2-2: Planned Faculty Members Hiring in ECE for the years 2006 to 2010

Year	Number of faculty members hires
2006-2007	6
2007-2008	6
2008-2009	3
2009-2010	3

UOIT is open to offering adjunct professorships both to well-qualified external academics and to professionals with industrials ties, who would contribute to the program in terms of student supervision and teaching of the graduate courses. It is also expected that members of other Faculties at UOIT will participate in the proposed programs as they evolve.

2.2 External operating research funding

Table 2-3 presents the external research funding that faculty members have received to date since 1999. Note that the funding listed represents only confirmed funding and shall increase as the faculty members successfully secure additional funding. Since the first faculty members started at UOIT in 2003, the funding in Table 2-3 for the years 1999 to 2003 represents funding secured by UOIT faculty members while at other institutions.

Table 2-3: Operating Research Funding by Source and Year

	Source		
Year[1]	**Granting Councils [2]**	**Other Peer Adjudicated [3]**	**Others [4]**
1999	$105,440	$14,000	$21,500
2000	$84,300	$4,178,006	$2,360
2001	$73,840	$9,377,000	$1,200
2002	$83,000	$29,000	$51,000
2003	$83,000	$31,250	$45,000
2004	$139,000	$30,422	$107,800
2005	$236,515	$199,208	0
2006	$127,700	0	0
Totals	$932,795	$13,858,886	$228,860

[1] *Calendar year.*
[2] *NSERC, Mitacs-NCE, AUTO21-NCE, OCE-CITO.*
[3] *DRDC, CFI, ASRA CERG, RGC, FCAR, University of Victoria, Sharif University of Technology, Government of Iran, Government of Brunei.*
[4] *Alcatel, CDEN, Microsoft, IFToMM, ISE limited, Bell University Laboratories.*

Table 2-4 presents the total external research funding for 2003-2006. As with Table 2-3, the amounts in Table 2-4 represent only the confirmed funding and shall increase as the faculty members successfully secure funding from the various source listed above and from industry. As the number of faculty members increases over the next few years, it is fully expected that the funding presented in Tables 2-3 and 2-4 will increase substantially.

Table 2-4: Total External Operating Research Funding 2003 - 2006

	Source		
Year	**Granting Councils**	**Other Peer Adjudicated**	**Others**
Totals	$586,215	$260,880	$152,800

2.3 Graduate supervision

Table 2-5 lists the completed and current numbers of thesis supervisions by faculty member. The Table shows that there is a good balance of senior professors, who have successfully graduated students, and new professors, who have not yet graduated students. Table 2-5 also shows that

although UOIT does not yet have a graduate program in Electrical and Computer Engineering, the faculty members are active in co-supervising students with professors at other institutions within Ontario and Canada. A number of the faculty members involved in the proposed program currently hold adjunct appointments at other universities. Table 2-6 outlines these adjunct appointments.

2.4 Current teaching assignments

Table 2.7 shows the anticipated teaching loads for the 2006-2007, academic year. Table 2.8 and Table- 2.9 show the teaching assignments for the 2005-2006 and 2004-2005 academic years. Note that UOIT took in its first undergraduate students in the 2003-2004 academic year. The teaching loads are in table 2.10. In all these four tables, the numbers in the brackets following the course number correspond to weekly Lecture/Laboratory/Tutorial hours, respectively. Also note the Graduate courses in these tables are not part of the program being reviewed, and in fact MITS courses are part of the Faculty of Business and Information Technology's Master of Information Technology Security program.

Table 2-5: Completed and Current Numbers of Thesis Supervisions by Faculty Member

	Completed			Current		
Member	**Master's**	**PhD**	**PDF**	**Master's**	**PhD**	**PDF**
Category 1						
Ramiro Liscano	8	0	0	6	1	0
Richard Marceau	13	4	0	0	0	0
Jing Ren	0	0	0	0	0	0
Shahram Shahbazpanahi	2	2	0	0	0	0
Category 3						
George Bereznai	2	0	0	0	0	0
Ebrahim Esmailzadeh	31	8	7	4	4	3
Ali Grami	0	0	0	0	0	0
Mark Green	13	9	0	0	1	0
Patrick Hung	0	0	0	1	0	0
Lixuan Lu	0	0	0	0	0	0
Clemens Martin	11	0	0	1	0	0
Scott Nokleby	0	0	0	2	0	0
Miguel Vargas Martin	0	0	0	1	0	0
***Category* 4**						
Michael Bennett	27	2	0	0	0	0
***Category* 5**						
R. Gorantla - Adjunct	2	0	0	0	0	0

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

Professors Grami, Martin, and Vargas Martin hold cross appointments between the Faculty of Engineering and Applied Science and the Faculty of Business and Information Technology. They are involved in teaching courses in the Faculty of Business and Information Technology's Master of Information Technology program. As cross-appointed faculty, all three faculty members will divide their time accordingly between the two faculties.

Professors Green and Hung are involved in proposed graduate programs within the Faculty of Science and the Faculty of Business and Information Technology, respectively, in addition to being involved in the proposed graduate program of the Faculty of Engineering and Applied Science. It is expected that as UOIT expands, additional members from the Faculty of Science and the Faculty of Business and Information Technology whose expertise complement the specializations listed will become involved in the proposed programs.

Table 2-6: Adjunct Appointments

Member	**University**
Ramiro Liscano	University of Ottawa Dalhousie University
Shahram Shahbazpanahi	McMaster University
Ebrahim Esmailzadeh	Concordia University Sharif University of Technology, Iran University of Toronto
Ali Grami	Ryerson University
Lixuan Lu	University of Western Ontario
Scott Nokleby	University of Victoria
Miguel Vargas Martin	Universidad Autonoma de Aguascalientes, Mexico
Michael Bennett	University of Western Ontario

Table-2.7: Proposed Teaching Assignments for 2006-07

Category [1]	Rank	Undergraduate	Graduate	Comments
Ramiro Liscano	Associate Professor	ENGR 1200 ENGR 2710 ENGR 2720		
Richard Marceau	Full Professor			UOIT Provost
Ren Jing	Assistant Professor			
Shahram Shahbazpanahi	Assistant Professor	ENGR 2790 (3/1/1) ENGR 2200 (3/1.5/1)		
Category [3]				
George Bereznai	Full Professor	ENGR 3860 (3/0/1) ENGR 4640 (3/0/1)	UN08013 McMaster	Dean, SESNC
Ebrahim Esmailzadeh	Full Professor	ENGR 3350 (3/1.5/0) ENGR 3210 (3/1.5/1) ENGR 4010 (3/0/1)		
Ali Grami	Associate Professor	BUSI 1500 (3,0,0) BUSI 1900 (3,0,1) ENGR 1400 (3,0,0)		
Mark Green	Full Professor			
Patrick Hung	Assistant Professor	BUSI 1650 (3/0/0)		
Lixuan Lu	Assistant Professor	ENGR 3740 (3/1.5/1) ENGR 4730 (3/0/0) ENGR4015 (3/0/1) ENGR 4994 (1/4/1)		
Clemens Martin	Assistant Professor	ENGR 1200 (3/0/2)	MITS 5200G (co-teaching) MITS 5300G	
Scott Nokleby	Assistant Professor	ENGR 4280 (3/1/1) ENGR 3390 (3/1/1)	ENGR 5260	
Miguel Vargas Martin	Assistant Professor	BUSI 1830 (3/0/3) INFR 1010 (3/0/3) INFR 2820 (3/3/3) ENGR 1200 (3/0/2)	MITS 5500G	
Category [4]				
Michael Bennett				
Category [5]				
Rao Gorantla	Adjunct Associate Professor			

Table-2.8: Teaching Assignments for 2005-2006

Category [1]	Rank	Undergraduate	Graduate	Comments
Ramiro Liscano	Associate Professor	CSI 1102 CEG 4185 CEG 4395 ENGR 1200 (3/3/2)	ELG 7178	University of Ottawa UOIT
Richard Marceau	Full Professor			UOIT Provost
Shahram Shahbazpanahi	Assistant Professor	ENGR 2790 (3/1/1)		
Category [3]				
George Bereznai	Full Professor	ENGR 3860 (3/0/1) ENGR 4640 (3/0/1)	UN08013 Mc Master	Dean, School of Energy Systems and Nuclear Science
Ebrahim Esmailzadeh	Full Professor	ENGR 2020 (4/0/2) ENGR 2420 (3/1/1)		
Ali Grami	Associate Professor	BUSI 1500 (3,0,0) BUSI 1900 (3,0,1) ENGR 1400 (3,0,0)	MITS 5200G (co-teaching)	
Mark Green	Full Professor	CSCI 1010 (3/0/2) CSCI 1020 (3/0/2) MATH 2080 (3/0/2) SCIE 1910 (3/0/0)		
Patrick Hung	Assistant Professor	BUSI 1830 (3/0/2) BUSI 2502 (3/0/0) BUSI 1650 (3/0/0) BUSI 2501 (3/0/0)		
Lixuan Lu	Assistant Professor	ENGR 3200U (3/1.5/1.5) ENGR 3460 (3/1.5/1.5)		
Clemens Martin	Assistant Professor	ENGR 1200 (3/0/2)	MITS 5200G (co-teaching) MITS 5300G	
Scott Nokleby	Assistant Professor	ENGR 3200 (3/1.5/1.5) ENGR 3270 (3/1/1) ENGR 3390 (3/2/1)		
Miguel Vargas Martin	Assistant Professor	BUSI 1830 (3/0/3) INFR 1010 (3/0/3)	MITS 5500G (3/0/0)	
Category [4]				
Michael Bennett		SE312 (3/2) SE313 (3/2)		University of Western Ontario
Category [5]				
R. Gorantla	Adjunct Associate Professor			

Table-2.9: Teaching Assignments for 2004-2005

Category [1]	Rank	Undergraduate	Graduate	Comments
Ramiro Liscano	Associate Professor	CSI 1102 CEG 4185 CEG 4395		University of Ottawa
Richard Marceau	Full Professor			Provost, UOIT
Shahram Shahbazpanahi	Assistant Professor	COE4TL4 (3/1.5/1) ECE761 (3/0/0)		McMaster University
Category [3]				
George Bereznai	Full Professor			Dean, School of Energy Systems and Nuclear Science
Ebrahim Esmailzadeh	Full Professor	ENGR 2020 (4/0/2)		Programs Director, FEAS
Ali Grami	Associate Professor	BUSI 1900 (3/0/0) ENGR 2790 (3/2/1)		
Mark Green	Full Professor	SM2215 (2/0/1) SM 3121 (2/0/1) SM 4130 (2/0/1)		City University of Hong Kong
Patrick Hung	Assistant Professor	BUSI1830 (3/0/2) BUSI 1650 (3/0/0)		
Clemens Martin	Assistant Professor	BUSI 2604 (3/0/0)		
Scott Nokleby	Assistant Professor	ENGR 3200 (3/1.5/1.5)		
Miguel Vargas Martin	Assistant Professor	BUSI 1830 (3/0/3) ENGR 1200 (3/0/2)		
Category [4]				
Michael Bennett		SE312 (3/2) SE313 (3/2) SE 454 (3/0) SE310 (3/0)		U. of Western Ontario and U. of Ottawa Knowledge Institute for Gov. Professionals
Category [5]				
Rao Gorantla	Adjunct Associate Professor			

Table-2.10: Teaching Assignments for 2003-2004

Category [1]	Rank	Undergraduate	Graduate	Comments
Ramiro Liscano	Associate Professor	CSI 1102 (3/2/0) CSI 1101 (3/2/0) CEG 4185 (3/1.5/1.5) CEG 4395 (3/1.5/1.5)		University of Ottawa
Category [3]				
George Bereznai	Full Professor		UN08013- Mc Master University	Dean, School of Energy Systems and Nuclear Science
Ebrahim Esmailzadeh	Full Professor	ENGR 3200U (3/1.5/1.5)		
Ali Grami	Associate Professor	BUSI 1520 (3/0/0) BUSI 1900 (3/0/0)		
Mark Green	Full Professor	SM1001 (2/0/2) SM2215 (2/0/1) SM 3120 (2/0/1) SM 3121 (2/0/1) SM4130 (2/0/1)		City University of Hong Kong
Clemens Martin	Assistant Professor	BUSI 1500 (3/0/0) BUSI 1830 (3/0/2) ENGR 1200 (3/0/2)		
Category [4]				
Michael Bennett		SE312 (3/2) SE313 (3/2) SE 454 (3/0 SE 310 (3/2) SEG 3310(4/2) SEG 4100(3/3) GNG 2100(3/0)	EMP5117 (3/0)	University of Western Ontario University of Ottawa Knowledge Institute for Government Professionals
Category [5]				
Rao Gorantla	Adjunct Associate Professor			

3 PHYSICAL AND FINANCIAL RESOURCES

3.1 Library resources

The goal of the University of Ontario Institute of Technology library is to enrich the research, and teaching carried out by the university through exceptional library and information services and facilities to support all academic programs.

The construction of a new, state-of-the-art library for the University of Ontario Institute of Technology was completed in the fall of 2004. Designed by internationally renowned Diamond and Schmitt Architects Incorporated, the 73,000-square-foot library serves students, faculty, and staff. The four-storey, $20.7-million library houses individual and collaborative learning spaces, research workstations, electronic classrooms, a round pavilion with a reading room and periodicals collection, and other facilities. It offers a variety of learning spaces to suit individual learning styles and user needs. Its design also allows for future enlargement, up to double the original size.

It is of great importance to highlight that the library resources include IEEE *Xplore*. IEEE *Xplore* is an online delivery system providing full text access to the world's highest quality technical literature in electrical engineering, computer science, and electronics. IEEE *Xplore* contains full text documents from IEEE journals, transactions, magazines, letters, conference proceedings, standards, and IEE (Institution of Electrical Engineers) publications. IEEE *Xplore* offers more than 1,300,000 documents, which can all be accessed online in an advanced search fashion.

The University's Mobile Learning environment provides students with access to library resources using their wireless laptop anytime, from anywhere. Students are able to work individually or collaboratively anywhere in the building. Digital resources and complementary print collections are provided for students in both a physical and virtual environment. Librarians are available to provide students with the skills to navigate effectively through the information environment.

In addition to interlibrary loans, students can search the catalogues of all Ontario university libraries and place immediate online requests for any available item.

To keep faculty members and students informed of the library's continued growth and to provide easy access to resources, the UOIT Library staff have been constructing and revising its web site: www.uoit.ca/library on an ongoing basis.

A more detailed presentation on the library resources is listed in Appendix A: Library Submission.

3.2 Laboratory facilities

Students in the MASc and MEng programs will have access to major equipment and common facilities, which have been or will be financially supported by the University of Ontario Institute of Technology, by a wide range of grants and significant donations from the Industry (both product manufacturers and service providers), and by various Government funding agencies, such as CFI, NSERC, and OCE. The facilities will be enhanced through major equipment acquisitions to maintain and upgrade laboratory equipment and to reflect state-of-the-art technology and industry-focused research, as the number of faculty members in ECE is significantly increased and the research expertise is thus broadened over the next few years.

Active Vibration Control Laboratory — This lab is primary used for research into the areas of adaptive, active and passive vibration control, and dynamic modeling and vibrations of nonlinear machines and flexible structures. The experimental work to be carried out is aimed to verify the vibration suppression of time-varying and parametrically excited dynamic structures through adapting a two-tier alternative, system identification to determine the deviations in the structural parameters, and a semi-active optimal re-tuning of the absorber elements. In order to show the vibration suppression improvement, initially the primary will be excited by a simple harmonic excitation.

Communication Networks Laboratory – This lab will focus on the research and development of leading associated networking technologies for the non-real and real time delivery of multimedia information, through theoretical design and simulation of innovative networking concepts. The facilities in this lab include SUN workstations and many PCs, protocol analyzers, hardware and software ATM switches, routers, and bridges to assess Voice over IP and Mobile IP performance, and to characterize the multimedia traffic in wired and wireless communications networks, with a wide range of traffic attributes and network pricing and resource management, monitoring and tomography, and protocol modeling mechanisms.

Communications and Signal Processing Laboratory – This lab will supply the infrastructure for research in signal processing and telecommunications including wireless systems, MIMO communications, spectral analysis and array signal processing, mobile ad hoc and sensor networks, and also satellite communications and interference analyses for a variety of system payloads and frequency bands. This lab provides an environment for the development of new information- and signal-processing algorithms from conception to implementation in software or hardware, including new coding and modulation schemes and access techniques for wire-line (twisted-pair and co-axial cable) and wireless systems using communication and signal-processing tool-sets for information processing applications in dynamically changing environments. The research encompasses theoretical analyses and modeling, computer simulation and hardware prototyping. This will provide state-of-the-art test, measurement, and proof-of-concept prototyping facilities which include radio transmission and test equipment (up to EHF frequencies), co-processor boards, audio and video equipment, data acquisition hardware, DSP development boards with test and evaluation boards. There will also be several, standalone or networked, SUN workstations and several dozen of high-speed Pentium-IV PCs with large RAMs. Software includes all of the standard programming and AI languages, symbolic algebra systems, word-processors, and various packages specific to telecommunications and signal processing.

Hacker Research Lab (HR-Lab) – This lab is not only used to train students through a hands-on research-based approach, but more importantly enable the faculty members and graduate students to lead research programs in their respective fields of IT security. The lab provides a physical and logical infrastructure to allow for a secured and isolated environment in which security related research can be safely performed. As the lab's configuration is designed to be flexible, it can also be linked to external networks if required. Housed in a room of 100 square meters, the lab consists of four main Unix/Linux/Windows2003 servers including two SUN V20Z and two V240 servers plus CISCO routers, switches and tape backup units. These servers act as the gateway to the HR-Lab form the outside world. Other than controlling user access and supporting applications, these servers also serve the purpose of Firewall and virus/content scanning. Behind these servers are eight groups of equipment. Each group has two servers, one switch, one desktop workstation PC and one laptop workstation PC. The Pentium based server is configured to allow multi-boot from any of the Windows 2003, Unix or Linux OS for different combinations. The second server is a SUN SPARC V100 server with Solaris on it. The CISCO 2950 switch is configured for multiple VLANs. Each group can work isolated or linked. When all eight groups are linked together, it provides a

large network with 16 servers and more than 32 VLAN. That is a very good environment for research on real time performance with proper network loadings. The HR-Lab is also equipped with four CISCO wireless access points and four PDAs for conducting research in the wireless networking area.

Integrated Manufacturing Centre (IMC) - The IMC is a 925 m^2, fully automated, industrial-grade, flexible manufacturing facility capable of fabricating and assembling a wide range of products. The IMC provides a facility to conduct research in advanced manufacturing and mechatronics engineering. The main components of the IMC are divided into two areas: the manufacturing zone and the assembly zone. Manufacturing zone includes Inverted, Rail-Mounted, 6-Axis Robot, Parts Washer, CNC Electrical Discharge Machine (EDM), CNC Milling Machine, CNC Lathe, Injection Moulding Machine, CNC Coordinate Measuring Machine (CMM), 3-D Printer, and assembly zone includes Automatic Storage and Retrieval System (ASRS), Conveyor System, and Eight 6-Axis Robots.

Intelligent Robotics and Manufacturing Laboratory – The Intelligent Robotics and Manufacturing Lab, within the Centre for Engineering Design, Automation, and Robotics (CEDAR) at UOIT, has two core research directions: Reconfigurable Manufacturing and Distributed Control. The two core research areas of the lab focus on developing complementary new technologies for flexible manufacturing systems. The objectives of the Distributed Control research are to develop new Internet/Web based distributed intelligent systems to monitor, manage and control production systems. The systems developed will allow manufacturers to reorganize production and process plans dynamically within a shop floor or within a group of shop floors. The objectives of the Reconfigurable Manufacturing direction are to develop new production systems that can be reconfigured to optimize utilization of resources. Three themes within the Reconfigurable Manufacturing research are the design of new modular reconfigurable machine systems (Reconfigurable Parallel Kinematic Machines), virtual reconfigurable manufacturing systems and modular reconfigurable control.

Mechatronic and Robotic Systems Laboratory – The lab conducts research into the kinematics and control of complex systems such as joint-redundant manipulators, mobile-manipulator systems, and redundantly-actuated parallel manipulators. Redundant manipulators and mobile-manipulator systems offer numerous advantages over traditional non-redundant systems. Effective utilization of the redundancy inherent in these systems is instrumental in moving the systems from the laboratory and applying them to real-world applications.

Microfabrication Lab – A micro-fabrication facility, pending CFI approval, will enable complete microsystems to be fabricated at UOIT. It will include a wet-bench, lithography setup, mask aligner and a small cleanroom. Cleanroom processes will use silicon substrates and future developments will allow silicon on sapphire, quartz, compound semiconductors and other types of materials. The wafer thickness will vary from 200 microns to 1 mm substrates, while the wafer size is 4 inches. Micro-devices will be fabricated, assembled and tested on these wafers. Unique capabilities in the Microsystems Laboratory will fabricate micro engines that produce electricity from a heat source. The micro engine is a cyclical device that uses liquid pumping within a micro-channel to convert heat losses to electricity through a flexible piezoelectric membrane at the right end of the micro-channel. Many such micro-channels would be fabricated in parallel to produce larger amounts of electricity. The liquid pumping within micro-channels is generated by thermo-capillary forces, which induce fluid motion by temperature-dependent variations of surface tension across an enclosed droplet. During assembly of each micro engine, the piezoelectric membrane converts fluid motion to an electrical signal through a flexing membrane. The piezoelectrics will be fabricated onto wafers with equipment in the UOIT Microsystems Laboratory.

Additional Facilities — Construction of a 3,835 m^2 Engineering Laboratory Building on the UOIT campus was commenced in the spring of 2005, with completion expected in the fall of 2006. Upon completion, graduate students will have access to the following shared laboratories: Computer Aided Design (CAD) Laboratory, Control Systems Laboratory, Electronics Laboratory, Mechatronics Laboratory, Microprocessors/Digital Systems Laboratory, and Power Systems Laboratory.

Automotive Centre of Excellence (ACE)

In 2005, General Motors of Canada announced a $2.5 billion investment in GM's Canadian operations. This represents the largest and most comprehensive automotive investment in Canadian history. Together with the Ontario and Federal Governments, this "Beacon Project" aims to strengthen automotive engineering, R&D and manufacturing capabilities in Canada. As part of the Beacon Project, an Automotive Centre of Excellence (ACE) will be created at UOIT. Launched with support from GMCL and the Province of Ontario, ACE will link participating automotive companies, suppliers, automotive engineers, universities, colleges, researchers and students in a new building equipped with state-of-the-art automotive design, engineering and research facilities. ACE will anchor a new Canadian Automotive Innovation Network, which will be comprised of selected universities in Ontario, Quebec and British Columbia, led by GM's Canadian Engineering Centre in Oshawa. GM Canada will invest in the Innovation Network to enhance the competitiveness of the Canadian automotive industry through leading edge R&D. This will include investments in new research projects, Design and Research Chairs at Canadian universities and in-kind donations of computer-based design tools by GM and partners.

The Centre will be owned and operated by UOIT. It will provide approximately 90,000 (gross) ft^2, which translates to approximately 45,000 (net) ft^2. It will be located in a new building at UOIT. ACE will comprise two main functional divisions: (i) Core Research Facility (CRF) containing a state-of-the-art climatic wind tunnel and (ii) other equipment designed to respond to automotive manufacturing issues, as well as enable research and involvement of graduate students in industry-based projects. The Integrated Research and Training Facilities (IRTF) will provide educational, lab, research, and project space for use by UOIT faculty, students and colleagues from other institutions. Also, it will serve collaborations with the automotive industry and suppliers, including graduate student research projects. The Centre will be connected to UOIT engineering labs, and it will share university services in the performance of its mandate. The Automotive Centre of Excellence will prepare the graduate students to take the automotive industry to a new level of competitiveness and future success. It will stimulate the development of new advanced technologies focused on future-based applications for the automotive industry in Canada. The $58 million grant provided by the Government of Ontario as part of its Ontario Automotive Investment Strategy program supports the ACE project costs for CRF and IRTF. ACE will be provide the following exceptional opportunities for graduate students at UOIT: a multi-faceted centre with world-class experimental facilities to conduct automotive related research; a way to share learning, best practices, pedagogical tools, and curriculum development with the goals of enhancing graduate studies and research opportunities; an opportunity for graduate students to work and learn alongside top professionals in the automotive industry; and a stimulating environment for research collaboration among university and industry-based researchers, ranging from the exploration of 'what if' research ideas and their implications, to the pursuit of new product design, development, and commercialization.

It is imperative to note that many areas of research in automotive engineering are ECE based, such as Automotive Software and Electronics, and Automotive Control and Robotics. To this effect, ACE facilities are expected to be extensively used also by the ECE faculty members and graduate students whose focus on their research and applications lie in the automotive engineering.

3.3 Computer facilities

Individual supervisors will provide computer facilities, including appropriate computer systems and software packages, for their MASc and MEng-Project students. These facilities will enable them to carry out their research, for their computational, modeling and simulation needs, as well as to enable them access to the internet, email and library resources (such as online journals and conference proceedings). Also, graduate students will have the option to subscribe to UOIT's laptop program. UOIT's laptop program provides students with a current model IBM laptop that is equipped with a suite of program specific software. UOIT has additional shared computer facilities of several hundred PCs available to all students in the Learning Commons and library.

UOIT has joined the PACE Program – Partners for the Advancement of Collaborative Engineering Education[1]. PACE is a program between General Motors, Sun Microsystems, and UGS, that provides state-of-the-art hardware and software for engineering schools. The value of the PACE contribution to UOIT will be $35 million. Dedicated engineering computer labs featuring state-of-the-art workstations and software will be established at UOIT through PACE. Both MASc and MEng graduate students will have full access to the PACE hardware and software located in these labs for their studies.

UOIT is a member of SHARCNET (Shared Hierarchical Academic Research Computer Network (http://www.sharcnet.ca), a high-performance computing consortium of 9 universities and 2 colleges based in South-Central Ontario. A high-speed optical network connects the computing facilities located at each institution. At present, the majority of the computational facilities are located at McMaster University, the University of Western Ontario and the University of Guelph; however, UOIT faculty members and their research groups have access to any part of this state-of-the-art computing facility. SHARCNET was successful in a recent 2004 CFI Innovation Fund competition ($48.3M), which will result in a significant expansion of the facility. With the new funding, it is projected that SHARCNET will become one of the top 100 High-Performance Computing facilities in the world. As part of this expansion, UOIT will acquire a small 'development cluster' of approximately 32 processors that will be located on-site. This, combined with other local equipment, will give students involved in the Master's programs in ECE the ability to work on cutting-edge research in their respective fields. AccessGrid facilities will also be installed as part of the local SHARCNET installation; AccessGrid is an ensemble of resources including multimedia large-format displays, presentation and interactive environments, and interfaces to Grid middleware and to visualization environments, to support group-to-group interactions across SHARCNET. These facilities will facilitate collaboration by faculty members and students across SHARCNET.

3.4 Space

The Faculty of Engineering and Applied Science and the School of Energy Systems and Nuclear Science are located in UOIT's Engineering and Science Building. This is a brand new building that features office space for faculty members and graduate students in addition to research lab space. The current total research space allocated to engineering is 1,496 m^2.

All offices and research spaces are wired for access to UOIT's network. In addition, wireless and wired access is available throughout the Engineering and Science Building as well as the library and other spaces on campus. Faculty members have private offices with telephone lines. Faculty office space averages 13 m^2 and faculty member research space averages ~25 m^2.

1 Source: PACE web site: http://www.pacepartners.org/

Graduate students will have access to shared office facilities and/or research labs. There will be shared office space available for both MASc and MEng students who are Teaching Assistants. In addition there will be shared computer facilities along with a limited number of shared spaces for both MASc and MEng students to work. The various shared spaces will provide the opportunity for MASc and MEng students to interact with one another. The amount of space allocated to graduate students will increase as the programs come online. It is expected that the majority of graduate students will have their office space within the research laboratory of their respective supervisors.

In addition to the ACE (as described in detail earlier) and the above-mentioned new Engineering building—with offices, classrooms, and large lab spaces for teaching and research—ready for summer 2006, UOIT has a detailed plan for two more large buildings with the construction start date of late 2006, pending government's approval. ECE offices, research and teaching labs, and classrooms will be housed in one of these two new buildings. Electrical and Computer Engineering, with a heavy focus on research and graduate programs, form a critical aspect of the University of Ontario Institute of Technology's mandate in the advancement of higher education.

3.5 Financial support of graduate students

MASc Students

Every MASc student offered admission to a graduate program at the Faculty of Engineering and Applied Science and its affiliate School of Energy Systems and Nuclear Science at the University of Ontario Institute of Technology should be able to complete their program regardless of their financial status.

It is expected that the average support for MASc students will be approximately $16,000 per year with funding coming from a variety of sources, including:

- UOIT Scholarships/Bursaries[2] – ten Engineering Research Excellence Awards of $7,500 per year and five Engineering Research Awards of $5,000 per year will be available once the program is running full scale. These two sets of awards will be merit based. Another $41,000 in funding per year will be distributed on a needs basis in the form of bursaries. The amounts for both the scholarships and bursaries will be distributed over a two-year period to eligible students.
- External Awards – These include NSERC postgraduate awards and provincial awards.
- Teaching Assistantships – MASc students will be eligible to earn up to approximately $8,000 per year through teaching assistantships.
- Research Assistantships – Additional support from individual supervisors will be available to students.
- Work-Study and Other Forms of Employment-Based Learning.
- Provincial Loan Programs.

It is expected that the majority of funding for MASc students will come from Research and Teaching Assistantships. Normally, funding will not be provided to part-time students.

2 Note that the amounts listed are based on a financial analysis of the proposed programs. Exact amounts of the proposed awards may change depending on University policies and market demands.

MEng Students

MEng students will have access to financial support through provincial loan programs, teaching assistantships, and work-study placements. Normally, additional funding will not be provided to MEng students.

Financial Counseling

The University and its student support services shall make financial counseling available to students.

Annual Reporting

The Office of Graduate Programs, with the assistance of Student Services, shall issue an annual report on Student Financial Support to include the following:

- levels of student financial need;
- student financial assistance provided, broken down by category and source (external/Faculty) of assistance; and
- the debt levels carried by students upon graduation.

This report shall be submitted for information to the Academic Council.

4. PROGRAM REGULATIONS AND COURSES

4.1 The intellectual development and the educational experience of the student

There are four objectives common to the graduate programs:

- Depth – To provide students with an understanding of the fundamental knowledge prerequisites for the practice of, or for advanced study in communications and signal processing, software engineering, control systems, electronics, and power systems.

- Breadth – To provide students with the broad and advanced education necessary for productive careers in the public or private sectors and in academia.

- Professionalism – To develop skills necessary for clear communication and responsible teamwork, and to inspire professional attitudes and ethics, so that students are prepared for modern work environments with diverse needs and for lifelong learning and enrichment.

- Learning Environment – To provide an environment that will enable students to pursue their goals through innovative graduate programs that are rigorous, challenging, and supportive.

The vision, mission and values of the university provide the foundation for all activities and are reflected in the plans for the intellectual development and educational experience of graduate students in the Faculty of Engineering and Applied Science.

VISION

The University of Ontario Institute of Technology is an innovative and market-oriented institution, pursuing inquiry, discovery and application through excellence in teaching and learning, value-added research and vibrant student life.

MISSION

- Provide career-oriented undergraduate and graduate university programs with a primary focus on those programs that are innovative and responsive to the needs of students and employers
- Advance the highest quality of research
- Advance the highest quality of learning, teaching, and professional practice in a technologically enabled environment
- Contribute to the advancement of Ontario and Canada in the global context with particular focus on Durham Region and Northumberland County
- Foster a fulfilling student experience and a rewarding educational (work) environment
- Offer programs with a view to creating opportunities for college graduates to complete a university degree

VALUES

- Integrity and Respect: We will treat each other with dignity, including those with challenges.
- Honesty and Accountability: Our actions reflect our values, and we are accountable for both.
- Intellectual Rigor: We strive for excellence and challenge convention.

The Academic Unit

In keeping with this part of its mission to foster a fulfilling student experience and a rewarding educational (work) environment, UOIT has developed operational and support processes and services to enhance the learning environment for students. UOIT will continue to provide a fulfilling experience and a rewarding educational environment for graduate students.

The mission of the Faculty of Engineering and Applied Science is to contribute to society through excellence in education, scholarship, and service. We will provide for our graduate students a rigorous education and endeavour to instill in them the attitudes, values, and vision that will prepare them for a lifetime of continued learning and leadership in their chosen careers. We engage in scholarship of discovery, application, and integration.

In order for our students and faculty members to engage in scholarship of discovery, application, and integration, UOIT has made every effort to provide state-of-the-art learning resources, including the library, learning technologies, and laboratories. In addition, academic support staff, and student support services, also contribute to the operation of the department and provide service, guidance and support for graduate students.

As highlighted earlier, a team of well-qualified faculty members is already available or yet to be hired for the development of the students and for the ongoing monitoring of program quality and student progress.

Program Learning Outcomes

Graduates of the engineering graduate programs shall be able to:

1. Demonstrate specialized knowledge and understanding of essential facts, concepts, principles, and theories in a specific area of advanced study
2. Recognize and be guided by social, professional, and ethical expectations and concerns involved in advanced education and research
3. Effectively use advanced tools for research
4. Apply the principles of effective data management, information organization, and information-retrieval skills to data of various types
5. Utilize analytical, methodological, interpretive and expository skills in conducting research
6. Expand and enhance the application of specific and well-concentrated research to engineering problems and practice
7. Critically evaluate advanced information and knowledge and examine their application in engineering practice
8. Identify problems and opportunities for system analysis, design, improvement, and optimization
9. Understand, explain, and solve problems using quantitative and qualitative methods
10. Appreciate the importance of, and develop the strategies for, further education and lifelong learning

11. Design and conduct experiments, and analyze and interpret experimental data and computational results

12. Demonstrate effective oral and written communication skills

The learning outcomes for the MASc program are achieved through a combination of course work, supervised research, a research seminar, and a research thesis.

The objectives for the MEng program are achieved through either a combination of course work and a project, or solely course work depending on which option the student selects. Note that all MEng students will be involved in research through research projects included in most of the courses. Students will be exposed to both quantitative and qualitative research methodologies through these course-based research projects.

The combination of courses and/or projects and research, will be designed collaboratively between the student and an assigned faculty advisor/mentor. Each learner will have the opportunity to develop the prerequisites for specialized practice of, or for advanced study in, various areas of Electrical and Computer Engineering, such as Communications and Signal Processing; Software Engineering; Electronics, Control, and Mechatronics; and Electromagnetics and Power Systems. Learning activities and materials in graduate courses will be carefully designed to ensure that learners are deliberately exposed to study, the majority of which is at, or informed by, the forefront of engineering theory and practice.

The courses have been designed to give students in-depth learning in a specialized area of engineering, opportunity for advanced development of generic skills such as communication and teamwork, as well as participation in the scholarly activities of research, seminars, and presentations.

Throughout the curriculum, learning activities are planned, and student progress will be monitored to ensure that safety, professional guidelines, and ethical responsibilities relevant to engineering and for specific areas of advanced study are modelled, developed, and evaluated.

Learning Community

UOIT is committed to providing innovative programs through excellence in teaching and learning, value-added research and “vibrant student life.” The MASc and the MEng exemplify this commitment. The physical design of the university environment provides many places and spaces for groups to meet and interact, for academic and social purposes. The technological links available to students ensure that a network of communication and support among students and between students and university resources is established and strengthened during their years at UOIT. Facilities and personnel are available to support learning and development in all areas – academic, physical, social and emotional.

The student-centered philosophy of UOIT is designed to develop and continually enhance a strong sense of academic community, in which students, faculty, support staff and administrators share ideas and experiences. Students in the MASc and MEng will benefit from the relationship with faculty members in a learning partnership.

Regularly scheduled scientific presentations, guest speakers, and research colloquia which are open to the university community, are already a part of academic life at UOIT. With the development of graduate programs in Electrical and Computer Engineering the number of seminars

in the Faculty of Engineering and Applied Science will be increased. In addition, the Faculty of Engineering and Applied Science will plan to invite recognized experts and leading-edge researchers to present seminars and advise on student and faculty research. Unit's rich network of industry and academic contacts, as exemplified by ACE (Automotive Centre of Excellence), will provide access to exceptional researchers and professionals.

Scholarly Activities

As can be seen in the course outlines, students are required to undertake significant independent work, and to organize and provide reports and seminars. This provides for development of leadership, organization, communication, and professional presentation skills. These sessions will be conducted in an environment which supports intellectual debate, allows for critique and constructive feedback, and encourages reflective practice.

All students in the engineering graduate programs will be encouraged to attend professional conferences and educational sessions, which may take place at UOIT or outside the university. MASc students will be encouraged to attend and participate in conferences and workshops relevant for their specialized area of interest. Financial support will be made available by their faculty supervisor. Students will be encouraged and mentored to present their thesis and project work at professional conferences and to other audiences through industry and academic networks.

The learning activities and academic culture of UOIT is guided by its mission and values. The graduate programs being developed by the Faculty of Engineering and Applied Science will be a model of our university values.

4.2 Program regulations

Part-time studies

To facilitate access to all potential students, part-time studies will be permitted. It is especially important to allow engineers in local industries access to the MEng program. The MASc program has a minimum residence requirement where the student must be enrolled full-time and attending the University of Ontario Institute of Technology. For the MASc program, students must spend a minimum of one year of full-time study in residence at UOIT.

Admission requirements

The minimum admission requirements for the MEng and MASc programs are as follows:

- Completion of an undergraduate engineering degree from an accredited engineering program at a Canadian university, or its equivalent from a recognized institution.

- Overall academic standing of at least a B (GPA = 3.0 on a 4.0/4.3 scale), with a minimum B in the last two full-time years (four semesters) of undergraduate work or equivalent, although a B+ is preferred for MASc applicants. Submission of one certified copy of each previous undergraduate and graduate transcript directly from the granting institute is required. It is the student's responsibility to provide a certified English translation of the transcript if the original is in another language. Applicants may be required to submit a brief description of the courses listed on their official transcripts or provide a copy of the relevant calendar where they are listed.

- A minimum of two letters of reference from persons having direct knowledge of the applicant's academic competence. Academic references are preferred; however professional references will be accepted. Letters of reference should come from individuals under whom the applicant has worked closely or studied. The quality of the letters will be assessed by the Graduate Committee of the Faculty of Engineering and Applied Science to make sure relevant requirements have been met.

- Proof of English proficiency is needed from those applicants whose first language is not English.

- Since close technical contact with a faculty member is an essential part of graduate education in engineering, MASc students must find a professor, who specializes in the applicant's desired area of research, willing to act as a supervisor, prior to being accepted into the program. MEng students who wish to do the MEng-Project option must find a professor who is willing to act as a project supervisor. In the event the MEng student cannot find a project supervisor, the student must transfer into the MEng-Course option.

Degree requirements

Table 4-1 summarizes the degree requirements for the MASc, MEng-Project, and MEng-Course programs. For any one of these programs, a student must complete 30 credits.

For the MASc program, a student must complete five courses worth a total of 15 credits and a thesis worth 15 credits. In addition to the five courses, the student must successfully complete ENGR 5003G – Seminar. MASc students must spend a minimum of one academic year of full-time study in residence at the University of Ontario Institute of Technology. The maximum time for completion of a MASc degree is three years, or five years for students who switch to part-time status, measured from the date the student entered the program. No financial support will be available from the Faculty after two years.

For the MEng-Project option, a student must complete seven courses worth a total of 21 credits and a project worth nine credits. For the MEng-Course option, a student must complete 10 courses worth a total of 30 credits. The maximum time for completion of a MEng degree is three years, or five years for part-time students, measured from the date the student entered the program.

Section 4.4 provides a list of available courses and Section 4.5 provides detailed course descriptions and outlines.

Table 4-1: Degree Requirements

Program	Required - Credits	Options - Credits	Total Credits
MASc	Thesis plus ENGR 5003G – Seminar - 15 Credits	5 Courses - 15 Credits	30
MEng-Project	Project - 9 Credits	7 courses - 21 Credits	30
MEng-Course		10 courses - 30 Credits	30

Progress reports

After completing the first year of their program and in each year thereafter, MASc students must complete a progress report that outlines what they have done in the previous year and what are their objectives for the following year. This progress report must be submitted to the student's supervisory committee. Permission to continue in the program will be based on a satisfactory report as determined by the student's supervisory committee.

Thesis evaluation procedures

Within six months of starting a MASc program, a supervisory committee for the student must be formed. The supervisory committee for a MASc student will consist of the student's supervisor or supervisors plus two faculty members from UOIT. The FEAS Graduate Programs Director will be an ex-officio member of all supervisory committees.

The supervisory committee is chaired by a member of the committee other than the student's supervisor. The supervisory committee is responsible for monitoring and evaluating the student's progress through their program.

All MASc students must successfully defend their thesis in front of an examination committee. The examination committee for a MASc student will be comprised of the student's supervisory committee, plus an external examiner who may or may not be a faculty member of UOIT. All external examiners must be approved by the Associate Provost, Research and the Dean of Graduate Studies.

Language requirements

All applicants are required to give evidence of their oral and written proficiency in English. This requirement can be satisfied with one of the following criteria:

i) The student's mother tongue or first language is English.

ii) The student has studied full-time for at least three years (or equivalent in part-time studies) in a secondary school or university where the language of instruction and examination was English.

iii) The student has achieved the required proficiency on one of the tests in English language acceptable to the University of Ontario Institute of Technology: TOEFL (computer based) 220 or TOEFL (paper based) 560 or IELTS 7 or MELAB 85 or CAEL 60.

Distance delivery

The programs will not be delivered in a distance delivery manner at the present time. In the future, it is expected that distance/hybrid delivery of parts of the programs will be used where the subject matter permits. Distance delivery of courses will comply fully with Section 31 of the OCGS By-Laws governing distance delivery.

A WebCT course website will play a role in the delivery of resources for all courses: syllabus, schedule, assignments, solutions to homework assignments and tests, and past exams, handouts, and supplementary notes. Also, all UOIT and labs are equipped with VCR, DVD, data projectors, and wired and wireless Internet access.

4.3 Part-time studies

Part-time studies are primarily offered for the MEng program. To facilitate engineers from industry taking the MEng program, graduate courses are planned to be offered in the late afternoon or early evening. In general, all courses will be taught by regular faculty members. Part-time students may have course load restrictions.

The MASc program has a minimum residence requirement where the student must be enrolled full-time and attending the University of Ontario Institute of Technology. For the MASc program, students must spend a minimum of one year of full-time study in residence at UOIT.

4.4 Total graduate courses listed and level

Table 4-2 lists the proposed graduate courses to be offered, followed by detailed outlines for the proposed courses. Courses related to the Communications and Signal Processing areas are numbered as ENGR 56xxG. Courses related to the Software and Computer Systems areas are numbered as ENGR 57xxG. Courses related to Electronics and Mechatronics areas are numbered as ENGR 58xxG. Courses related to Control Systems and Power Systems areas are numbered as ENGR 59xxG.

MASc and MEng-Project students may take one ENGR 4xxxU level undergraduate course in lieu of a graduate level course, provided they have not already taken a similar course during their undergraduate degree and the course is approved by both the student's supervisor and the FEAS Graduate Programs Director. MEng-Course students may take up to two ENGR 4xxxU level undergraduate courses in lieu of up to two graduate level courses, again, provided they have not taken similar courses during their undergraduate degree and the courses are approved by the FEAS Graduate Programs Director.

Students will be allowed to take one graduate course (if they are in the MASc program) or two graduate courses (if they are in the MEng program) offered by other faculties at the UOIT or other universities, provided they are first approved by the FEAS Graduate Programs Director.

Courses will be offered on the basis of demand with the expectation that courses will be offered at a minimum of once every two years.

4.5 Collateral and supporting departments

The School of Energy Systems and Nuclear Science is affiliated with the Faculty of Engineering and Applied Science, and it is an integral component of these programs. Both the Faculty of Business and Information Technology and the Faculty of Science at the University of Ontario Institute of Technology are supporting the proposed programs, in part by providing faculty members who contribute their expertise and time to the proposed programs and by sharing resources where mutually beneficial.

Table 4.2 – List of the Proposed Graduate Courses

Course Number	Course Title
ENGR 5001G	MASc Thesis
ENGR 5002G	MEng Project
ENGR 5003G	Seminar
ENGR 5004G	Directed Studies
ENGR 5005G	Special Topics
ENGR 5010G	Advanced Optimization
ENGR 5610G	Stochastic Processes
ENGR 5620G	Digital Communications
ENGR 5630G	Statistical Signal Processing
ENGR 5640G	Advanced Wireless Communications
ENGR 5650G	Adaptive Systems and Applications
ENGR 5660G	Communication Networks
ENGR 5670G	Cryptography and Secure Communications
ENGR 5710G	Network Computing
ENGR 5720G	Pervasive and Mobile Computing
ENGR 5730G	Algorithms and Data Structures
ENGR 5740G	User Interface Design
ENGR 5750G	Software Quality Management
ENGR 5760G	Software Metrics
ENGR 5770G	Service Computing
ENGR 5780G	Advanced Computer Architecture
ENGR 5850G	Analog Integrated Circuit Design
ENGR 5860G	Digital Integrated Circuit Design
ENGR 5360G	Automotive Software and Electronics
ENGR 5910G	Embedded Real-Time Control Systems
ENGR 5920G	Analysis and Control of Nonlinear Systems
ENGR 5930G	Adaptive Control
ENGR 5940G	Intelligent Control Systems
ENGR 5950G	Computational Electromagnetics
ENGR 5960G	Power System Operations, Analysis and Planning
ENGR 5970G	Power Electronics
ENGR 5980G	Advances in Nuclear Power Plant Systems

Course Title: ENGR 5001G – MASc Thesis

- **Course Description and Content Outline:** The thesis is the major component of the MASc program and is carried out under the direction of the student's supervisor. The thesis may involve an investigation which is fundamental in nature, or may be applied, incorporating creative design. Through the thesis, candidates are expected to give evidence of competence in research and a sound understanding of the area of specialization involved.
- **Delivery Mode and Teaching Method:** N/A
- **Student Evaluation:** The student is required to write a research thesis. Upon completion, the student must defend the thesis in front of an examination committee comprised of his or her supervisory committee plus an external examiner.
- **Suggested Textbook:** None
- **Learning Outcomes:** Students who successfully complete the MASc thesis have reliably demonstrated the ability to:
  Outcome 1: understand and explain the essential facts, concepts, principles, and theories relating to their research topic.
  Outcome 2: effectively use advanced tools for research.
  Outcome 3: apply the principles of effective data management, information organization, and information-retrieval skills to data of various types.
  Outcome 4: critically evaluate advanced information and knowledge and their implementation.
  Outcome 5: understand, explain, and solve problems using quantitative and qualitative methods.
  Outcome 6: design and conduct experiments, analyze and interpret experimental data, and/or computational results.
  Outcome 7: prepare and present, orally and in writing, to peers and experts, a systematic report on a significant research topic.

- **Information About Course Designer/Developer:**
  Course designed by S. Nokleby, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  All Faculty Members

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research.
  Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5002G – MEng Project

- **Course Description and Content Outline:** The MEng Project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study. The chosen topic will be dependent on the area of specialization of the student.
- **Delivery Mode and Teaching Method:** N/A
- **Student Evaluation:** Students are required to write a report and give a presentation on their completed project. Upon completion, the student must defend the project in front of an examination committee.
- **Suggested Textbook:** None
- **Learning Outcomes:** Students who successfully complete the MEng project have reliably demonstrated the ability to:
  Outcome 1: understand and explain the essential facts, concepts, principles, and theories relating to their research topic.
  Outcome 2: identify problems and opportunities for system analysis, design, improvement, and optimization.
  Outcome 3: understand, explain, and solve problems using quantitative and qualitative methods.
  Outcome 4. organize and complete a significant project in a timely manner.
  Outcome 5: synthesize significant information from the project and prepare well organized and complete technical reports.
  Outcome 6: prepare and present, orally and in writing, to peers and experts, a final report on a significant project.

- **Information About Course Designer/Developer:**
  Course designed by S. Nokleby, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  All Faculty Members

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research.
  Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5003G – Seminar

- **Course Description and Content Outline:** Participation in a program of seminars by internal and external speakers on current research topics. All MASc students will be required to give a seminar on their thesis research during the second year of their program.
- **Delivery Mode and Teaching Method:** Mandatory attendance in a series of seminars by internal and external speakers.
- **Student Evaluation:** Pass/Fail
- **Suggested Textbook:** None
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: comply with the social, professional, and ethical requirements involved in advanced education and research.
  Outcome 2: examine and reflect on contemporary issues and professional and ethical responsibilities which impact both engineering, and their specific area of interest.
  Outcome 3: appreciate the need, and have the knowledge and skills required to further their education through lifelong learning.
  Outcome 4: prepare and present a research seminar on a significant topic, to an audience of peers and experts.
  Outcome 5: receive and respond to questions, critique and other feedback from peers and experts.

- **Information About Course Designer/Developer:**
  Course designed by S. Nokleby, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  N/A

- **Faculty qualifications required to teach/supervise the course:**
  N/A

Course Title: ENGR 5004G – Directed Studies

- **Course Description and Content Outline:** Faculty permission may be given for supervised research projects, individual study, or directed readings. Students wishing to pursue a course of directed studies must, with a faculty member who is willing to supervise such a course, formulate a proposal accurately describing the course content, the learning goals, the intended method and extent of supervision, and the method by which work will be evaluated. This course may only be taken once.
- **Delivery Mode and Teaching Method:** Dependent on the Topic
- **Student Evaluation:** Dependent on the Topic
- **Suggested Textbook:** Dependent on the Topic
- **Learning Outcomes:** Dependent on the Topic

- **Information About Course Designer/Developer:**
  Course designed by S. Nokleby, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  All Faculty Members

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research.
  Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5005G – Special Topics

- **Course Description and Content Outline:** Presents material in an emerging area or one not covered in regular offerings. May be taken more than once, provided the subject matter is substantially different.
- **Delivery Mode and Teaching Method:** Dependent on the Topic
- **Student Evaluation:** Dependent on the Topic
- **Resources to be purchased by students:** Dependent on the Topic
- **Suggested Textbook:** Dependent on the Topic
- **Learning Outcomes:** Dependent on the Topic

- **Information About Course Designer/Developer:**
- Course designed by S. Nokleby, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  All Faculty members

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research.
  Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5010G – Advanced Optimization

- **Course Description and Content Outline:** The objective of this course is to understand the principles of optimization and its application to engineering problems. Topics covered include: the steepest descent and Newton methods for unconstrained optimization; golden section, quadratic, cubic and inexact line searches; conjugate and quasi-Newton methods; the Fletcher-Reeves algorithm; fundamentals of constrained optimization theory; simplex methods for linear programming; modern interior-point methods; active-set methods and primal-dual interior-point methods for quadratic and convex programming; semi-definite programming algorithms; sequential quadratic programming and interior-point methods for non-convex optimization. In addition, implementation issues and current software packages/algorithms for optimization will be covered. Global optimization, including genetic algorithms and simulated annealing, will be introduced.
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** Two major research projects: 30% and 50%, assignments: 20%.
- **Suggested Textbook:** Antoniou, A. and Lu, W.-S., (In-Press), *Optimization: Methods, Algorithms, and Applications*, Kluwer Academic.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: formulate and solve unconstrained and constrained optimization problems.
  Outcome 2: understand how the major unconstrained, constrained, and global optimization techniques work.
  Outcome 3: use optimization as a tool for solving engineering design problems.

- **Information About Course Designer/Developer:**
  Course designed by S. Nokleby, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  S. Nokleby, S. Shahbazpanahi

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research.
  Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5610G – Stochastic Processes

- **Course Description and Content Outline:** Review of probability theory including, random variables, probability distribution and density functions, characteristic functions, convergence of random sequences, and laws of large numbers. Random processes, stationarity and ergodicity, correlation and power spectral density, cross-spectral densities, response of linear systems to stochastic input, innovation and factorization, Fourier and K-L expansion, mean square estimation, Markov chains and processes, queuing theory. Applications in communications and signal processing, emphasis on problem solving using probabilistic approaches.
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week.
- **Student Evaluation:** assignments: 10%, mid-term test: 20%, research project: 20%, and final exam: 50%.
- **Suggested Textbook:** A. Papoulis and S.U. Pillai, *Probability, Random Variables and Stochastic Processes*, McGraw-Hill, 2003, ISBN 0-07-366011-6
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome-1: apply the fundamentals of probability theory and random variables.
  Outcome-2: understand the meaning and importance of the laws of large numbers.
  Outcome-3: distinguish between strict-sense and wide-sense stationary random processes
  Outcome-4: analyze systems with stochastic inputs.
  Outcome-5: obtain the correlation functions of practically important stochastic processes and analyze it.
  Outcome-6: derive power spectral density for stationary signals.
  Outcome-7: expand the stochastic process.
  Outcome-8: factorize stochastic processes and whiten them.
  Outcome-9: grasp the importance of Markov process and basic renewal processes.
  Outcome-10: analyze birth-death processes.
  Outcome-11: appreciate and benefit from applying their knowledge on stochastic processes to the applications in Communications and Signal Processing.

- **Information About Course Designer/Developer:**
  Course designed by Shahram Shahbazpanahi, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  S. Shahbazpanahi, A. Grami

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5620G – Digital Communications

- **Course Description and Content Outline:** Optimum receiver principles: AWGN, geometric representation of signals, maximum likelihood criterion and optimum decision regions, correlation receivers and matched filters, probability of error and union bound; digital bandpass modulation (ASK, FSK, PSK, QAM, CPFSK, CPM), baseband systems (PAM, PRS), performance comparisons: bit error rate, bandwidth, power, complexity; fundamental limits in information theory: entropy and the source coding theorem; channel capacity and the channel coding theorem; information capacity theorem and design trade-offs
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week.
- **Student Evaluation:** assignments: 20%, mid-term test: 30%, and final exam: 50%.
- **Suggested Textbook:** J.G. Proakis, *Digital Communications*, McGraw-Hill, 2001, ISBN 0-07-232111-3.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome-1: understand Gram-Schmidt orthogonalization procedure.
  Outcome-2: categorize classes of noise and characterize Additive White Noise Gaussian Noise and its impact on performance.
  Outcome-3: analyze coherent detection of signals in noise.
  Outcome-4: grasp the fundamentals of optimum receivers.
  Outcome-5: derive probability of error and assess bit error rate and symbol error rate.
  Outcome-6: find spectra for various modulation schemes and line codes.
  Outcome-7: identify trade-offs for coherent and non-coherent detection schemes.
  Outcome-8: know theoretical aspects design trade-offs for all M-PSK and M-QAM systems in use.
  Outcome-9: appreciate Shannon's theorems, their limits, roles, benefits, and design trade-offs.
  Outcome-10: obtain insights into rate distortion theory and its applications.

- **Information About Course Designer/Developer:**
  Course designed by Ali Grami, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology.

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  A. Grami, S. Shahbazpanahi.

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5630G – Statistical Signal Processing

- **Course Description and Content Outline:** Detection Theory: fundamentals of detection theory, Neyman-Pearson theorem, receiver operating characteristics, minimum probability of error, Bayes risk, binary multiple hypothesis testing, minimum Bayes risk detector, Maximum Likelihood detector, Chernoff bound, detection of deterministic and random signals. Estimation Theory: mathematics of estimation theory, minimum variance unbiased estimation, Cramer-Rao lower bund, linear models, general minimum variance unbiased estimation, best linear unbiased estimators, Maximum Likelihood estimation.
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week.
- **Student Evaluation:** mid-term test: 20%, research project: 40%, and final exam: 40%.
- **Suggested Textbook:** H.L. Van Trees, *Detection, Estimation, and Modulation Theory, Part I*, John Wiley, 2004, ISBN 0-471-09517-6.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome-1: apply the fundamentals of detection and estimation.
  Outcome-2: characterize the operation of a detector.
  Outcome-3: understand the concepts of consistency and bias in estimation.
  Outcome-4: decide which criteria to use to estimate or to detect a parameter.
  Outcome-5: derive performance bounds for estimation or a detection problem.
  Outcome-6: analyze the performance of different estimation or detection techniques by comparing the performance of the estimator or detector with the corresponding bounds.
  Outcome-7: appreciate the Maximum Likelihood approach in detection and estimation.
  Outcome-8: apply the theory of estimation and detection to communication systems.
  Outcome-9: grasp the basic idea of linear estimators.
  Outcome-10: apply the theory of estimation to spectral analysis and array processing.
- **Information About Course Designer/Developer:** Course designed by S. Shahbazpanahi, PhD, Faculty of Engineering and Applied Science
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  S. Shahbazpanahi, A. Grami
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5640G – Advanced Wireless Communications

- **Course Description and Content Outline:** Wireless communications systems, technologies, and standards; propagation environments (indoor/outdoor, fixed/mobile, cordless/wireless, voice/data/video/multimedia, radio/infra-red/optical, terrestrial/satellite); spread spectrum techniques; multiple access schemes (TDMA, OFDM, MC-CDMA), duplexing methods and diversity techniques; mobile cellular systems: frequency reuse, cell splitting, cellular traffic, call processing, hand-off, roaming, location determination; radio link analysis; multipath fading and fading models; wireless security and protocols, ad hoc mobile and sensor networks; link design aspects for emerging techniques (UWB, RFID)
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week.
- **Student Evaluation:** assignments: 10%, mid-term test: 20%, research project: 20%, and final exam: 50%.
- **Suggested Textbook:** S.G. Glisic, *Advanced Wireless Communications*, Wiley, 2004, ISBN 0-470-86776-0.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome-1: understand and apply the fundamentals of IEEE wireless standards (WLAN, WPAN, WMAN).
  Outcome-2: describe the principles of operations of cellular mobile systems (IS-95, I-136, GSM, 3G-WCDMA).
  Outcome-3: assess diversity techniques (time, space, polarization, frequency, angle, multipath).
  Outcome-4: characterize various fading channels and appreciate various fading models and parameters.
  Outcome-5: explain how equalization and synchronization methods are employed in wireless environments.
  Outcome-6: analyze Orthogonal Frequency Division Multiplexing and Multi-Carrier CDMA.
  Outcome-7: carry out network modeling, analysis, and simulation.
  Outcome-8: research major issues in mobile ad hoc and sensor networks and provide potential solutions.
  Outcome-9: conduct thorough link budgets for emerging wireless systems.
  Outcome-10: grasp the basics of space-time coding and their benefits and applications.
- **Information About Course Designer/Developer:**
  Course designed by A. Grami, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology.
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  A. Grami, S. Shahbazpanahi.
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5650G – Adaptive Systems and Applications

- **Course Description and Content Outline:** This course covers algorithms, filter structures, and applications in adaptive systems. Basic information-processing operations and recursive algorithms are discussed. Also, distinct methods for deriving recursive algorithms for the operation of adaptive filters are identified. Lastly, applications of adaptive filters, mainly to digital communication systems, are explored in details.
- **Content Outline by Topic:**
  - o Linear filtering problem and their types
  - o Recursive algorithms and their parameters
  - o Methods for deriving algorithms
  - o Applications of adaptive filters to communications
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam: 20%, research project and presentation: 40%, assignments: 20%, and final exam: 20%.
- **Suggested Textbook:** S. Haykin, *Adaptive Filter Theory*, Pearson Education, 2001, ISBN 0130901261.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: model filtering, smoothing, and prediction problems.
  Outcome 2: analyze algorithms based on various performance measures, such as rate of convergence, mis-adjustment, robustness, computational requirements, structure, and numerical properties.
  Outcome 3: understand methods for deriving recursive algorithms, namely Wiener filter theory, Kalman filter theory, and least squares.
  Outcome 4: assess performance of transversal and lattice structures in adaptive systems.
  Outcome 5: apply adaptive filters to communications, namely to system identification, adaptive equalization, spectrum estimation, noise and echo cancellation, adaptive beam forming, and carrier and symbol synchronization.
  Outcome 6: carry out numerical analysis and computer simulations for various adaptive systems and a variety of scenarios.

- **Information about Course Designer/Developer:**
  Course designed by A. Grami, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  S. Shahbazpanahi, A. Grami

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in electrical engineering, and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5660G – Communication Networks

- **Course Description and Content Outline:** Transmission media: guided (twisted-pair/coaxial/fibre) and non-guided (infra-red/radio/optical); network types and topologies; multiplexing (FDM, TDM, WDM), circuit switching and telephone network; the Internet and communications layers; broadband systems (T1, xDSL, cable modems); error detection schemes (parity, CRC, checksum); Automatic Repeat Request mechanisms; random access techniques (ALOHA, CSMA); controlled access techniques (reservation, polling); wired/wireless LANs; congestion control and quality of service; delay and loss performance in basic queuing models
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week.
- **Student Evaluation:** assignments: 20%, mid-term test: 30%, and final exam: 50%.
- **Suggested Textbook:** A. Leon-Garcia and I. Widjaja, *Communication Networks*, McGraw-Hill, 2004, ISBN 0-07-246352-X
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome-1: understand PSTN and digital telephony, including signalling and switching.
  Outcome-2: describe the fundamentals of broadband transmission systems and networking and multimedia applications requirements.
  Outcome-3: assess circuit switching and packet switching (virtual-circuit and datagram).
  Outcome-4: explain essential elements of stack protocols, including full appreciation of MAC, TCP/IP layers.
  Outcome-5: illustrate how the routing and traffic management in packet networks are done.
  Outcome-6: compare (Stop-and-Wait, Go-back-N, Selective-Repeat) ARQ techniques in terms of complexity and throughput.
  Outcome-7: analyze various types of wired/wireless LAN access methods, topologies and standards.
  Outcome-8: grasp how error detection and correction work in the data link layer
  Outcome-9: perform basic delay analysis, including Little's formula and identify performance measures.
  Outcome-10: derive results for M/G/1 queue, Erlang-B and Erlang-C formulas, carry out performance modeling and queuing analysis.

- **Information About Course Designer/Developer:**
  Course designed by faculty eligible to teach this course: A. Grami, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  A. Grami

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5670G – Cryptography and Secure Communications

- **Course Description and Content Outline:** This course covers diverse topics on cryptography and security including classical encryption, symmetric and public-key cryptography, key management, message authentication, digital signatures, denial-of-service (DoS), distributed DoS, malicious software, and intrusion detection systems.
- **Content Outline by Topic:**
  - o Introduction to security and cryptography
  - o Classical cryptography and block ciphers and Data Encryption Standard
  - o Advanced Encryption Standard
  - o Confidentiality using symmetric encryption
  - o Public-key cryptography and RSA, and key management
  - o Message authentication and hash functions and authentication applications
  - o Web security, malicious software & denial-of-service attacks
  - o Firewalls & intrusion detection systems
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** mid-term test: 20%, research project and presentation: 30%, assignments: 25%, and final exam: 25%.
- **Suggested Textbook:** W. Stallings. *Cryptography and Network Security: Principles and Practices (4th edition)*. Prentice Hall, 2006. ISBN: 0131873164.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  - Outcome 1: apply fundamentals of security, and symmetric and public-key cryptography, including block ciphers, RSA, key management, hash functions, detection of and reaction to mal-code attacks, mitigation of denial-of-service attacks, and network disruptions.
  - Outcome 2: articulate the basic fundamentals of number theory applied to cryptography in order to provide confidentiality, integrity and availability in information systems.
  - Outcome 3: assess the security of information systems based on the quality of cryptographic algorithms and protocols, authentication systems, firewalls, and intrusion detection systems.
  - Outcome 4: design secure information systems using symmetric and public-key cryptography applied to Web services and transactions.
  - Outcome 5: determine the suitability of a security system based on its cryptographic strengths and vulnerabilities, and the value and significance of the protected information.
  - Outcome 6: evaluate the security of commercial applications by understanding the fundamentals of their underlying cryptographic algorithms.

- **Information about Course Designer/Developer:**
  Course designed by M. Vargas Martin, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  M. Vargas Martin, R. Liscano

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering/computer science, & relevant experience in teaching & research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5710G – Network Computing

- **Course Description and Content Outline:** This course will introduce the students to topics in Internet Programming, Distributed Software Components, Network Computing Paradigms, and Service Oriented Architectures.
- **Content outline by topic:**
  - o Internet Programming: Socket Programming, Remote Procedure Calls (RPCs and XML-RPCs), Remote Method Invocation (RMI), CORBA, and IIOP.
  - o Distributed Software Components: Java Beans, DCOM/COM, Active X, and Enterprise Java Beans (EJBs).
  - o Network Computing Paradigms: client/server, publish-subscribe, blackboard and tuple-space, and peer-to-peer computing.
  - o Service Oriented Architectures (SOA): Web Services Modelling, Web Services Description Language (WSDL), Simple Access Object Protocol (SOAP), WS-Eventing and Universal Description Discovery and Integration (UDDI).
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam: 20%, research project: 30%, assignments: 15%, and final exam: 25%, paper review: 10%.
- **Suggested Textbook:** A. S. Tanenbaum and M. van Steen, *Distributed, Systems: Principles and Paradigms*, Prentice Hall, ISBN 0130888931, 2001
  Erl, T., *Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services*, Prentice Hall. ISBN: 0131428985, 2004.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: communicate among distributed objects using Sockets, RPC, and RMI.
  Outcome 2: develop distributed software systems by leveraging Java Beans, DCOM/COM, Active X, and Enterprise Java Beans.
  Outcome 3: understand fundamental networking computing paradigms like client/server, publish-subscribe, blackboard and tuple spaces, and peer-to-peer computing.
  Outcome 4: understand how distributed systems are built using the Service Oriented Architecture model and leveraging web services.

- **Information About Course Designer/Developer:**
  Course designed by faculty eligible to teach this course: R. Liscano, PhD, Faculty of Engineering and Applied Science and P. Hung, Faculty of Business and Information Technology.

- **Identify faculty to teach the course and/or statement "faculty to be hired":** R. Liscano, Faculty of Engineering and Applied Science, P. Hung, Faculty of Business and IT

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Engineering or Computer Science with relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5720 – Pervasive and Mobile Computing

- **Course Description and Content Outline:** An introduction and comprehensive view into technologies relevant to pervasive and mobile computing. An overview of cellular and personal wireless area networks, service discovery protocols, context-aware computing, and middleware platforms and software to support pervasive and mobile computing.
- **Content outline by topic:**
  - Mobility Management in Wireless Networks.
  - Wireless Personal Area Networks (802.11, Bluetooth, 802.15)
  - Service Discovery Models and Protocols (JINI, Bluetooth SDP, SLP, UPnP)
  - Content Adaptation models
  - Context aware computing and contextual modeling
  - Middleware Software for Pervasive Computing: Agent Models, HAVi, OSGI.
  - Middleware Communication Protocols, SIP, and Tuple Spaces
  - Mobile Security and Privacy
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week
- **Student Evaluation:** Mid-term exam (20%), research project (30%), assignments (15%), and final exam (25%), paper review (10%).
- **Suggested Textbook:** F. Adelstein, S.K.S. Gupta, G.G. Richard III, and L. Schwiebert, *Fundamentals of Mobile and Pervasive Computing*, The McGraw-Hill Companies, ISBN 0-07-141237-9, 2005.
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: understand mobility management in cellular networks.
  Outcome 2: articulate the basic protocols required for personal wireless area networks.
  Outcome 3: describe, explain, and model the mechanisms required for service discovery.
  Outcome 4: model contextual information and understand its use on mobile applications.
  Outcome 5: understand the basic components required for the design of mobile middleware platforms.
  Outcome 6: understand how the most recent communication models are used in pervasive and mobile computing.
  Outcome 7: describe how media content can be adapted based on mobile constraints and contextual information.
  Outcome 8: understand the fundamental components required to support mobile security and privacy.

Information About Course Designer/Developer:
Course designed by R. Liscano, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
R. Liscano

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and/or computer science. Relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR5730G – Algorithms and Data Structures

- **Course Description and Content Outline:** This course studies the mathematical foundations of algorithms and data structures, covering sorting and searching algorithms, stacks, queues, lists, trees, hash tables, search trees, binomial heaps, minimum spanning trees, shortest paths, the theory of NP-completeness, and approximation algorithms.
- **Content Outline by Topic:**
  - o Functions, summations, recurrences, set theory, counting
  - o The heap sort algorithm and the quick sort algorithm
  - o Lower bounds for sorting
  - o Stacks and queues
  - o Linked lists, trees
  - o Hash tables and functions
  - o Insertion and deletion in binary search trees
  - o Message authentication and hash functions
  - o Binomial trees and breadth-first and depth-first search, minimum spanning trees
  - o Dijkstra's algorithm and the Bellman-Ford algorithm
  - o Theory of NP-completeness proofs and problems
  - o Approximation algorithms to NP problems
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 25%, homework assignments: 15%, and final exam: 40%.
- **Suggested Textbook:** T.H. Cormen, *et al. Introduction to Algorithms (2nd ed.)*. MIT Press, McGraw-Hill, New York, USA, 2006.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: apply the fundamentals of algorithms analysis and design, and data structures.
  Outcome 2: articulate the fundamentals of sorting and searching algorithms for data structures.
  Outcome 3: analyze problems from the perspective of computational efficiency.
  Outcome 4: design solutions that involve efficient algorithms to perform fundamental computation tasks that operate on appropriate and efficient data structures.
  Outcome 4: analyze the algorithmic complexity of problems and be able to design approximation algorithms for NP problems.

- **Information About Course Designer/Developer:**
  Course designed by M. Vargas Martin, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  M. Vargas Martin, R. Liscano

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in electrical/software engineering or computer science, and relevant experience in teaching & research.

Course Title: ENGR 5740G – User Interface Design

- **Course Description:** This course is an introduction to user interface design and implementation on a wide range of hardware platforms. It covers the basic techniques used in user interface design, how users behave, implementation tools and techniques and the evaluation of user interface designs. It covers both desktop and mobile environments, including the design of user interfaces for cell phones, PDAs and mobile games.
- **Course Outline by Topic:**
  - o User behaviour: Basic cognitive psychology, Types of users, Usage patterns
  - o Design methodologies
  - o Prototyping
  - o Design and implementation tools: Prototyping systems, Software libraries, GUI builders
  - o Evaluation of user interface designs: Mathematical models, User studies, Experimental techniques
  - o User interfaces for mobile and embedded devices: Design challenges with limited devices: Mobile devices: cell phones, PDAs, and mobile entertainment, Appliances and consumer devices
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** assignments: 30%, final project: 25% and final examination: 45%.
- **Suggested Textbook:** Alan Cooper and Robert Reimann, *About Face 2.0: The Essentials of Interaction Design*, Wiley, 2003, 0764526413.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  - Outcome 1: apply in-depth knowledge of the important properties of users and how they impact user interface design.
  - Outcome 2: design and implement user interfaces for desktop, mobile and embedded environments.
  - Outcome 3: illustrate the importance of evaluating user interface designs both before and after they are implemented.
  - Outcome 4: follow a formal user interface design and implementation methodology.
  - Outcome 5: select the appropriate tools for the design and implementation of a user interface and be able to use them in a competent manner.
  - Outcome 6: apply in-depth understanding of the important difference between user interfaces for a desktop environment and user interfaces for mobile and embedded environments.

- **Information About Course Designer/Developer:**
  Course designed by M. Green, PhD, Faculty of Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  M. Green and additional faculty will be hired.

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Engineering or Computer Science with relevant experience in teaching and research. Faculty members may normally be registered Professional Engineers.

Course Title: ENGR 5750G – Software Quality Management

- **Course Description and Content Outline**: An intensive investigation into software quality engineering issues, including testing techniques, defect detection and prevention, reliability engineering, examination of maintenance issues and configuration management. Software evolution issues, including planning for evolution, round out the course. Students will do a major team project examining issues in defect reduction. The course will have a strong industrial flavour.
- **Content outline by topic:**
  - Introduction to software quality engineering
  - Software Quality Standards
  - Testing: concepts, issues and techniques
  - Life cycle testing
  - Coverage and usage testing
  - Software quality metrics
  - Defect reduction, defect classification
  - Software inspection
  - Developing a software quality plan
  - Safety and quality Issues
  - Software reliability engineering
  - Software evolution
  - Maintenance issues
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam: 10%, research project and presentation: 20%, assignments: 30%, and final exam: 40%.
- **Suggested Textbook:** J. Tien, *Software Quality Engineering,* John Wiley 2005
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: apply in-depth understanding of the importance of good quality in software.
  Outcome 2: explain and use the basic Quality Life Cycle.
  Outcome 3: use the 7 basic tools of quality control.
  Outcome 4: write a software quality management plan.
  Outcome 5: use software quality metrics.
  Outcome 6: implement defect reduction programs.
  Outcome 7: manage safety-software issues.
  Outcome 8: plan for the evolution of software.
  Outcome 9: manage software maintenance.
  Outcome 10: analysis case studies in software quality.

- **Information About Course Designer/Developer:**
  Course designed by J.M. Bennett, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  J.M. Bennett, R. Liscano, C. Martin

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering/computer science & relevant experience in teaching & research. Faculty members may be registered Professional Engineers.

Course Title: ENGR 5760G – Software Metrics

- **Course Description and Content Outline**: Analysis of software metrics. Introduction to the techniques of measurement. Syntax and semantics of software metrics. Planning a metrics program. Using metrics for prediction (quality, project time estimations). Case studies.
- **Content outline by topic:**
  - Fundamentals of Measurement and Experimentation.
  - Visualizing Metrics
  - Software Metrics
  - Estimation Metrics
  - Process Control with Software Metrics
  - Project Control with Software Metrics
  - Implementing and Managing a Metrics Program
  - Case Studies
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam: 10%, research project and presentation: 20%, homework assignments: 30%, and final exam: 40%.
- **Suggested Textbook:** *Software Metrics, 2nd ed.* Fenton, N.E. & Pfleeger, S.L.
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to
  Outcome 1: measure in an engineering way.
  Outcome 2: use the Goal-Question-Metric paradigm.
  Outcome 3: capture meaningful metrics.
  Outcome 4: display the reduced data in a meaningful way.
  Outcome 5: apply control theory to software metrics.
  Outcome 6: handle metrics related to product and process, internally and externally.
  Outcome 7: plan and execute a measurement program.
  Outcome 8: predict the outcome of software activities using appropriate metrics.
  Outcome 9: control and predict software project management.
  Outcome 10: analyze case studies.

- **Information About Course Designer/Developer:**
  Course designed by J.M. Bennett, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  J.M. Bennett, R. Liscano, C. Martin

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research.
  Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5770G – Service Computing

- **Course Description and Content Outline:** This course introduces the fundamental concepts and applications of service computing. Service computing, as a new cross discipline, addresses how to enable IT technology to help people perform business processes more efficiently and effectively. One of the fundamental components in service computing is Web service. Web services are Internet-based application components published using standard interface description languages and universally available via uniform communication protocols. Web services let individuals and organizations do business over the Internet using standardized protocols to facilitate application-to-application interaction.
- **Content outline by topic:**
  - eXtensible Markup Language (XML)
  - Document Type Definitions (DTD)
  - XML Style Sheets (XSLT)
  - XML Path Language (XPath)
  - XML Schemas
  - Service Oriented Architecture (SOA)
  - Web Services Modelling
  - Web Services Description Language (WSDL)
  - Simple Access Object Protocol (SOAP)
  - Universal Description, Discovery and Integration (UDDI)
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam (20%), research project and presentation (30%), programming homework assignments (20%), and final exam (30%).
- **Suggested Textbook:** Erl, T. 2004, *Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services*, Prentice Hall. ISBN: 0131428985
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:

  Outcome 1: To provide a conceptual overview on contemporary XML and Web Services technologies.

  Outcome 2: To provide hands-on and programming opportunities on selected features of the technologies.

  Outcome 3: To provide basic skills of writing research reports.

  Outcome 4: To provide a basis for undertaking further courses or self-learning in related and/or more specific areas.

- **Information About Course Designer/Developer:**
  Course designed by P. Hung, Faculty of Business and IT
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  P. Hung and additional faculty to be hired
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in computer science/information systems and relevant experience in teaching and research.

Course Title: ENGR 5780G – Advanced Computer Architecture

- **Course Description and Content Outline:** This course covers evolution of computer architecture and factors influencing the design of hardware and software elements of computer systems. Topics include processor micro-architecture and pipelining, performance measures, instruction set design, cache and virtual memory organizations; protection and sharing; I/O architectures, hazards and exceptions, dependencies, branch prediction, instruction-level parallelism, memory hierarchies, cache organization, buses, rotating storage and I/O subsystem design.
- **Content Outline by Topic:**
  - Quantitative principles of computer architecture
  - Instruction set principles and examples
  - Pipelining and instruction-level parallelism
  - Vector and novel processors
  - Memory-hierarchy design
  - Storage systems
  - Interconnection networks
  - Multiprocessors
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam: 20%, research project and presentation: 20%, assignments: 20%, and final exam: 40%.
- **Suggested Textbook:** John L. Hennessy and David A. Patterson, *Computer Architecture: A Quantitative Approach*, 3rd Edition, 2002, ISBN 1-55860-596-7
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: distinguish between various types of computer architectures.
  Outcome 2: apply in-depth understanding of the impact of different architectures on performance.
  Outcome 3: derive first-order equivalent electrical circuit for interconnection in the packaging with the help of computer aided design tools.
  Outcome 4: analyze different microprocessors and their usability in various architectures.
  Outcome 5: suggest ways to enhance performance of microprocessors and related architectures.
  Outcome 6: explain various storage systems, interconnection networks, principles of instruction sets.

- **Information about Course Designer/Developer:**
  Course designed by A. Grami, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  J.M. Bennett and additional faculty to be hired

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in electrical engineering, and relevant experience in teaching & research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5850G – Analog Integrated Circuit Design

- **Course Description and Content Outline:** This course covers modeling of IC devices, current sources and mirrors, gain stages, level shifters, analysis and design of BJT and MOS operational amplifiers, current-feedback amplifiers, wideband amplifiers and comparators. Frequency response of amplifiers, feedback techniques, analysis and design, stability and compensation of amplifiers, high slew-rate topologies, noise in IC circuits, fully differential circuits, analog multipliers and modulators, CAD tools for circuit design and testing.
- **Content Outline by Topic:**
  - o Operational amplifiers modeling, applications and topologies
  - o CAD simulation tools, IC fabrication technology and device models
  - o Gain stages, current sources and active loads
  - o Frequency response: single-stage frequency response; multistage frequency response; frequency/time response relationship
  - o Feedback: gain sensitivity; effect on distortion; feedback configurations; effect of loading
  - o Frequency response and stability of feedback amplifiers
  - o Noise in integrated circuits: noise sources; noise models; circuit noise calculations; equivalent input noise generators; noise bandwidth; noise figure and noise temperature.
  - o Translinear and current-mode circuits
  - o Analog multipliers: Gilbert multiplier; multiplier specifications; multiplier applications
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 20%, homework assignments: 20%, and final exam: 40%.
- **Suggested Textbook:** P.R. Gray, P.J. Hurst, S.H. Lewis, R.G. Meyer, J., *Analysis and Design of Analog Integrated Circuits*, Wiley & Sons, 2001, ISBN 0-471-32168-0, 4th Ed.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: analyze and design transistor-based op amp filter and oscillator topologies.
  Outcome 2: analyze and design multi-device gain stages in bipolar and MOS technologies.
  Outcome 3: analyze and design bandgap reference circuits.
  Outcome 4: analyze the frequency response of transistor-based amplifier topologies.
  Outcome 5: analyze and design feedback circuits & establish stability in feedback amplifiers.
  Outcome 6: analyze the noise performance of analog circuits.
  Outcome 7: analyze and design translinear circuits.
  Outcome 8: design an analog circuit of the students choosing to meet desired specifications.

- **Information about Course Designer/Developer:**
  Course designed by A. Grami, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  Additional faculty o be hired

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in electrical engineering, and relevant experience in teaching & research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5860G – Digital Integrated Circuit Design

- **Course Description and Content Outline:** This course covers the analysis and design of digital integrated circuits. Students are instructed in methods and the use of computer-aided design tools for the design and testing of large-scale integrated digital circuits.
- **Content Outline by Topic:**
  - o CMOS devices and manufacturing
  - o Integrated circuit inter-connect
  - o CMOS combinational and sequential logic design
  - o CMOS design implementation and timing
  - o Static and dynamic characteristics
  - o DC and transient modeling
  - o CMOS datapath and control subsystems
  - o CMOS memory subsystems
  - o CMOS testing
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 20%, homework assignments: 20%, and final exam: 40%.
- **Suggested Textbook:** Rabaey, Chandrakasan & Nikolic, *Digital Integrated Circuits: Design*, Prentice Hall, 2003., ISBN 01309009963
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  - Outcome 1: apply in depth understanding of CMOS inverter, CMOS combinational and CMOS sequential circuits.
  - Outcome 2: study and design the arithmetic building blocks, memory and array structures.
  - Outcome 3: explore and explain about the effect of interconnect on the performance of the circuits.
  - Outcome 4: consider the timing issues in high speed digital circuits and implement methods to overcome the issues.
  - Outcome 5: understand and apply the concepts of design methodologies and VLSI implementations.
  - Outcome 6: use CAD tools to design and verify typical digital circuits.

- **Information about Course Designer/Developer:**
  Course designed by A. Grami PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  M. Green and additional faculty to be hired

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in electrical engineering, and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5360G – Automotive Software and Electronics

- **Course Description and Content Outline:** Automotive design software tools, including FEA, CFD, Unigraphics and other packages. Software development and integration for design and manufacturing of automobiles. Electrical systems in automobiles, including power supplies, junction transistors, sensors and rectifiers. Signal amplifiers, gain-bandwidth limitations and circuit models. Motor drive control, inverters, actuators, PWM controllers, active filters, signal conditioners, power electronics and regulators. Battery chargers and solar cells. Automotive applications and case studies.
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** assignments: 20%, course project: 30%, final examination: 50%
- **Suggested Textbook:** R. Bosch, *Automotive Electrics and Automotive Electronics*, John Wiley & Sons, New York, 2004 (ISBN 1-86058-436-5)
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: have detailed understanding of electronics with applications to automotive systems, including microelectronics, sensors and control systems
  Outcome 2: design automotive electrical systems, including effects of electromagnetic compatibility and interference suppression
  Outcome 3: carry out analysis of alternators, batteries, starter motors and lighting systems
  Outcome 4: understand sensor technologies for speed, rpm, acceleration, temperature, vibrations and force sensors
  Outcome 5: design and operation of automotive software packages
  Outcome 6: understand data processing, software and data transfer between automotive electronic systems
  Outcome 7: gain detailed knowledge necessary to comprehend journal publications and other archival literature relevant to automotive software and electronics

- **Information About Course Designer/Developer:**
  Course designed by G. F. Naterer, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  Additional faculty to be hired

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research.
  Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5910G – Embedded Real-Time Control Systems

- **Course Description and Content Outline:** This course focuses on the design and implementation techniques for embedded real-time control systems. It covers embedded system design, instruction sets for microprocessor architecture, I/O, interrupts, hardware and software of embedded systems, program design and analysis, practical issues, multi-tasking operating systems, scheduling and system design techniques.
- **Content outline by topic:**
  - o Embedded system design process
  - o Instruction sets for microprocessor architecture
  - o Mechanisms for input, output, and interrupts
  - o Basic hardware and software platforms and Embedded computing
  - o Program design and analysis
  - o Practical issues related to computer based control systems
  - o Multi-tasking operating systems for embedded applications
  - o Real-time programming in high-level languages
  - o Priority scheduling and System design techniques
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 25%, homework assignments: 15%, and final exam: 40%.
- **Suggested Textbook:** Wittenmark, K.J. 2000, *Principles of Embedded Computing System Design,* Wayne Wolf, Morgan Kaufmann Publishers. ISBN 1-55860-541-X
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  - Outcome 1: articulate the characteristics of embedded and real-time systems in terms of functionality, time constraints, power consumption, cost and development environment.
  - Outcome 2: become familiar with the design process in real-time applications; use UML modeling language to design real-time applications.
  - Outcome 3: describe architecture features of major embedded processors; understand the difference between the two processors; and use instruction sets of these processors to accomplish simple operations.
  - Outcome 4: understand and illustrate major challenges in embedded computing system design.
  - Outcome 5: apply knowledge of practical issues related to computer based control systems: PID tuning, anti-aliasing filters, integrator saturation and windup, switch de-bouncing, selection of sampling rates.
  - Outcome 6: write simple programs with multi-tasking operating systems.
  - Outcome 7: design, build and integrate hardware and software for simple real-time embedded applications.
  - Outcome 8: use industry-grade tools & development environment for embedded applications.
- **Information About Course Designer/Developer:**
  Course designed by J. Ren, PhD, Faculty of Engineering & Applied Science and L. Lu, PhD, School of Energy Systems & Nuclear Science and Faculty of Engineering & Applied Science
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  J. Ren, L. Lu
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5920G – Analysis and Control of Nonlinear Systems

- **Course Description and Content Outline:** Introduction to nonlinear systems, phase plane analysis, stability determination by Lyapunov direct method, advanced stability theory, existence of Lyapunov functions, describing function analysis, nonlinear control system design by feedback linearization, sliding control, variable structure control, adaptive control of linear and nonlinear systems, control of multi-output systems, control of multi-input multi-output systems.
- **Content outline by topic:**
  - o Introduction to nonlinear systems
  - o Planar systems and their phase space
  - o Lyapunov stability theory
  - o Input-output stability
  - o Absolute stability
  - o Passivity
  - o Perturbed systems
  - o Feedback linearization
  - o Sliding mode control
  - o Back-stepping control
  - o Lyapunov based adaptive control
  - o Nonlinear observers
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 25%, homework assignments: 15%, and final exam: 40%.
- **Suggested Textbook:** Khalil, H.K. *Nonlinear Systems – 3rd Edition*. Prentice Hall, 2002.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  - Outcome 1: apply knowledge of the basic fundamentals of nonlinear phenomena: multiple equilibria, limit cycles, complex dynamics, bifurcations.
  - Outcome 2: identify second order nonlinear systems: phase plane techniques, limit cycles-Poincare-Bendixson theory, index theory.
  - Outcome 3: understand Input-output analysis and stability: small gain theorem, passivity, describing functions.
  - Outcome 4: understand and apply Lyapunov stability theory: basic stability and instability theorems, LaSalle's theorem, indirect method of Lyapunov.
  - Outcome 5: linearize a system by state feedback: input-output and full state linearization, zero dynamics, inversion, tracking, stabilization.
  - Outcome 6: apply basic software tools to the analysis of nonlinear systems.

- **Information About Course Designer/Developer:**
  Course designed by L. Lu, PhD, School of Energy Systems and Nuclear Science and Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  L. Lu and E. Esmailzadeh

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5930G – Adaptive Control

- **Course Description and Content Outline:** This is a course on the general principles of adaptive control and learning. This course will cover real-time parameter estimation, deterministic self-turning regulators, stochastic & predictive self-tuning regulators, model reference adaptive systems, gain-scheduling, properties of adaptive systems, robust adaptive control schemes, adaptive control of nonlinear systems, practical issues and implementation.
- **Content outline by topic:**
  - Real-time parameter estimation
  - Deterministic self-turning regulators
  - Stochastic & predictive self-tuning regulators
  - Model reference adaptive systems
  - Gain-scheduling
  - Properties of adaptive systems
  - Robust adaptive control schemes
  - Adaptive control of nonlinear systems
  - Practical issues and implementation
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 25%, homework assignments: 15%, and final exam: 40%.
- **Suggested Textbook:** K. J. Astrom and B. Wittenmark, *Adaptive Control*, 2nd , Addison-Wesley, 1995
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to

  Outcome 1: utilize the fundamental concepts of adaptive control and learning.
  Outcome 2: understand and apply the concepts of convergence, stability, and robustness to analyze control systems.
  Outcome 3: estimate parameters and learn models from empirical data.
  Outcome 4: understand and analyze the behavior of adaptive control schemes such as model reference, adaptive control and self tuning regulators.
  Outcome 5: articulate perturbation and averaging theory.
  Outcome 6: use advanced stability theory to analyze adaptation schemes.
  Outcome 7: design of gain-scheduling controllers.
  Outcome 8: be familiar with practical issues in implementation of adaptive controllers.

- **Information About Course Designer/Developer:**
  Course designed by J. Ren, PhD, Faculty of Engineering & Applied Science
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  J. Ren, L. Lu
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research.
  Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5940G – Intelligent Control Systems

- **Course Description and Content Outline:** With the advance of increasingly faster computing hardware and cheaper memory chips, computational intelligence, also known as a part of "soft computation", is becoming more and more important in control engineering. This course will equip the student with the essential knowledge and useful resources to solve some of the systems control problems not easily solved using conventional control methods. This course will cover: fundamentals of fuzzy set theory, structures of fuzzy logic controllers, structures of neural networks, learning algorithms, genetic algorithms.
- **Content outline by topic:**
  - General characteristics of intelligent control systems.
  - Fundamentals of fuzzy set theory.
  - Application of fuzzy logic in control.
  - Basic and complex structures of fuzzy logic controllers.
  - Automated design and self-organization of fuzzy controllers.
  - Basic structures of neural nets.
  - Static and dynamic neural nets.
  - Learning algorithms.
  - Application of neural nets in modeling, identification and control of systems.
  - Optimization by using genetic algorithms.
  - Examples of intelligent control systems in industry.
- **Delivery Mode and Teaching Method:** One-term 3 hours of lectures per week.
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 25%, homework assignments: 15%, and final exam: 40%.
- **Suggested Textbook:** C.T.Lin and C.S.G.Lee (1996): *Neural Fuzzy systems - A Neuro-Fuzzy Synergysm to Intelligent Systems*, Prentice Hall, New York.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: understand fundamental concepts of fuzzy logic (FL), neural network (NN) and genetic algorithm (GA).
  Outcome 2: use NN/FL to model the complex static/dynamic systems.
  Outcome 3: use NN/FL as a tool to construct the complex nonlinear controller to better control the complex dynamics systems.
  Outcome 4: use GA to solve global optimization problem.
  Outcome 5. gain hands-on experience on MATLAB toolboxes for NN and FL to solve practical control design problems.
  Outcome 6: explore and utilize the Internet resources on computational intelligent related to control engineering.
- **Information About Course Designer/Developer:**
  Course designed by J. Ren, PhD, Faculty of Engineering & Applied Science
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  J. Ren
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in electrical engineering and relevant experience in teaching & research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5950G – Computational Electromagnetics

- **Course Description and Content Outline:** This course covers the theory, development, implementation, and application of the finite element method and its hybrid versions to electromagnetics. It also makes efficient and accurate formulations for electromagnetics applications and their numerical treatment. It employs a unified coherent approach dealing with both integral and differential equations using the method of moments and finite-element procedures.
- **Content outline by topic:**
  - Two- and three-dimensional integral equation/method-of-moments formulations
  - Open-region finite-element formulations based on the scalar and vector equations
  - Finite difference time-domain methods
  - Direct and iterative algorithms for the solutions of linear systems
  - Error analysis and the convergence behavior of numerical results
  - Radiation boundary conditions
  - Acceleration methods for periodic Green's functions
  - Vector finite elements
- **Delivery Mode and Teaching Method:** One-term 3 hours of lectures per week.
- **Student Evaluation:** assignments: 20%, projects: 50, and final exam: 30%.
- **Suggested Textbook:** A. F. Peterson, S.L. Ray, and R. Mittra, *Computational Methods for Electromagnetics*, ISBN: 0-7803-1122-1, Wiley-IEEE Press, 1997.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:

  Outcome 1: apply understanding of the basic problems in electromagnetic field theory associated with Maxwell's equations in the low frequency case (eddy current equations) and in the high frequency regime (time-harmonic approach; waveguides, scattering).

  Outcome 2: appreciate applications in the aerospace, defense, telecommunications, wireless, electromagnetic compatibility, and electronic packaging industries.

  Outcome 2: gain a thorough understanding of basic numerical solution procedure

  Outcome 3: formulate three-dimensional problems, such as closed domain, radiation and scattering.

  Outcome 4: know how to effectively use major commercial electromagnetic computer simulation packages.

  Outcome 5: workout the crucial treatment of local boundary conditions.

  Outcome 6: review of recent developments and advances in finite element methods for 2D and 3D electromagnetic field problems.

- **Information About Course Designer/Developer:**
  Course designed by A. Grami, PhD, Faculty of Engineering & Applied Science
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  Faculty to be hired
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in electrical engineering and relevant experience in teaching & research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5960G – Power System Operations, Analysis and Planning

- **Course Description and Content Outline:** Transmission lines. Steady state transmission capacity; network compensation; voltage management; load flow simulation; transient stability simulation; system security; system planning; symmetric operation of power systems.
- **Content Outline by Topics**
  - o Introduction to single-phase, three-phase systems and the per unit system
  - o Transmission line models and steady-state transmission capacity
  - o Concepts of network compensation: impedance, voltage, angle and power
  - o Voltage management and effect on transmission capacity
  - o Load flow simulation: admittance matrix, problem structure, numerical simulation by the Newton-Raphson method
  - o Transient stability simulation: deriving the swing equation, complex generator models, complex component control models, numerical simulation techniques
  - o Reliability and security: criteria, deterministic concepts, transfer limits, security limits, contingencies, limit determination
  - o Power system planning: operations versus planning; planning processes and criteria
  - o Asymmetric operation of transmission systems
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week.
- **Student Evaluation:** Homework assignments: 50%; final exam: 50%.
- **Suggested Textbook:** Marceau, R.J., *Notes on Power System Operation, Analysis and Planning*
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: determine steady-state transmission line capacity employing all the possible compensation strategies; choose an appropriate compensation strategy according to circumstances; explain the operation of the different compensation technologies.
  Outcome 2: derive the equations which describe steady-state network operation; explain how these equations can be solved. Develop load flow software; analyze the result of simulations describing different operating conditions; make recommendations concerning compensation strategies required to solve network operating problems.
  Outcome 3: explain how power systems react to unforeseen circumstances; derive the swing equation. Explain how transient conditions are represented and solved; develop appropriate software for transient stability simulation. Integrate complex generator models and network component control system models; determine whether a system is stable or unstable; determine a transient stability transfer limit.
  Outcome 4: explain the difference between reliability and security. explain such concepts as: i) operations and planning criteria; ii) transfer limit; iii) security limit; iv) steady-state security; v) dynamic security; determine a security limit; explain how security limits are employed in system operation.
  Outcome 5: plan a transmission corridor using traditional three-phase AC transmission concepts.
  Outcome 6: explain how asymmetric operation can increase: i) reliability, ii) security and iii) economics of power system operation and planning; plan a transmission corridor employing asymmetric operation and planning concepts.
- **Information About Course Designer/Developer:**
  Course designed by R. J. Marceau, PhD, Faculty of Engineering and Applied Science
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  R. J. Marceau
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5970G – Power Electronics

- **Course Description and Content Outline:** This course covers fundamentals of lossless switching techniques: zero-voltage switching, zero-current switching; resonant converters: series, parallel and series-parallel topologies; soft-switching converters: natural and auxiliary commutation converter topologies control techniques: variable frequency phase-shift and hybrid control; applications to single-phase three-phase and multi-level converters; line- and force-commutated converters; high power ac/dc and dc/ac converter structures and switching techniques; principles of HVDC and HVAC systems.
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week.
- **Student Evaluation:** assignments: 25%, mid-term test: 25% and final exam: 50%.
  Suggested Textbook: R.W. Erickson, D. Maksimovic, *Fundamentals of Power Electronics*, Springer, 2001, ISBN: 0792372700
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome-1: derive averaged equivalent circuit models of converters operating in steady state
  Outcome-2: apply Middlebrook's Extra Element Theorem to the input filter design and the resonant inverter design.
  Outcome-3: understand the dynamics of discontinuous conduction mode converters and current-mode control.
  Outcome-4: present the basic magnetics theory necessary for informed design of magnetic components in switching power converters.
  Outcome-5: model various classes of converters and identify their technical requirements, applications and characteristics.
  Outcome-6: appreciate engineering design process and the need for design-oriented analysis.
  Outcome-7: develop design techniques for practical applications.
  Outcome-8: carry out computer simulation of power electronics systems.

- **Information About Course Designer/Developer:**
  Course designed by A. Grami, Ph.D., Faculty of Engineering and Applied Science and Faculty of Business and Information Technology.

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  R. Marceau, additional faculty to be hired

- **Faculty qualifications required to teach/supervise the course:**
  Ph.D. degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5980G – Advances in Nuclear Power Plant Systems

- **Course Description and Content Outline:** A combination of lectures, self-paced interactive CD-ROM study and the use of power plant simulators imparts to students the advances in the key design and operating features of the main nuclear power plan types, including reactors using pressure vessels and pressure tubes, pressurized water, boiling water and gas cooled reactors; the use of natural versus enriched fuel, converters and breeders; overall plant control systems, load following capabilities, islanding operations; safety systems, responses to abnormal and emergency events. Self-paced interactive CD-ROM and operation of power plant simulators will be used throughout the course.
- **Content Outline by Topics**
  - o Introduction to the key design and operating features of the main nuclear power plan types
  - o Advances in the design features of reactors using pressure vessels and pressure tubes
  - o Operating characteristics of pressurized water, boiling water and gas cooled reactors
  - o Use of natural versus enriched fuel – design and operating aspects
  - o Design of reactors that are fuel converters or breeders
  - o Overall plant control systems and load following capabilities of the various reactor types
  - o Frequency and voltage control under islanding operations
  - o Evolution of safety system design
  - o Simulated responses to abnormal and emergency events in real time
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week
- **Student Evaluation:** Homework assignments: 30%; final exam: 70%.
- **Suggested Textbook:** Bereznai, G.T., *Nuclear Power Plant Systems and Operation*
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  - Outcome 1: specify the desired operating characteristics of a nuclear-electric generating unit to meet electric power system requirements.
  - Outcome 2: define the key design parameters for pressurized or boiling water reactors, and the criteria for selecting light or heavy water as coolant and/or moderator.
  - Outcome 3: demonstrate, using real time simulators, the normal operation of nuclear-electric power plants using various types of reactors.
  - Outcome 4: explain the responses of various reactor types to malfunction conditions.
  - Outcome 5: identify the conditions under which fast breeder reactors would be cost effective to construct and operate, and define the key reactor design parameters.
  - Outcome 6: explain the improvements in the reliability of reactor safety systems, emphasizing the key characteristics of passive systems.
  - Outcome 7: demonstrate, using real time simulators, the responses of nuclear-electric power plants using various types of reactors to design-basis emergency events.

- **Information About Course Designer/Developer:**
  Course designed by G. T. Bereznai, Ph.D., School of Energy Systems and Nuclear Science

- **Identify faculty to teach the course:**
  G.T. Bereznai

- **Faculty qualifications required to teach/supervise the course:**
  Ph.D. degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

5 OUTCOMES

5.1 Enrolment and graduations

As this is an application for a new program, this section is not applicable.

5.2 Employment

Employment records of the graduates from the program will be maintained on an ongoing basis.

5.3 Publications

Publication records of the graduates from the program will be maintained on an ongoing basis.

5.4 Projected graduate intake and enrolments

Table 5-1 shows the projected graduate student enrolment (both full-time and part-time students) over the next seven years. As additional faculty will be hired over the next few years, the planned enrolment in the program is expected to increase.

Table 5-1 Projected Intake and Enrolments for MASc and MEng Programs

YEAR	FULL-TIME				PART-TIME				TOTAL ENROLMENT	
	Intake		Enrolments		Intake		Enrolments		MASc	MEng
	MASc	MEng	MASc	MEng	MASc	MEng	MASc	MEng		
2007	5-10	5-10	5-10	5-10	1-3	5-10	1-3	5-10	6-13	10-20
2008	10-15	5-10	15-25	10-20	1-3	5-10	2-6	10-20	17-31	20-40
2009	10-15	5-10	20-30	10-20	1-3	5-10	3-9	10-20	23-39	20-40
2010	10-20	10-15	20-35	10-25	1-3	5-10	3-9	10-20	23-44	20-45
2011	10-20	10-15	20-40	10-30	1-3	5-10	3-9	10-20	23-49	20-50
2012	10-20	10-15	20-40	10-30	1-3	5-10	3-9	10-20	23-49	20-50
2013	10-20	10-15	20-40	10-30	1-3	5-10	3-9	10-20	23-49	20-50

In the spring of 2009, the first class of students will graduate from UOIT's undergraduate programs in Electrical Engineering and Software Engineering. It is expected that as more and more students successfully complete their undergraduate degrees at UOIT, the enrolments in the master's programs will rise as some of these students pursue post-graduate degrees.

University of Ontario
INSTITUTE OF TECHNOLOGY

Faculty of Engineering and Applied Science

Business Plan

Master of Engineering and
Master of Applied Science in
Electrical and Computer Engineering

This is the business plan for the new Masters (MEng and MASc) programs in Electrical and Computer Engineering to be offered by the Faculty of Engineering and Applied Science beginning in the Fall semester 2007. Note that the methodology and set of assumptions are the same as those in the Mechanical Engineering Masters program, which CPRC and Academic Council approved last year.

Rationale for the New Programs
The rationale for offering these programs is outlined in the submission to the UOIT's Curriculum and Program Review (CPRC) Committee. Market needs and attractiveness of the programs are also laid out in the above mentioned document.

Enrollment Projections and Business Plan Assumptions: MEng & MASc
We propose a scenario that we believe to be the most likely for enrollment in the program as a "Most Likely Scenario". The enrolment corridors have been confirmed to be realistic by the Registrar's office.

The following assumptions were included in the proposed business plan:

- [0][1] Tuition for the programs is set to $ 5,400 (to be consistent with the Faculty of Engineering and Applied Science's proposal for its Mechanical Engineering graduate program).
- [0] Enrollment for the second year to be 90 % of the first year enrollment. 50% of the students will stay for six instead of five terms.
- [1] Full Operating Grant (reduced by the 15% deduction for debt service) per full time student is assumed to be $14,321.55 / annum for a maximum of two years. Part time tuition and operating grant at 1/3 of the above (thus allowing the student to stay five instead

[1] References in square brackets [ ] are to the revenue/expenses spreadsheet attached below on page 5.

of two years). Part Time students stay a maximum of five years. This deviates from the proposal that assumes an quicker degree completion, but the presented assumption is more conservative on the budgetary side.

- [2] [7] Salary Cost is set to $90,000 plus 18.5% in benefits for full time faculty.
- [3] A small number of courses with specializations that cannot be staffed with current faculty will be taught by qualified part time faculty (e.g., adjunct professors, specialists from industry, etc.). The priority is to staff graduate courses with full time faculty. There is no cost to "buy" courses from other faculties in the current proposal. All courses will be offered by the FEAS (and SENS).
- [4] A number of Graduate Research Awards will be provided. The total sum available for these Graduate Research Awards is included as a cost line item in this business plan. We assume that $3,000 per full time student (consistent with the Faculty of Science BP) will be available to fund the GRA. The individual GRA will be awarded according to merit and need to bring up the graduate student income to approx $16,000/annum. Other resources (faculty and granting agencies research grants, TA positions, etc) will amount for the rest of the balance.
- [5] Technical Support Staff will be added to the program. There will be one tech support employee when the program has grown to capacity. As funding for graduate research infrastructure is expected to come from research grants, we see an ongoing necessity to maintain a minimal centralized support infrastructure.
- [6] The program will be supported by 1 additional administrative staff,
- [7] Benefits are calculated on a basis of 18.5 for FT faculty and staff and 11% for all other positions.
- The majority of laboratory needs will be satisfied either with existing undergraduate laboratories or through research grants.
- [8] Some additional equipment will be required to supplement undergraduate teaching labs for the use in graduate studies, where the scale of the procurement would not warrant applying for an equipment grant.
- [9] A phased in cost of annually $30,000 is assumed for additional teaching resources. This includes hiring of guest lecturers, technical consultants, instructional materials, etc., to support the program.
- [10] A phased in cost of $20,000 for miscellanea is included in the business plan This line item is for purchasing required supplies to support the new graduate program. This also includes a variety of operating costs. Other miscellaneous costs could include, but not limited to, travel to promote the program and for faculty to attend relevant conferences, engagement of technical consultants and part-time instructors to support the program, instructional aides, office and classroom supplies, acquisition of relevant journals and other publications, and other required cost.
- Inflation has an overall effect on the business plan. Salaries and equipment cost are subject to an annual increase, which will has to be countered by tuition increases. Therefore an inflation factor is not included in the business plan.

Enrollment and Staffing Projection

The following enrollment projection is based on average enrollment target. The underlying enrollment corridor (min/max numbers) was confirmed to be realistic by the Registrar's office.

Most likely Scenario

	New Enrollment		Cumulative Enrollment			Cumulative Full-time Faculty Equivalents (F.T.E.)	Cumulative Part-time Faculty Equivalents (F.T.E.)	Additional Support Personal		Government Grant	Tuition	**Total Revenue**
	Full-Time	Part-Time	Full-Time	Part-Time	Total			Tech	Admin			
2007	15	7	15	7	22	1.5	0	0.5	0.5	$248,240.20	$93,600.00	$341,840.20
2008	20	8	31	15	46	2	1	1	1	$515,575.80	$194,400.00	$709,975.80
2009	20	8	35	23	58	3	1	1	1	$611,052.80	$230,400.00	$841,452.80
2010	28	8	43	31	74	3.5	1	1	1	$763,816.00	$288,000.00	$1,051,816.00
2011	28	8	49	39	88	4	1	1	1	$887,936.10	$334,800.00	$1,222,736.10
2012	28	8	49	47	96	4	1	1	1	$926,126.90	$349,200.00	$1,275,326.90

NOTES

1. Government grant is calculated as $14,321.55 * FT enrolment + 1/3rd $14,321.55 * PT enrolment
2. Cumulative FT enrolment = New Intake + 90% of (5/6th previous year's intake)
3. Cumulative PT enrolment is previous years enrolments added for five years
4. Tuition is calculated as $5,400 * FT enrolment + 1/3rd $5,400 * PT enrolment

Projected Revenue vs. Estimated Expenses

	2007	2008	2009	2010	2011	2012
Total Revenue [0,1]	$341,840	$709,976	$841,453	$1,051,816	$1,222,736	$1,275,327
Salaries						
Faculty [2]	$135,000	$180,000	$270,000	$315,000	$360,000	$360,000
Part-Time Faculty [3]	$0	$42,000	$42,000	$42,000	$42,000	$42,000
Course Cost to other Faculties [3]	$0	$0	$0	$0	$0	$0
Teaching Assistants	$0	$0	$0	$0	$0	$0
Graduate Research Awards [4]	$45,000	$93,000	$105,000	$129,000	$147,000	$147,000
Tech Support Staff [5]	$32,500	$65,000	$65,000	$65,000	$65,000	$65,000
Admin Staff [6]	$21,250	$42,500	$42,500	$42,500	$42,500	$42,500
Benefits [7]	$34,919	$57,808	$74,458	$82,783	$91,108	$91,108
Sub-Total	$268,669	$480,308	$598,958	$676,283	$747,608	$747,608
Ratio	78.59%	67.65%	71.18%	64.30%	61.14%	58.62%
Equipment[8]	$10,000	$10,000	$20,000	$30,000	$30,000	$30,000
Other Teaching Rsrc [9]	$10,000	$10,000	$20,000	$20,000	$20,000	$20,000
Miscellaneous [10]	$10,000	$10,000	$20,000	$20,000	$20,000	$20,000
Total Expenses	$298,669	$510,308	$658,958	$746,283	$817,608	$817,608
Ratio	87.37%	71.88%	78.31%	70.95%	66.87%	64.11%
Net Revenue	$43,171	$199,668	$182,495	$305,534	$405,129	$457,719

APPENDIX B

From: Richard Levin
Sent: Monday, May 29, 2006 11:55 AM
To: Karen Spearing
Cc: Jeff Macnab; Leslie Becskei; Kelly Dodson
Subject: RE: GRADUATE PROGRAM PROPOSALS - FACULTY OF ENGINEERING & FACULTY OF SOCIAL SCIENCE

Karen,

Thanks for the opportunity to comment.

In terms of enrolment targets, I'm content to let the current estimates stand. It is very difficult to forecast enrolment for new programs, even more so for graduate programs since the vehicles for active recruitment are quite limited. I note that York's graduate enrolments rose very quickly during its first years in the 1960s as it became better known and regarded.

Two other points:

First, the engineering proposals state that all graduate students have access to all campus wireless facilities. I'm not aware that a decision has been made to require all graduate programs to adopt the mobile learning program, so it might be best to restrict the remarks to the programs under consideration. I wasn't clear whether Criminology students will be using the laptop or not but I may have missed the reference.

Second, to date none of our graduate programs have entertained the use of standardized tests such as the GRE or GMAT. This is an entirely legitimate choice, but it should be made consciously. Such instruments do not add a lot of predictive validity to domestic grades but can level the playing field for other applicants. There may be situations in which we would like to consider non-traditional applicants and might entertain the use of such an instrument to supplement the credentials presented. We may wish to gain some experience with the programs before making this decision.

I hope these thoughts are helpful.

Richard

APPENDIX C

UNIVERSITY OF ONTARIO INSTITUTE OF TECHNOLOGY

Brief for the Appraisal
of the
MASc and MEng Programs
in
Automotive Engineering

Submitted to the
Ontario Council on Graduate Studies
August 31, 2006

VOLUME I: The Program

CONTENTS

1 INTRODUCTION

1.1 Brief listing of programs

The University of Ontario Institute of Technology (UOIT) proposes to offer master's programs leading to a Master of Applied Science (MASc) or Master of Engineering (MEng) in Automotive Engineering. The MEng program will have two options: (i) MEng-Project with of a combination of courses and a project and (ii) MEng-Course, which consists only of courses. These graduate programs are new programs offered at UOIT. The programs are planned to start in January, 2008, or as soon as practical after all necessary approvals are obtained, by the Faculty of Engineering and Applied Science and its affiliated School of Energy Systems and Nuclear Science.

1.2 Background

The automotive sector has vital importance to the economies of Ontario and Canada. One in seven Canadians depends on the automotive sector for employment. The automotive industry is Canada's largest manufacturing sector. It represents about 12 percent of manufacturing GDP and 25 percent of manufacturing trade. It employs about 171 thousand people in automotive assembly and component manufacturing, plus about another 333 thousand in distribution and aftermarket sales and service. It has grown significantly over the past few decades, from industry shipments of $37.8 billion in vehicles and $14.7 billion in parts in 1993, to $69.3 billion in vehicles and $31.4 billion in parts in 2003. Automotive manufacturing is mainly clustered in southern Ontario, with seven of the world's largest vehicle manufacturers operating 14 plants in Ontario. These include giant multinationals, such as Ontario-based Magna International, Dana Corporation and Delphi Automotive, as well as dynamic home-grown companies like the Woodbridge Group, Wescast Industries and Linamar. Ontario is the largest auto-making province or state in North America (see Fig. 1.1; source: http://strategis.ic.gc.ca).

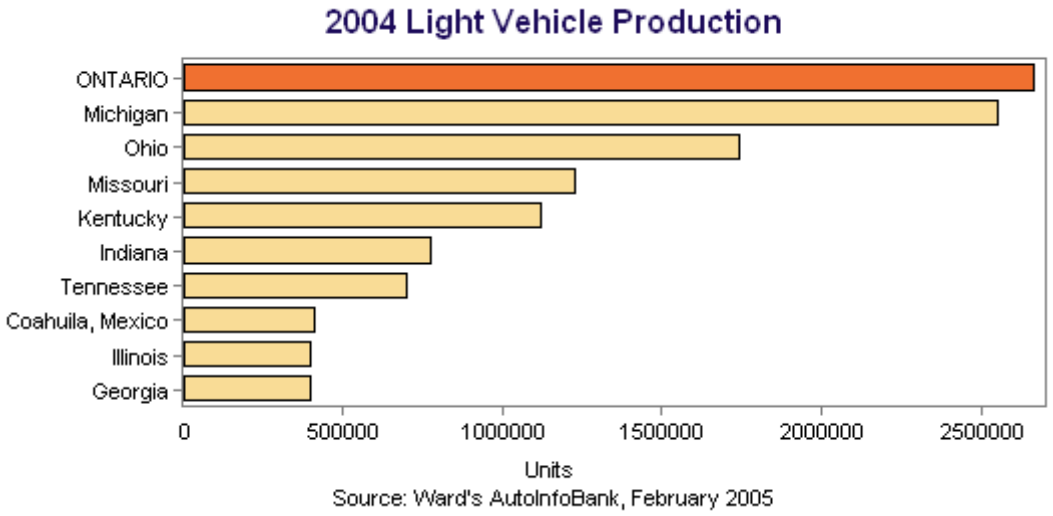


Figure 1-1: 2004 Light Vehicle Production in North America

It is well known that Ontario's automotive industry is experiencing challenges with global competition. In 2001, Canada ranked fifth in global vehicle production, but it has slipped to eighth place in 2004. Automakers are facing severe competition overseas with lower labor costs. Also, rising commodity and energy costs are reducing profits. This includes rising costs of iron ore, steel and other raw materials, as well as energy costs related to manufacturing operations.

Ontario's future prosperity depends heavily on economic growth in its automotive sector. This will require training of future engineers to foster automotive innovation and commercialization of advanced new technologies. At Ontario's newest university, UOIT (University of Ontario Institute of Technology), the undergraduate Automotive Engineering program provides students with the knowledge and skills required for engineering in all areas of the automotive sector and related industries. The program is the only undergraduate program in Automotive Engineering in Canada. At the post-graduate level, there are currently no Automotive Engineering programs in Canada. However, there is a great need for such programs that train students at a Master's degree level. Training of future graduate students in Automotive Engineering is critical to provide a competitive advantage for Ontario's automakers. These graduate students would provide the advanced skills needed to lead Ontario's automakers to future success.

UOIT accepted its first undergraduate engineering students in the fall of 2003. Undergraduate engineering degrees at UOIT are offered by both the Faculty of Engineering and Applied Science and its affiliated School of Energy Systems and Nuclear Science. The Faculty of Engineering and Applied Science first offered an undergraduate program in Manufacturing Engineering in the fall of 2003. In the fall of 2004, the Faculty of Engineering and Applied Science added an undergraduate program in Mechanical Engineering with three options: (i) Mechanical Engineering Comprehensive, (ii) Energy Engineering and (iii) Mechatronics Engineering. In the fall of 2005, the Faculty of Engineering and Applied Science added undergraduate programs in Automotive, Electrical, and Software Engineering. The School of Energy Systems and Nuclear Science, which is affiliated with the Faculty of Engineering and Applied Science, first offered an undergraduate program in Nuclear Engineering in the fall of 2003.

UOIT offered its first master's program (Master of Information Technology Security) in September 2005. In the Faculty of Engineering and Applied Science, graduate programs leading to the degrees of Master of Applied Science (MASc) and Master of Engineering (MEng) were approved to commence by the Ontario Council on Graduate Studies (OCGS) in January, 2006. A Master of Science (MSc) in Modelling and Computational Science was also recently approved to commence by OCGS. With the rapid growth of UOIT's engineering programs, the Faculty of Engineering and Applied Science is ready and able to expand graduate programs by offering MASc and MEng programs in Automotive Engineering in January, 2008. Doctoral programs are also planned, but after the master's programs are up and running. Table 1-1 summarizes the details of UOIT's graduate programs.

Table 1-1 – UOIT Graduate Programs

Graduate Program	**Status**
Master of Information Technology Security	Launched in September, 2005
MASc and MEng in Mechanical Engineering	Expected to begin in September, 2006

MSc in Modelling and Computational Science	Expected to begin in January, 2007
MASc and MEng in Electrical and Computer Engineering	Planned to begin in September, 2007
MASc and MEng in Automotive Engineering	Proposed to begin in January, 2008

1.2.1 Other programs

As of the fall of 2005, there were 15 universities in Ontario offering graduate programs in engineering (see Table 1-2).

Table 1-2 – Graduate Engineering Programs in Ontario as of 2005

University	Programs	Degrees
Brock University	Geological Engineering	MSc
Carleton University	Civil Engineering[1]	MASc/MEng/PhD
	Electrical Engineering[1]	MASc/MEng/PhD
	Environmental Engineering[1]	MASc/MEng/PhD
	Geological Engineering[1]	MSc/PhD
	Mechanical & Aerospace Engineering[1]	MASc/MEng/PhD
	Software Engineering ConGESE[2]	MEng
	Telecommunications Technology Management	MEng
University of Guelph	Engineering	MEng/MSc/PhD
Lakehead University	Environmental Engineering	MSc
	Control Engineering	MSc
	Geological Engineering	MSc
Laurentian University	Mineral Resources Engineering	MASc/MEng
	Geological Engineering	MSc/PhD
McMaster University	Chemical Engineering	MASc/MEng/PhD
	Civil Engineering	MASc/MEng/PhD
	Design & Manufacturing[3]	MEng
	Electrical & Computer Engineering	MASc/MEng/PhD
	Engineering Physics	MEng/PhD
	Geological Engineering	MSc/PhD
	Materials Science & Engineering	MASc/MSc/PhD
	Mechanical Engineering	MASc/MEng/PhD
	Software Engineering	MASc/MEng/PhD
University of Ontario Institute of Technology	Mechanical Engineering	MASc/MEng
University of Ottawa	Chemical Engineering	MASc/MEng/PhD
	Civil Engineering[1]	MASc/MEng/PhD
	Electrical Engineering[1]	MASc/MEng/PhD
	Engineering Management	MEng
	Environmental Engineering[1]	MASc/MEng/PhD
	Geological Engineering[1]	MSc/PhD
	Mechanical & Aerospace Engineering[1]	MASc/MEng/PhD
	Software Engineering ConGESE[2]	MEng

Queen's University	Chemical Engineering	MEng/MSc/PhD
	Civil Engineering	MEng/MSc/MSc(Eng)/PhD
	Design & Manufacturing[3]	MEng
	Electrical & Computer Engineering	MEng/MSc/MSc(Eng)/PhD
	Geoengineering[4]	MSc/MScE/PhD
	Materials & Metallurgical Engineering	MEng/MSc/MSc(Eng)/PhD
	Mechanical Engineering	MEng/MSc/MSc(Eng)/PhD
	Mining Engineering	MEng/MSc/MSc(Eng)/PhD
Royal Military College of Canada	Chemistry & Chemical Engineering	MSc/MEng/PhD
	Civil Engineering	MEng/PhD
	Defence Engineering & Management	MDEM
	Electrical & Computer Engineering	MEng/PhD
	Mechanical Engineering	MASc/MEng/PhD
Ryerson University	Chemical Engineering	MASc/MEng
	Civil Engineering	MASc/MEng/PhD
	Electrical & Computer Engineering	MASc/MEng/PhD
	Elect. & Comp. Eng. – Computer Networks	MASc/MEng
	Environmental Applied Science & Management	MASc
	Mechanical Engineering	MASc/MEng/PhD
University of Toronto	Aerospace Science & Engineering	MASc/MEng/PhD
	Biomedical Engineering	MASc/PhD
	Chemical Engineering & Applied Chemistry	MASc/MEng/PhD
	Civil Engineering	MASc/MEng/PhD
	Clinical Biomedical Engineering	MHSc
	Design & Manufacturing[3]	MEngDM
	Electrical & Computer Engineering	MASc/MEng/PhD
	Engineering & Management	BASc/MBA
	Environmental Engineering[5]	MASc/MEng/PhD
	Environmental Studies[5]	MASc/MEng/PhD
	Geological Engineering	MASc/MSc/PhD
	Integrated Manufacturing[5]	MEng
	Knowledge Media Design[5]	MASc/PhD
	Materials Science & Engineering	MASc/MEng/PhD
	Mechanical & Industrial Engineering	MASc/MEng/PhD
	Software Engineering ConGESE[2]	MEng
	Telecommunications	MEng
	Wood Engineering[5]	MASc
University of Waterloo	Chemical Engineering	MASc/PhD
	Civil Engineering	MASc/MEng/PhD
	Design & Manufacturing[3]	MEng
	Electrical & Computer Engineering	MASc/MEng/PhD
	Geological Engineering	MSc/PhD
	Management of Technology	MASc
	Management Sciences	MASc/MMSc/PhD
	Mechanical Engineering	MASc/MEng/PhD
	Software Engineering ConGESE[2]	MASc
	Systems Design Engineering	MASc/MEng/PhD

University of Western Ontario	Biomedical Engineering	MESc/PhD
	Design & Manufacturing[3]	MEng
	Geological Engineering	MSc/PhD
	Engineering Science	MESc/MEng/PhD
University of Windsor	Civil Engineering	MASc/MEng/PhD
	Electrical Engineering	MASc/MEng/PhD
	Engineering Materials	MASc/MEng/PhD
	Environmental Engineering	MASc/MEng/PhD
	Geological Engineering	MSc/PhD
	Industrial Engineering	MASc/MEng
	Manufacturing Systems	PhD
	Mechanical Engineering	MASc/MEng/PhD

Sources: Advanced Design and Manufacturing Institute (ADMI), Canadian Council of Professional Engineers (CCPE), Consortium for Graduate Education in Software Engineering (ConGESE), and Ontario Council on Graduate Studies (OCGS).

[1] Joint program between Carleton University and the University of Ottawa (Ottawa-Carleton Institute for Electrical and Computer Engineering (OCIECE))

[2] ConGESE: Consortium for Graduate Education in Software Engineering – Joint program between Carleton University, University of Ottawa, Queen's University, University of Toronto, University of Waterloo, University of Western Ontario, and York University. Note that only schools that offer ConGESE master's degrees through engineering departments are noted in the table.

[3] ADMI: Advanced Design and Manufacturing Institute - Joint program between McMaster University, Queen's University, University of Toronto, University of Waterloo, and University of Western Ontario.

[4] Joint program between Queen's University and Royal Military College of Canada.

[5] Collaborative program between two or more graduate units at the University of Toronto.

It can be observed in Table 1-2 that Automotive Engineering graduate programs are not offered by any universities in Ontario. Unlike most auto-making countries in the world, Canada does not have graduate programs in Automotive Engineering. Several universities in Ontario offer graduate degrees in Mechanical Engineering and other programs related to automotive systems (such as Electrical Engineering), but not specifically Automotive Engineering.

In the United States, many universities offer graduate programs in Automotive Engineering. For example, at Lawrence Technological University in Southfield, Michigan, an MAE degree in Automotive Engineering is offered. The main faculty research areas focus on advanced composite materials, carbon and glass fiber sheets and development of drive shafts using composite materials. Recent figures indicate that there are currently about 245 graduate students enrolled in the MAE program, including part-time students. Students have both core and elective courses in the program. Electrical engineering students take (i) Introduction to Thermal Systems and (ii) Introduction to Mechanical Systems. Mechanical engineering students take (i) Circuits and Electronics and (ii) Electrical Machines and Controls. Additional examples of graduate programs around the world are listed in Appendix A.

Figure 1-2 shows the cities that offer engineering graduate programs in Southern Ontario. Kingston, Toronto, and Ottawa have two universities offering graduate programs. Figure 1-1 shows alls cities in Ontario that offer engineering graduate programs, except Lakehead University in Thunder Bay.

Figure 1-2: Cities Offering Graduate Engineering Programs in Southern Ontario (Large Circles) and the Location of the University of Ontario Institute of Technology in Oshawa
Source: Yahoo! Maps (http://maps.yahoo.com/)

1.2.2 Graduate program demand

Due to recent events in the United States, there has been a shift in international graduate student enrolments from the United States to Canada. Also, a large proportion of new immigrants to Canada have settled in the Greater Toronto Area (GTA) and they wish to upgrade their skills with graduate degrees for employment opportunities in the automotive sector. These two trends will contribute to strong demand for graduate student spaces in Automotive Engineering at UOIT.

Both federal and provincial government policies are also encouraging demand for graduate programs in Automotive Engineering. A report in 2002 by Industry Canada[1] has outlined many goals and targets, including:

> **GOALS - ADDRESSING THE KNOWLEDGE PERFORMANCE CHALLENGE**
> • Vastly increase public and private investments in knowledge infrastructure to improve Canada's R&D performance.
>
> **TARGETS**
> • By 2010, rank among the top five countries in the world in terms of R&D performance.
> • By 2010, at least double the Government of Canada's current investments in R&D.

1 Source: Industry Canada, 2002, *Achieving Excellence: Investing in People, Knowledge and Opportunity*.

GOALS - ADDRESSING THE SKILLS CHALLENGE

• Develop the most skilled and talented labour force in the world.

TARGETS

• Through to 2010, increase the admission of master's and PhD students at Canadian universities by an average of 5 percent per year.

• By 2004, significantly improve Canada's performance in the recruitment of foreign talent, including foreign students, by means of both permanent immigrant and temporary foreign worker programs.

• Over the next five years, increase the number of adults pursuing learning opportunities by 1 million.

GOALS - ADDRESSING THE INNOVATION ENVIRONMENT CHALLENGE

• Governments at all levels work together to stimulate the creation of more clusters of innovation at the community level.

• Federal, provincial/territorial and municipal governments cooperate and supplement their current efforts to unleash the full innovation potential of communities across Canada, guided by community-based assessments of local strengths, weaknesses and opportunities.

TARGETS

• By 2010, develop at least 10 internationally recognized technology clusters.

• By 2010, significantly improve the innovation performance of communities across Canada.

The proposed graduate programs in Automotive Engineering at UOIT would help to meet the above goals and targets.

In 2003, the Council of Ontario Universities (COU) formed a Task Force on Future Requirements for Graduate Education in Ontario. The Task Force determined that the Government of Ontario should establish a 10-year goal of doubling graduate enrolment in Ontario's universities to meet the demand for increased graduates[2]. The programs proposed by UOIT and the location of the university make it an advantageous choice for developing Automotive Engineering graduate school capacity in Ontario.

Figure 1-3 shows the location of graduate engineering programs in the GTA and neighbouring cities. The figure shows that there are no engineering graduate schools in the eastern half of the GTA, or in any neighbouring cities east of the GTA. All of the graduate schools in the region are located in the centre of the GTA or in neighbouring cities west of the GTA. The location of UOIT makes it an excellent choice for increasing engineering graduate school capacity to the eastern half of the GTA and neighbouring cities. In addition to having a strategic location based on the population of the GTA, the location of UOIT is also ideal for taking advantage of many automotive companies in the eastern half of the GTA, including General Motors of Canada, Lear Corporation and others.

2 Source: COU Task Force on Future Requirements for Graduate Education in Ontario, 2003, *Advancing Ontario's Future Through Advanced Degrees.*

Figure 1-3: Universities Offering Graduate Engineering Programs within the Greater Toronto Area (GTA) and Neighbouring Cities and the Location of the University of Ontario Institute of Technology
Source: Yahoo! Maps (http://maps.yahoo.com/)

1.3 Mission

The mission of the Faculty of Engineering and Applied Science is to contribute to society through excellence in education, scholarship, and service. It will provide for our graduate students a rigorous education and endeavour to instil in them the attitudes, values, and vision that will prepare them for a lifetime of continued learning and leadership in their chosen careers. The Faculty engages in scholarship of discovery, application, and integration.

1.4 Program objectives

There are four objectives common to the Automotive Engineering graduate programs:

- Depth. To provide students with a detailed understanding for the practice and advanced study of advanced technologies related to automotive systems. This includes scientific principles, analysis techniques, and design methodologies.

- Breadth. To provide students with the broad and advanced education necessary for productive careers in the public or private sectors, as well as academia.

- Professionalism. To develop skills necessary for clear communication and responsible teamwork, and to inspire professional attitudes and ethics, so that students are prepared for modern work environments and lifelong learning.

- Learning Environment. To provide an environment that will enable students to pursue their goals through innovative graduate programs, which are rigorous, challenging, and supportive.

The main objective of the MASc program is to prepare students for a career as an R&D engineer. Graduates of the program will be able to work as R&D engineers in the automotive sector, other advanced technology companies, government agencies or continue their education and pursue a PhD degree. The objectives of the MASc program are achieved through a combination of course work, supervised research, a research seminar, and a research thesis.

The main objective of the MEng program is to provide the opportunity for engineers in industry to upgrade and expand their skills. Graduates of the program will apply their education to various advanced technologies in the automotive sector and other industries. The objectives of the MEng program are achieved through a combination of course work and a project (MEng-Project), or solely course work (MEng-Course), depending on which option the student selects.

1.5 Method used for self-study and preparation of this brief

This appraisal was prepared by an Automotive Graduate Committee in the Faculty of Engineering and Applied Science, in consultation with practicing engineers in the automotive sector. Many faculty members have contributed material to this brief. The appraisal has received thorough reviews by the Curriculum Committee and the Faculty Council of the Faculty of Engineering and Applied Science and School of Energy Systems and Nuclear Science, as well as by the Dean of Graduate Studies, the Curriculum and Program Review Committee, and the Academic Council of UOIT.

1.6 Fields in the programs

There are no declared fields in this program.

1.7 Review concerns expressed in previous appraisal and actions taken

This is an application for a new program, so this section is not applicable.

1.8 Special matters and innovative features

The University of Ontario Institute of Technology provides each of its students access to a Mobile Learning Environment. Every graduate student at UOIT will have wireless access to library resources, email, and the internet, in addition to other online services.

Students enrolled in the programs will have access to state-of-the-art facilities that are unique to Canada and particularly beneficial to conducting automotive research. These include the Automotive Centre of Excellence (ACE) and the Integrated Manufacturing Centre (IMC). The ACE and IMC will provide an opportunity for graduate students in the program to conduct innovative research in automotive systems.

ACE will be a state-of-the-art automotive R&D facility at UOIT. It will provide graduate students access to world-class automotive testing and research facilities that will be unique to Canada.

The IMC is a fully automated, industrial-grade, flexible manufacturing facility capable of fabricating and assembling automotive products from raw materials, with limited human intervention. The IMC provides a facility to conduct research in advanced manufacturing related to the automotive industry. Additional details regarding ACE and IMC will be provided in Section 3.2.

2 THE FACULTY

2.1 List of faculty by field

Table 2-1 lists the faculty members involved in the graduate program and identifies their research field, gender, home unit, and supervisory privileges. Currently, there are 19 core faculty members involved in the graduate programs. This includes 3 Category-1 core faculty, 10 Category-3 core faculty and 8 Category-6.

Faculty Name and Rank	M/F	Home Unit [2]	Supervisory Privileges	Fields[3]
Category [1]				
Ebrahim Esmailzadeh – Full Professor	M	FEAS	Full	**X**
Yuping He – Assistant Professor	M	FEAS	Full	**X**
Subhash Rakheja - Full Professor (CRC nominee)	M	FEAS	Full	**X**
Greg Rohrauer – Assistant Professor	M	FEAS	Full	**X**
Category [3]				
Peter Berg – Assistant Professor	M	FS	Full	**X**
Ibrahim Dincer – Full Professor	M	FEAS	Full	**X**
Kamiel Gabriel – Full Professor	M	FEAS	Full	**X**
Greg Naterer – Full Professor	M	FEAS	Full	**X**
Scott Nokleby – Assistant Professor	M	FEAS	Full	**X**
Remon Pop-Iliev – Associate Professor	M	FEAS	Full	**X**
Ghaus Rizvi – Assistant Professor	M	FEAS	Full	**X**
Marc Rosen – Full Professor	M	FEAS	Full	**X**
Dan Zhang – Associate Professor	M	FEAS	Full	**X**
Category [6]				
Michael Bennett – Full Professor	M	FBIT/FEAS	Full	**X**
Ali Grami – Associate Professor	M	FBIT/FEAS	Full	**X**
Ramiro Liscano – Associate Professor	M	FEAS	Full	**X**
Lixuan Lu – Assistant Professor	F	FEAS/SESNS	Full	**X**
Richard Marceau – Full Professor	M	FEAS	Full	**X**
Clemens Martin – Assistant Professor	M	FBIT/FEAS	Full	**X**
Jing Ren – Assistant Professor	F	FEAS	Full	**X**

Shahram Shahbazpanahi – Assistant Professor	M	FEAS	Full	**X**
Miguel Vargas Martin – Assistant Professor	M	FBIT/FEAS	Full	**X**

[1] 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] FEAS: Faculty of Engineering and Applied Science
SESNS: School of Energy Systems and Nuclear Engineering
FBIT: Faculty of Business and Information Technology
FS: Faculty of Science

[3] There are no declared fields in the programs.

It should be noted that UOIT is a new university and it began to offer undergraduate programs in Automotive Engineering in the fall 2005 semester. The first undergraduate class will graduate in the spring of 2009. UOIT recognizes that it is imperative for the Faculty of Engineering and Applied Science to increase the number of faculty members in this program rapidly over the next few years, to fully meet CEAB requirements in terms of faculty to student ratios. CEAB is the Canadian Engineering Accreditation Board, which was established by the Candian Council of Professional Engineers (CCPE) in 1965 to accredit undergraduate engineering programs.

Table 2-2 shows the Faculty's plan for new faculty hires up to 2010. Faculty members will be hired at all levels, to ensure a successful balance between full professors, associate professors, and assistant professors across different fields of interests. With graduate programs in Automotive Engineering in place, it is anticipated that more senior faculty can be hired. It is expected that faculty members having expertise in all main areas of Automotive Engineering will be hired over the next 5 years, including vehicle dynamics, powertrains, NVH (noise, vibration and harshness), vehicle aerodynamics, materials and automotive electronics.

Table 2-2: Planned Faculty Hiring in Automotive Engineering (2006 to 2010)

Year	*Number of faculty hires*
2006-2007	3
2007-2008	6
2008-2009	4

2009-2010	4

Also, UOIT plans to support adjunct professorships to well-qualified external academics and professionals with industrial links. They would contribute to the graduate programs, in terms of student supervision and teaching of graduate courses. It is also expected that members of other Faculties at UOIT will participate in the proposed programs as they evolve.

2.2 External operating research funding

Table 2-3 shows the external research funding secured by faculty members since 1998. The funding represents confirmed funding and it will likely increase over time, as faculty members successfully secure additional funding. Since the first professors started at UOIT in 2003, the funding in Table 2-3 for the years 1998 to 2002 represents funding secured by UOIT faculty, while at other institutions.

Table 2-3: Operating Research Funding by Source and Year

	Source			
Year[1]	**Granting Councils [2]**	**Other Peer Adjudicated [3]**	**Contracts**	**Others [4]**
1998	$20,947	$153,584	$24,148	$81,366
1999	$20,947	$111,633	$44,000	$84,041
2000	$53,947	$116,179	$2,360	$2,675
2001	$101,407	$61,375	$33,750	$0
2002	$68,000	$124,360	$33,750	$0
2003	$58,000	$150,505	$61,250	$128,210
2004	$145,870	$57,975	$105,050	$283,210
2005	$112,870	$0	$105,050	$150,000
2006[5]	$572,994	$218,191	$0	$120,000
Totals	$1,154,982	$993,802	$409,358	$849,502

[1] *Calendar year.*
[2] *NSERC.*
[3] *Canadian International Development Agency; Canadian Space Agency; Environment Canada; Natural Resources Canada; MITACS, PREA, Ontario Ministry of Community and Social Services, Business and Technology Integration Branch; Alberta Innovation Fund; International Federation for the Promotion of Mechanism and Machine Science (IFToMM), King Fahd University of Petroleum and Minerals (KFUPM); Auto 21; CDEN; MMO; Sharif University of Technology; Government of Brunei; Government of Iran.*
[4] *University start-up grants and other miscellaneous research funding.*
[5] *Confirmed to date. Note that all new faculty member have applied for NSERC Discovery Grants. In addition, faculty members have applied for NSERC Research Tools and Instruments Grants, CFI New Innovations Fund and ORF (Research Excellence) Grants.*

Faculty members are actively applying for funding from the Natural Sciences and Engineering Research Council (NSERC) of Canada, the Canadian Foundation for

Innovation (CFI), AUTO21, Materials and Manufacturing Ontario (MMO), ORF (Ontario Research Fund; Research Excellence Program) and others. In addition, faculty members are active in securing research funding through industry contracts. As the number of faculty increases rapidly over the next few years, it is fully expected that the funding levels in Table 2-3 will increase substantially.

2.3 Graduate supervision

Table 2-4 shows the completed and current numbers of thesis supervisions by faculty member. The table shows that there is a good balance of senior professors, who have successfully graduated students, and new professors, who have not yet graduated students. Faculty members are also active in co-supervising students with professors at other institutions within Ontario and Canada. Several faculty members have adjunct appointments at other universities. Table 2-5 outlines these adjunct appointments.

Table 2-4: Completed and Current Numbers of Thesis Supervisions by Faculty Member

	Completed			Current		
Member	**Master's**	**PhD**	**PDF**	**Master's**	**PhD**	**PDF**
Category 1						
Ebrahim Esmailzadeh	31	8	7	4	4	3
Yuping He	0	0	0	1	0	0
Subhash Rakheja	35	15	9	5	10	2
Greg Rohrauer	0	0	0	4	0	0
Category 3						
Peter Berg	0	0	0	0	1	1
Ibrahim Dincer	9	7	12	4	7	4
Ebrahim Esmailzadeh	31	8	7	4	4	3
Kamiel Gabriel	16	1	7	3	1	1
Greg Naterer	5	6	2	1	3	0
Scott Nokleby	0	0	0	2	0	0
Remon Pop-Iliev	4	0	0	0	1	0
Ghaus Rizvi	3	0	0	0	2	1
Marc Rosen	10	1	2	4	0	2
Dan Zhang	2	0	0	0	0	0
Category 6						
Michael Bennett	27	2	0	0	0	0
Ali Grami	0	0	0	0	0	0

Ramiro Liscano	8	0	0	6	1	0
Lixuan Lu	0	0	0	0	0	0
Richard Marceau	13	4	0	0	0	0
Clemens Martin	11	0	0	1	0	0
Jing Ren	0	0	0	0	0	0
Shahram Shahbazpanahi	2	2	0	0	0	0
Miguel Vargas Martin	0	0	0	1	0	0

Table 2-5: Adjunct Appointments

Member	University – Department
Category 1	
Ebrahim Esmailzadeh	Concordia University – Department of Mechanical and Industrial Engineering Sharif University of Technology, Iran – Department of Mechanical Engineering University of Toronto – Department of Mechanical and Industrial Engineering
Yuping He	
Subhash Rakheja	
Greg Rohrauer	
Category 3	
Peter Berg	University of Waterloo – Department of Mechanical Engineering
Ibrahim Dincer	Carleton University – Department of Mechanical Engineering University of Toronto – Department of Mechanical and Industrial Engineering University of Waterloo – Department of Mechanical Engineering
Kamiel Gabriel	
Greg Naterer	University of Toronto – Department of Mechanical and Industrial Engineering University of Manitoba – Dept. of Mechanical and Manufacturing Engineering
Scott Nokleby	University of Victoria – Department of Mechanical Engineering
Remon Pop-Iliev	
Ghaus Rizvi	
Marc Rosen	Ryerson University – Department of Mechanical and Industrial Engineering University of Western Ontario – Department of Mechanical Engineering
Dan Zhang	University of Saskatchewan – Department of Mechanical Engineering
Category 6	
Michael Bennett	University of Western Ontario
Ali Grami	
Ramiro Liscano	University of Ottawa – School of Information Technology and Engineering Dalhousie University – Faculty of Computer Science

Lixuan Lu	
Richard Marceau	
Clemens Martin	
Jing Ren	
Shahram Shahbazpanahi	McMaster Unviersity
Miguel Vargas Martin	Universidad Autonoma de Aguascalientes, Mexico – Department of Electronic Systems

2.4 Current teaching assignments

Table 2-6 shows the planned teaching loads for the 2006/2007, academic year, while Table 2-7 shows the teaching assignments for the previous 2005/2006 academic year. Note that UOIT had its first undergraduate students in the 2003/2004 academic year. After graduate programs begin in the Faculty of Engineering and Applied Science, a normal teaching load will consist of three to four semester-length courses per year.

Table 2-6: Teaching Assignments for 2006/2007 at UOIT

Faculty Member	Rank	Undergraduate[1]	Graduate	Comments
Category 1				
Ebrahim Esmailzadeh	Professor	ENGR 3350U (3/1/1) ENGR 3210U (3/2/1)	ENGR 5240G	
Yuping He	Assistant Professor	ENGR 3270U (3/1/1) ENGR 2860U (3/2/1)		
Subhash Rakheja	Professor			Tier 1 Canada Research Chair (nominee, pending)
Greg Rohrauer	Assistant Professor	ENGR 2310U (3/2/0) (2 sections) ENGR 3220U (3/2/1)		
Category 3				
Peter Berg	Assistant Professor	PHY1010U (3/3/2) PHY2030U (3/3/2)		
Ibrahim Dincer	Professor	ENGR 2320U (3/1/1)	ENGR 5100G	Programs Director, Faculty of Engineering and Applied Science
Kamiel Gabriel	Professor			Associate Provost, Research, UOIT
Greg Naterer	Professor	ENGR 3930U (3/2/1)	ENGR 5140G	Director of Research, Graduate Studies and Development, FEAS
Scott Nokleby	Assistant Professor	ENGR 4280U (3/2/1) ENGR 3390U (3/1/1) (2 sections)	ENGR 5260G	
Remon Pop-Iliev	Associate Professor	ENGR 3200U (3/1.5/1.5) ENGR 3030U (4/2/0) ENGR 3395U (3/0/2)	ENGR 5011G	NSERC-GM Chair in Innovative Design Engineering, UOIT

Ghaus Rizvi	Assistant Professor	ENGR 2220U (3/0/0) (2 sections) ENGR 4045U (3/0/1)		
Marc Rosen	Professor			Dean, Faculty of Engineering and Applied Science
Dan Zhang	Associate Professor	ENGR 2420U (3/1/1) (2 sections)		
Category 6				
Michael Bennett	Professor			
Ali Grami	Associate Professor	ENGR 1400 (3/0/0)		
Ramiro Liscano	Associate Professor	ENGR 2710 (3/3/2) ENGR 1200 (3/3/2) ENGR 2720U (3/0/2)		
Lixuan Lu	Assistant Professor	ENGR 4015U (3/0/1) ENGR 2450U (3/3/2)		
Richard Marceau	Professor			Provost, UOIT
Clemens Martin	Assistant Professor	ENGR 1200 (3/0/2)	MITS 5200G MITS 5300G	
Jing Ren	Assistant Professor			hired in 2006
Shahram Shahbazpanahi	Assistant Professor	ENGR 2200U (3/3/2) ENGR 2790U (3/2/0) (2 sections)		
Miguel Vargas Martin	Assistant Professor	BUSI 1830 (3/0/3) INFR 1010 (3/0/3) INFR 2820 (3/3/3) ENGR 1200 (3/0/2)	MITS 5500G	

[1] *The numbers in the brackets after the course number refer to weekly Lecture/Laboratory/Tutorial hours, respectively.*

Table 2-7: Teaching Assignments for 2005/2006 at UOIT

Faculty Member	Rank	Undergraduate[1]	Graduate	Comments
Category 1				
Ebrahim Esmailzadeh	Professor	ENGR 2020 (4/0/2) ENGR 2420 (3/1/1)		
Yuping He	Assistant Professor			hired in 2006
Subhash Rakheja	Professor			Tier 1Canada Research Chair (nominee, pending)
Greg Rohrauer	Assistant Professor			Academic Leader, Automotive Centre of Excellence
Category 3				

Peter Berg	Assistant Professor	PHY1010U (3/3/2) PHY2030U (3/3/2)		Faculty of Science
Ibrahim Dincer	Professor	ENGR 2320U (3/1/1) ENGR 2860U (3/1/1) (2 Sections)		Programs Director, Faculty of Engineering and Applied Science
Kamiel Gabriel	Professor			Associate Provost, Research, UOIT
Greg Naterer	Professor	ENGR 2640U (3/1/1)		Director of Research, Graduate Studies and Development, FEAS
Scott Nokleby	Assistant Professor	ENGR 3200U (3/1.5/1.5) ENGR 3270U (3/1/1) ENGR 3390U (3/1/1)		
Remon Pop-Iliev	Associate Professor	ENGR 2310U (3/2/0) ENGR 3030U (4/2/0) ENGR 3300U (3/0/1)		NSERC-GM Chair in Innovative Design Engineering, UOIT
Ghaus Rizvi	Assistant Professor	ENGR 2220U (3/0/0) ENGR 2420U (3/1/1) ENGR 3190U (3/1.5/0)		
Marc Rosen	Professor			Dean, Faculty of Engineering and Applied Science
Dan Zhang	Associate Professor	ENGR 2220U (3/0/0) ENGR 2420U (3/1/1) ENGR 3350U (3/1/1)		
Category 6				
Michael Bennett	Professor	SE312 (3/2) SE313 (3/2)		University of Western Ontario
Ali Grami	Associate Professor	BUSI 1500 (3/0/0) BUSI 1900 (3/0/1) ENGR 1400 (3/0/0)	MITS 5200G (co-teaching)	
Ramiro Liscano	Associate Professor	ENGR 1200 (3/3/2)		hired in 2006
Lixuan Lu	Assistant Professor	ENGR 3200U (3/1.5/1.5) ENGR 3460U (3/1.5/1.5)		
Richard Marceau	Professor			Provost, UOIT
Clemens Martin	Assistant Professor	ENGR 1200 (3/0/2)	MITS 5200G (co-teaching) MITS 5300G	
S. Shahbazpanahi	Assistant Professor			hired in 2005
M. Vargas Martin	Assistant Professor	BUSI 1830 (3/0/3) INFR 1010 (3/0/3)	MITS 5500G (3/0/0)	

[1] *The numbers in the brackets after the course number refer to weekly Lecture/Laboratory/Tutorial hours, respectively.*

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

Professors Martin, Grami and Vargias Martin hold a cross appointment between the Faculty of Engineering and Applied Science and the Faculty of Business and Information Technology. He teaches graduate courses in both faculties. This includes courses in the

MASc and MEng programs in Electrical and Computer Engineering (Faculty of Engineering and Applied Science), as well as graduate courses in the Faculty of Business and Information Technology's Master of Information Technology program. As a cross appointed faculty member, he will divide his time accordingly between the two faculties. Professor Lu is cross appointed between the School of Energy Systems and Nuclear Science, and the Faculty of Engineering and Applied Science.

Professor Berg in the Faculty of Science is involved in graduate programs within the Faculty of Science, in addition to his involvement in the proposed graduate program in the Faculty of Engineering and Applied Science. As UOIT expands, it is expected that additional faculty members from the Faculty of Science with automotive related expertise will have involvement in the proposed graduate programs.

3 PHYSICAL AND FINANCIAL RESOURCES

3.1 Library resources

The goal of the University of Ontario Institute of Technology library is to enrich the teaching, research and learning environment of the University by providing exceptional library and information services and facilities to support all academic programs.

A new, state-of-the-art library for the University of Ontario Institute of Technology was recently completed in the fall of 2004. Designed by internationally renowned Diamond and Schmitt Architects Inc., the 73,000-square-foot library serves students, faculty, and staff. The four-storey, $20.7-million library houses individual and collaborative learning spaces, research workstations, electronic classrooms, a round pavilion with a reading room and periodicals collection, and other facilities. It offers a variety of learning spaces to suit individual learning styles and user needs. Its design also allows for future enlargement, up to double the original size.

The University's Mobile Learning environment provides students with access to library resources using their wireless laptop anytime, from anywhere. Students can work individually or collaboratively anywhere in the building. Digital resources and complementary print collections are provided for students in both a physical and virtual environment. Librarians are available to provide students with the skills to navigate effectively through the information environment.

In addition to interlibrary loans, students will also have access to the resources available at the largest academic library in Canada, the University of Toronto Libraries, through a partnership program. To keep faculty and students informed of the library's continued growth and to provide easy access to resources, the UOIT Library staff have been developing and updating its website (www.uoit.ca/library) on an ongoing basis.

3.2 Automotive Centre of Excellence (ACE)

In 2005, General Motors of Canada (GMCL) announced a $2.5 billion investment in GM's Canadian operations. This represents the largest and most comprehensive automotive investment in Canadian history. Together with the Ontario and Federal Governments, this "Beacon Project" aims to strengthen automotive engineering, R&D and manufacturing capabilities in Canada. GM Canada will make major investments in new vehicle and advanced engine technologies at its operations in Oshawa, St. Catharines and Ingersoll,

Ontario. It will also proceed with major investments in flexible manufacturing systems at its Oshawa Car Assembly Plant. These investments will enable the Oshawa plant to adapt quickly to customer and vehicle market changes. They will enable production of a multitude of vehicle models and platforms on the same assembly line.

As part of the Beacon Project, an Automotive Centre of Excellence (ACE) will be created at UOIT. Launched with support from GMCL and the Province of Ontario, ACE will link participating automotive companies, suppliers, automotive engineers, universities, colleges, researchers and students in a new building equipped with state-of-the-art automotive design, engineering and research facilities. ACE will anchor a new Canadian Automotive Innovation Network, which will be comprised of selected universities in Ontario, Quebec and British Columbia, led by GM's Canadian Engineering Centre in Oshawa. GM Canada will invest in the Innovation Network to enhance the competitiveness of the Canadian automotive industry through leading edge R&D. This will include investments in new research projects, Design and Research Chairs at Canadian universities and in-kind donations of computer-based design tools by GM and partners.

The Centre will be owned and operated by UOIT. It will provide approximately 90,000 (gross) ft^2, which translates to approximately 45,000 (net) ft^2. It will be located in a new building at UOIT. ACE will comprise two main functional divisions: (i) Core Research Facility (CRF) containing a state-of-the-art climatic wind tunnel and (ii) other equipment designed to respond to automotive manufacturing issues, as well as enable research and involvement of graduate students in industry-based projects. The Integrated Research and Training Facilities (IRTF) will provide educational, lab, research, and project space for use by UOIT faculty, students and colleagues from other institutions. Also, it will serve collaborations with the automotive industry and suppliers, including graduate student research projects. The Centre will be connected to UOIT engineering labs, and it will share university services in the performance of its mandate.

The Automotive Centre of Excellence will prepare the Automotive Engineering graduate students to take the automotive industry to a new level of competitiveness and future success. It will stimulate the development of new advanced technologies focused on future-based applications for the automotive industry in Canada. The $58 million grant provided by the Government of Ontario as part of its Ontario Automotive Investment Strategy program supports the ACE project costs for CRF and IRTF. ACE will be provide the following exceptional opportunities for Automotive Engineering graduate students at UOIT:

- a multi-faceted centre with world-class experimental facilities to conduct automotive related research;
- a way to share learning, best practices, pedagogical tools, and curriculum development with the goals of enhancing graduate studies and research opportunities in Automotive Engineering;
- an exposure for students to the commercial applications of research;
- an opportunity for graduate students to work and learn alongside top professionals in the automotive industry;
- a stimulating environment for research collaboration among university and industry-based researchers, ranging from the exploration of 'what if' research ideas and their implications, to the pursuit of new product design, development, and commercialization;
- a path to developing the leaders who will shape Canada's automotive industry future.

The Core Research Facility will comprise a net 15,000 ft^2 specifically for Beacon Project infrastructure, including the following facilities:

- Climatic Wind Tunnel (CWT)
- CWT Control Room, Data Room and Soak Area
- Environmental Chamber and Four-Post Shaker
- Chassis Dynamometer
- Four Post Test Cell HVAC Plant
- NVH Noise and Vibration Test Cell
- General Hoist Bay Work Areas
- Drive Aisle
- Engine Test Cells
- Vehicle Concept Lab and Bay Areas
- Optical Microscopy and Electron Microscopy
- Polishing and Etching Lab
- Ancillary facilities, support shop and office areas
- Areas for on-site physical modifications to vehicles and systems
- Computer and software tools
- Miscellaneous test and IT equipment
- Facility arrangements to ensure security between the various industrial users

The Integrated Research and Training Facilities (IRTF) will comprise an additional 30,000 ft^2 net space, which will span three floors for research, education and training space within ACE. Space will be allocated in accordance with the following three levels of activity.

1) A dedicated UOIT space will function as university (rather than rental) space, including offices for faculty members, graduate students and other researchers.
2) Collaborative research laboratory space will be made available for automotive research projects, including graduate student projects, contract research and space leased to industry for access to ACE research equipment and facilities.
3) For industry-sponsored research space, automotive partners and suppliers will have access to additional ACE space on a contractual basis to conduct research projects relevant to their needs. Faculty members and graduate students may also contribute to this industry work.

Thus, IRTF provide educational, research, and project space for use by UOIT faculty and graduate students, as well as colleagues from other institutions, the automotive industry and suppliers. It will be results-focused and designed to support UOIT automotive research and education, as well as attracting revenue-generating research projects on a continuous basis. ACE will work closely with automotive partners to help close the innovation gap faced by the automotive industry in developing advanced technologies, through leading-edge research and training of a new generation of automotive engineering graduate students.

Through ACE, GMCL will be able to expand research and development activities, through unique facilities not currently available in Canada or elsewhere. These R&D efforts will have direct applications to current automotive industry needs. ACE will bring GMCL advanced product engineers to UOIT. It will also foster project opportunities for faculty members and graduate students to have access to the GMCL Canadian Engineering Centre virtual simulation and physical test facilities. ACE will provide extraordinary opportunities for cross-fertilization of research innovations, by bringing together personnel from industry and universities to study industry's most pressing needs. As these partnerships grow over time,

suppliers will be attracted to the learning, knowledge and advanced developments conducted at ACE. They will be encouraged to further invest and participate in the growing source of intellectual capital and graduate student talent for their own local engineering and commercialization efforts. This new collaborative spirit of ACE will contribute to a new generation of Automotive Engineering graduate students, which will be uniquely prepared to contribute to future success of Canada's automotive industry.

3.3 Other laboratory facilities

In addition to ACE, students in the Automotive Engineering MASc and MEng programs will have access to the following other equipment and common facilities.

- Integrated Manufacturing Centre (IMC; 925 m^2 – Shared)
- Active Vibration Control Laboratory – UA1540 (65 m^2 – Shared)
- Advanced Materials Engineering Laboratory – UA1440 (70 m^2 – Shared)
- Advanced Energy Systems Research (AESR) Laboratory – UA1620 (55 m^2)
- Centre for Engineering Design, Automation, and Robotics (CEDAR) – UA1460 (65 m^2 – Shared)
- Thermal Engineering and Microfluidics Laboratory – UA1520 (60 m^2)
- Intelligent Robotics and Manufacturing Laboratory – UA1460 (65 m^2 – Shared)
- Laboratory for Applied Research on Design and Engineering of Composite Materials – UA1440 (70 m^2 – Shared)
- Mechatronic and Robotic Systems Laboratory – UA1460 (65 m^2 – Shared)
- Nuclear Engineering Laboratory – UA4150 (78 m^2)
- Radiation Engineering Laboratory – UAB408 (45 m^2)
- SHARCNET – UA4280 (70 m^2)
- Two-Phase Flow Laboratory – UA1420 (78 m^2)

Integrated Manufacturing Centre (IMC): The IMC is a 925 m^2, fully automated, industrial-grade, flexible manufacturing facility capable of fabricating and assembling a wide range of products from raw materials, with limited human intervention. The IMC provides a facility to conduct research in advanced manufacturing for automotive applications. The main components of the IMC are divided into two main areas: (i) manufacturing zone and (ii) assembly zone.

Manufacturing Zone:

- Inverted, Rail-Mounted, 6-Axis Robot
- Parts Washer
- CNC Electrical Discharge Machine (EDM)
- CNC Milling Machine
- CNC Lathe
- Injection Moulding Machine
- CNC Coordinate Measuring Machine (CMM)
- 3-D Printer

Assembly Zone:

- Automatic Storage and Retrieval System (ASRS)
- Conveyor System
- Eight 6-Axis Robots (Two with Welding Capabilities)

Active Vibration Control Laboratory: This lab is primary used for research into the areas of adaptive, active and passive vibration control, and dynamic modeling and vibrations of nonlinear machines and flexible structures. The experimental work is aimed to verify the vibration suppression of time-varying and parametrically excited dynamic structures through adapting a two-tier alternative: a) system identification to determine the deviations in the structural parameters, and b) a semi-active optimal re-tuning of the absorber elements. In order to show the vibration suppression improvement, the system is initially excited by a simple harmonic excitation. After changing the frequency of excitation, the effectiveness of the re-tuning procedure is obtained. Additional research will study performance of servo-valve controlled pneumatic isolators. Feedback and feed-forward signals using displacement and velocity transducers (LVDT) will be fed to the control systems to excite the spool valve and adjust the air trapped in a pneumatic system. The aim is to have zero level motion for a spring mass subjected to a harmonically excited base support. These studies will have relevance to vibration suppression in automotive related projects.

Advanced Energy Systems Research (AESR) Laboratory: Advanced energy systems, including fuel cells, have importance in automotive related research. The lab will conduct research with analysis, design, modeling, performance improvement, and economic and environmental considerations of advanced energy systems. The main objective is to develop more efficient, cost-effective, environmentally benign and more sustainable systems of energy supply. Some current research projects are listed below.

- Energy and exergy analysis of PEM and SO fuel cells
- Transport phenomena in PEM and SO fuel cells
- Life cycle assessment of fuel cell vehicles
- Hybrid energy systems for hydrogen production
- Energy and exergy analysis of energy storage systems
- Hybrid energy systems for snow melting and freeze protection of highways and bridges
- Performance assessment of integrated energy systems

Advanced Materials Engineering Laboratory: The Advanced Materials Engineering Laboratory conducts leading research on plastic composites, polymer bonding and other topics. Studies are conducted to improve mechanical properties of plastic parts produced by rapid prototyping systems, with the ultimate goal of manufacturing functional parts instead of just 3-D models. The parts are produced by fusing particles or filaments of plastics, at elevated temperatures, which are formed layer by layer to build a 3-D part. The research investigates bond formation due to sintering and diffusion phenomena in polymers. It also develops predictive models for new materials and compositions to be evaluated expeditiously with minimum experimentation.

The Laboratory also conducts research on wood plastic composites. Wood is one of the most versatile of natural materials with many desirable properties. Therefore, its widespread usage as a building material is placing strain on the world's forest resources. The research involves development and production of Wood Plastic Composites (WPC) with improved properties, with goals of enabling these composites to replace wood in many applications, thereby helping to reduce deforestation rates. Current WPC materials have certain inferior properties, which are not suitable for many wood replacement applications. Current research focuses on improving the properties of WPC by using stronger reinforcing fibres, in conjunction with a fine cellular structure. In this way, the new composite not only looks and

feels like real wood, but it will have mechanical properties similar to it too. The WPC will be produced with an extrusion processing system capable of using both chemical and physical blowing agents. Other research interests in the Lboratory are development of production processes and characterization of new composites, nano-materials, bio-based materials, and foamed materials. These advanced materials are envisioned to have promising potential for various automotive applications.

Centre for Engineering Design, Automation, and Robotics (CEDAR): This Centre consists of a reconfigurable manipulator system, mobile-manipulator system, and a machine vision system. The facilities are used to conduct research into robotics, mechatronics, and manufacturing. The CEDAR facilities will also be used in conjunction with the IMC to increase the IMC's ability to conduct research into flexible manufacturing, including applications to automotive manufacturing. CEDAR currently has one affiliated laboratory: the Mechatronic and Robotic Systems Laboratory.

Thermal Engineering and Microfluidics Laboratory: This laboratory studies heat transfer related to automotive and other industrial applications. This includes heat transfer in manufacturing and materials solidification problems, such as extrusion, welding, casting and injection molding. Experimental studies of convective heat transfer with phase change are performed in a closed test cell. Thermocouples and interferometric/pulsed laser measurements provide new temperature and velocity data involving convective irreversibilities within the fluid. Also, predictive design tools are developed with CFD (Computational Fluid Dynamics). The research infrastructure includes test cells for forced and free convection, computer workstations, microchannel experiments, fluid and heat transfer instrumentation (including laser based measurements) and temperature control systems.

Additional research includes micro-scale heat transfer, with applications to automotive waste heat recovery to generate electricity using micro-devices and MEMS (microelectrmechanical systems). Advanced miniaturization involving microfluidic systems has considerable potential in the development of ultra small power sources (micro heat engines), sensors, waste heat recovery, fluid control and advanced insulation materials. For example, micro heat engines could enhance battery performance by recovering lost heat in automotive systems. Also, micro-devices have promising potential for drag reduction in vehicle aerodynamics. This laboratory investigates embedded microchannels, micro-engines or micro-tabs within a surface to delay boundary layer separation or reduce wall friction. It is known that micro-scale heat and fluid flow become appreciably different from large-scale systems, due to surface, electromagnetic and thermocapillary effects. Experimental and theoretical studies of these effects are conducted. In the micro heat engine experiments, a suspended droplet within a microchannel is developed with a thermal bridge to provide a cyclic heat source to the microchannel. The experiment includes sensors responsive to a pressure change within the microchannel to induce a voltage drop.

Intelligent Robotics and Manufacturing Laboratory: The Intelligent Robotics and Manufacturing Laboratory within the Centre for Engineering Design, Automation, and Robotics (CEDAR) at UOIT has two core research directions: (i) Reconfigurable Manufacturing and (ii) Distributed Control. The two core research areas of the lab focus on developing complementary new technologies for flexible manufacturing systems, including applications to automotive manufacturing. The objectives of the Distributed Control research are to develop new Internet/Web based distributed intelligent systems to monitor, manage and control production systems. The newly developed systems will allow manufacturers to

re-organize production and process plans dynamically within a shop floor or within a group of shop floors. The objectives of the Reconfigurable Manufacturing research are to develop new production systems that can be reconfigured to optimize utilization of resources. Three themes within the Reconfigurable Manufacturing research are the design of new modular reconfigurable machine systems (Reconfigurable Parallel Kinematic Machines), virtual reconfigurable manufacturing systems and modular reconfigurable control. The Laboratory will conduct studies relevant to manufacturing processes and robotics relevant to automotive systems.

Laboratory for Applied Research on Design and Engineering of Composite Materials: Cellular and reinforced polymeric and metallic composite materials offer a balance of properties unavailable from other material types. These materials have importance in automotive applications, as they can satisfy the following conflicting requirements of materials: (i) minimum material usage, due to high material costs and weight constraints, and (ii) the need for safe and predictable performance within severe service environments. This research laboratory, led by Dr. Remon Pop-Iliev, focuses on addressing these conflicting requirements. It studies the design and development of novel composite materials capable of satisfying demanding combined mechanical, chemical, thermal and environmental factors. Also, it develops innovative processing strategies for their fabrication. This includes research on material selection development, materials qualification and evaluation, materials processing, product design and manufacturing. It also involves product evaluation, life prediction failure analysis, and disposal recycle reuse analysis.

Mechatronic and Robotic Systems Laboratory: The Mechatronic and Robotic Systems Laboratory conducts research into advanced robotic and mechatronic systems, which have relevance and applications to automotive systems. The laboratory is led by Dr. Scott Nokleby and it is affiliated with UOIT's Centre for Engineering, Design, Automation, and Robotics (CEDAR). The lab conducts research into the kinematics and control of complex systems, such as joint-redundant manipulators, mobile-manipulator systems, and redundantly-actuated parallel manipulators. Redundant manipulators and mobile-manipulator systems offer numerous advantages over traditional non-redundant systems. Effective utilization of the redundancy inherent in systems is instrumented in the systems for practical feasibility in real-world applications. Research is conducted in conjunction with facilities of CEDAR.

SHARCNET: See Section 3.4.

Two Phase Flow Laboratory: Two-phase flows occur in automotive air conditioning systems. The Two Phase Flow Laboratory at UOIT contains a two-phase experimental facility, which is used to study the behaviour of two-phase flows under different orientations and flow conditions. It is a fully automated, closed loop system with vertical upward and vertical downward observation sections, heated test sections, and a 180 degree bend. The facility permits studies of heat transfer, film thickness, void fraction, pressure drop, and phase distribution properties of two-phase flows. An HSV-1000 high speed video camera capable of recording at 500 or 1000 frames per second in colour or black & white is used to record flow regimes and their transitions. Additional equipment planned for the laboratory includes: circumferentially and volumetrically heated channels; concentric heated piping; condensers and heat exchangers; manifolds; low-flow meters; pressure and differential transducers; void-fraction meters; thermocouples; and other instruments. The equipment will be used to conduct research on natural circulation phenomena under single-phase and two-phase flow conditions in pipes and interconnected piping, manifolds, and heat

exchangers. These studies will have significance to improved performance of automotive air conditioning systems.

Additional Facilities: Construction of a 3,835 m^2 Engineering Laboratory Building on the UOIT campus will be completed in the Fall of 2006. Upon completion, graduate students will have access to the following shared laboratories:

- Combustion/HVAC Laboratory
- Component Design Laboratory
- Computer Aided Design (CAD) Laboratory
- Control Systems Laboratory
- Electronics Laboratory
- Emerging Energy Laboratory
- Fluid Mechanics/Heat Transfer Laboratories
- Manufacturing Laboratory with CNC and Plastics Processing Equipment
- Mechatronics Laboratory
- Microprocessors/Digital Systems Laboratory
- Solid Mechanics Laboratory

Future Research Laboratories and Facilities: As the Faculty of Engineering and Applied Science and the School of Energy Systems and Nuclear Science expand, additional research labs will be added. Future labs and facilities relevant to the Automotive Engineering graduate programs are shown in the following list.

- Controls Laboratory
- Materials Laboratory
- Micro-Electrical-Mechanical Systems (MEMS) and Nano-Engineering Laboratory
- Thermodynamics Laboratory

The Faculty of Engineering and Applied Science plans to also launch graduate programs (MASc and MEng) in Electrical and Computer Engineering. These programs will compliment Automotive Engineering graduate programs, including the following additional future research labs and facilities.

- Digital Signal Processing (DSP) Laboratory
- Digital Systems Laboratory
- Electronics Laboratory
- Power Systems Laboratory
- Software Laboratory
- Wireless Communications Laboratory

3.4 Computer facilities

Individual supervisors will provide computer facilities, including appropriate computer systems and software packages, for their MASc and MEng-Project students. These facilties will enable them to carry out their research, for their computational, modeling and simulation needs, as well as to enable them access to the internet, email and library resources (such as online journals and conference proceedings). Also, graduate students will have the option to subscribe to UOIT's laptop program. UOIT's laptop program provides students with a current model IBM laptop that is equipped with a suite of program specific software. UOIT

has additional shared computer facilities of several hundred PCs available to all students in the Learning Commons and library.

UOIT is a member of the Shared Hierarchical Academic Research Computing Network (SHARCNET). SHARCNET[3] is a High Performance Computing (HPC) institute involving 11 academic institutions in southern Ontario. The purpose of SHARCNET is to provide computational facilities for leading-edge research in high performance computing. Automotive Engineering graduate students will have access to this facility for their research.

Also, UOIT has joined the program of Partners for the Advancement of Collaborative Engineering Education4 (PACE). PACE is a program between General Motors of Canada, Sun Microsystems, and UGS, which provides state-of-the-art hardware and software for universities with engineering programs. The value of the PACE contribution to UOIT will be $35 million. Both MASc and MEng graduate students will have full access to the PACE hardware and software for their automotive related studies.

3.5 Space

The Faculty of Engineering and Applied Science and the School of Energy Systems and Nuclear Science are located in UOIT's Engineering and Science Building. This is a new building that features office space for faculty and graduate students, in addition to research lab space. The current total research space allocated to Engineering is 1,496 m^2. An additional 273 m^2 has been allocated for faculty and graduate student offices.

Faculty members have private offices with telephone lines. Graduate students will have access to shared office facilities and/or research labs. All offices and research spaces are wired for access to UOIT's network.

Office space totalling 62 m^2 is currently allocated exclusively to graduate students. The amount of space allocated to graduate students will increase as additional graduate programs come online. Graduate students will also have office space within the research laboratory of their respective supervisors. Faculty office space averages 13 m^2 and faculty research space averages ~25 m^2.

3.6 Financial support of graduate students

Every MASc student offered admission to a graduate program in the Faculty of Engineering and Applied Science and its affiliate School of Energy Systems and Nuclear Science at the University of Ontario Institute of Technology should be able to complete their program regardless of their financial status.

It is expected that the average support for MASc students will be approximately $16,000 per year with funding coming from a variety of sources, including the following sources.

- UOIT Scholarships/Bursaries[5] – ten Engineering Research Excellence Awards of $7,500 per year and five Engineering Research Awards of $5,000 per year will be

3 Source: SHARCNET web site: http://www.sharcnet.ca/

4 Source: PACE web site: http://www.pacepartners.org/

5 The amounts listed are based on a financial analysis of the proposed programs. Exact amounts of the proposed awards may change, depending on University policies and market demands.

available. These two sets of awards will be merit based. Another $41,000 in funding per year will be distributed on a needs basis in the form of bursaries. The amounts for both scholarships and bursaries will be distributed over a two-year period to eligible students.

- External Awards – These include NSERC postgraduate awards and provincial awards.

- Teaching Assistantships – MASc students will be eligible to earn up to approximately $8,000 per year through teaching assistantships.

- Research Assistantships – Additional support from individual supervisors will be available to students.

- Work-Study and Other Forms of Employment-Based Learning will be available.

- Provincial Loan Programs are also available.

It is expected that most funding for MASc students will come from Research Assistantships and Teaching Assistantships. Normally, funding will not be provided to part-time students.

MEng students will have access to financial support through provincial loan programs, teaching assistantships, and work-study placements. Normally, additional funding will not be provided to MEng students.

The University and its student support services shall make financial counselling available to students. Also, the Office of Graduate Programs, with the assistance of Student Services, will issue an annual report on Student Financial Support to include the following items:
- levels of student financial need;
- student financial assistance provided, broken down by category and source (external/Faculty) of assistance; and
- the debt levels carried by students upon graduation.

This report shall be submitted for information to the Academic Council of UOIT.

4 PROGRAM REGULATIONS AND COURSES

4.1 Intellectual development and educational experience of the student

Graduates of the Automotive Engineering graduate programs shall be able to:

- Demonstrate knowledge and understanding of essential facts, concepts, principles, and theories relating to their graduate programs.
- Recognize and be guided by the social, professional, and ethical issues pertaining to advanced education and research.
- Learn to effectively use advanced tools for research.
- Apply the principles of effective data management, information organization, and information-retrieval skills to data of various types.
- Be prepared to pursue specific and well-concentrated research topics in depth.
- Critically evaluate advanced information and knowledge and their implementation.
- Identify problems and opportunities for system analysis, design, improvement, and

optimization of automotive systems.

- Understand, explain, and solve problems using quantitative and qualitative methods.
- Have a solid understanding of contemporary issues, as well as professional and ethical responsibility.
- Have an appreciation of the need and ability to further their education through lifelong learning.
- Know how to design and conduct experiments, analyze and interpret experimental data and results from computational simulations.
- Demonstrate effective oral and written communication skills.
- Have a demonstrated competence in their graduate program areas.

4.2 Program regulations

4.2.1 Part-time studies

To facilitate access to all potential students, part-time studies will be permitted. This is especially true to allow engineers in industry to have access to the MEng program. The MASc program has a minimum residence requirement, where the student must be enrolled full-time and he/she must attend the University of Ontario Institute of Technology. For the MASc program, students must spend a minimum of one year of full-time study in residence at UOIT.

4.2.2 Admission

The minimum admission requirements for the Automotive Engineering MASc and MEng programs is completion of an undergraduate engineering degree from an accredited engineering program at a Canadian university, or its equivalent, with a minimum of a B (75%) average in the last two years, although a B+ is preferred for MASc applicants. Students having undergraduate degrees in mechanical engineering, electrical engineering, or other fields of engineering or science are expected to apply to the Automotive Engineering graduate programs. The multi-disciplinary nature of automotive systems, ranging from manufacturing and powertrains to electrical power / control systems and others, are believed to support high demand and strong enrolment in the new graduate programs.

Applicants must possess maturity and self-motivation. Since close technical contact with a faculty member is an essential part of graduate education in engineering, MASc students must find a professor, who specializes in the applicant's desired area of research and is willing to act as a supervisor, prior to being accepted into the program. MEng students that pursue the MEng-Project option must find a professor who is willing to act as a project supervisor. In the event the MEng student cannot find a project supervisor, the student must transfer into the MEng-Course option.

4.2.3 Degree requirements

The MASc degree involves a thesis, whereas the MEng program has two options. The MEng-Project consists of both courses and a project, while the MEng-Course consists only of courses. Courses offered in the MASc and MEng programs are listed in section 4.4. They are sub-divided into an automotive core area (53xxG) and specific concentration areas of energy and thermofluids (51xxG), mechatronics and manufacturing (52xxG),

communications and signal processing (56xxG), software (57xxG) and electronics and control systems (58xxG, 59xxG).

For the MASc program, a student must complete five courses for a total of 15 credits and a thesis worth 15 credits. The course ENGR 5300G (Automotive Engineering) is a required course for all automotive engineering graduate students. It gives an advanced overview of the automobile as an integrated system. Students having adequate background in automotive engineering with an equivalent undergraduate course may receive an exemption (subject to the approval of both the student's supervisor and the Graduate Program Director), thereby allowing ENGR 5300G to be replaced with another course in the set of 53xxG courses.

Students must also select at least two additional courses from the group of ENGR 53xxG courses (focusing on automotive engineering), plus remaining electives from the series of 50xxG, 51xxG, 52xxG, 56xxG, 57xxG, 58xxG and 59xxG courses. In addition to these five graduate courses, the student must successfully complete ENGR 5003G – Seminar. MASc students must spend a minimum of one year of full-time study in residence at the University of Ontario Institute of Technology. The maximum time for completion of a MASc degree is three years, or six years for students who switch to part-time status, measured from the date the student entered the program. No financial support will be available from the Faculty after two years.

For the MEng-Project option, a student must complete seven courses for a total of 21 credits and a project worth 9 credits. This includes the required course (5300G), at least three other courses from the 53xxG group and remaining courses from the electives. For the MEng-Course option, a student must complete 10 courses, worth a total of 30 credits. In this option, the student requires 5300G, plus at least three other courses from the 53xxG group and the remaining elective courses. The maximum time for completion of a MEng degree is four years measured from the date the student entered the program.

MASc and MEng-Project students may take one senior year engineering or applied science (i.e., a course with the prefix ENGR) undergraduate course in lieu of a graduate level elective course, provided they have not already taken a similar course during their undergraduate degree and the course is approved by both the student's supervisor and the Faculty Graduate Programs Director.

4.2.4 Progress reports

After completing the first year of their program and in each year thereafter, MASc students must complete a progress report that outlines accomplishments in the previous year and objectives for the following year. This progress report must be submitted to the student's supervisory committee (see Section 4.2.6). Permission to continue in the program will be based on a satisfactory report, as determined by the student's supervisory committee.

4.2.5 Thesis evaluation procedures

Within six months after starting a MASc program, a supervisory committee for the student must be formed. The supervisory committee for a MASc student will consist of the student's supervisor or supervisors plus two faculty members from UOIT.

The supervisory committee is chaired by a member of the committee, other than the

student's supervisor. The supervisory committee is responsible for monitoring and evaluating the student's progress throughout their program.

All MASc students must successfully defend their thesis in front of an examination committee. The examination committee for a MASc student will be comprised of the student's supervisory committee plus an external examiner, who may or may not be a faculty member of UOIT. All external examiners must be approved by the Dean of Graduate Studies.

4.2.6 Language requirements

All applicants are required to give evidence of their oral and written proficiency in English. This requirement can be satisfied with one of the following criteria:

i) The student's first language is English;

ii) The student has studied full-time for at least three years (or equivalent in part-time studies) in a secondary school or university where the language of instruction and examination was English; or

iii) The student has achieved the required proficiency on one of the recognized tests in English language, which is acceptable to the University of Ontario Institute of Technology (see below).

Recommended Scores - English Language Proficiency Tests
(higher scores may be required)

TOEFL (computer based): 220
TOEFL (paper based): 560
IELTS: 7
MELAB: 85

4.2.7 Distance delivery

The programs will not be delivered in a distance delivery manner at the present time. In the future, it is expected that distance delivery of parts of the programs, where the subject matter permits, will be used.

4.3 Part-time studies

Part-time studies are primarily offered for the MEng program. To facilitate engineers from industry taking the MEng program, graduate courses are planned to be offered in the late afternoon or early evening.

The MASc program has a minimum residence requirement where the student must be enrolled full-time and he/she must attend the University of Ontario Institute of Technology. For the MASc program, students must spend a minimum of one year of full-time study in residence at UOIT.

4.4 Total graduate courses listed and level

The following list shows all courses relevant to the Automotive Engineering graduate programs. MASc and MEng-Project students may take one ENGR 4xxxU level undergraduate course, in lieu of a graduate level course, provided they have not already taken a similar course during their undergraduate degree and the course is approved by both the student's supervisor and the Faculty Graduate Programs Director. MEng-Course students may take up to two ENGR 4xxxU level undergraduate courses, in lieu of up to two graduate level courses, again, provided they have not taken similar courses during their undergraduate degree and the courses are approved by the Faculty Graduate Programs Director. Students will be allowed to take graduate courses offered by other faculties, provided they are approved by the Faculty Graduate Programs Director.

- ENGR 5001G - MASc Thesis
- ENGR 5002G - MEng Project
- ENGR 5003G - Seminar
- ENGR 5004G - Directed Studies
- ENGR 5005G - Special Topics
- ENGR 5010G - Advanced Optimization
- ENGR 5011G - Advanced Engineering Design
- ENGR 5012G - Advanced and Smart Materials

Concentration Area - Energy and Thermofluids:

- ENGR 5100G - Advanced Energy Systems
- ENGR 5101G - Thermal Energy Storage
- ENGR 5102G - Fuel Cells and Hydrogen Systems
- ENGR 5120G - Advanced Fluid Mechanics
- ENGR 5121G - Advanced Turbo Machinery
- ENGR 5122G - Computational Fluid Dynamics
- ENGR 5140G - Advanced Heat Transfer
- ENGR 5141G - Heat Exchanger Design and Analysis
- ENGR 5160G - Advanced Thermodynamics
- ENGR 5161G - HVAC and Refrigeration Systems Design and Analysis

Concentration Area - Mechatronics and Manufacturing:

- ENGR 5221G - Computer-Integrated Manufacturing
- ENGR 5222G - Polymers and Composite Processing
- ENGR 5223G - Advanced Manufacturing Processes and Methodologies
- ENGR 5240G - Advanced Dynamics
- ENGR 5241G - Advanced Mechanics of Materials
- ENGR 5242G - Advanced Vibrations
- ENGR 5260G - Advanced Robotics and Automation
- ENGR 5261G - Advanced Mechatronics: MEMS and Nanotechnology
- ENGR 5263G - Advanced Control

Core Area of Automotive Systems:

- ENGR 5300G - Automotive Engineering
- ENGR 5310G - Automotive System Dynamics
- ENGR 5320G - Automotive Aerodynamics
- ENGR 5330G - Automotive Powertrains
- ENGR 5340G - Automotive Noise, Vibrations and Harshness

- ENGR 5350G - Automotive Materials and Manufacturing
- ENGR 5360G - Automotive Software and Electronics

Concentration Area – Communications and Signal Processing:

- ENGR 5610G - Stochastic Processes
- ENGR 5620G - Digital Communications
- ENGR 5630G - Statistical Signal Processing
- ENGR 5640G - Advanced Wireless Communications
- ENGR 5650G - Adaptive Systems and Applications
- ENGR 5670G - Cryptography and Secure Communications

Concentration Area - Software:

- ENGR 5720G - Real-Time and Embedded Computing
- ENGR 5730G - Algorithms and Data Structures
- ENGR 5750G - Software Quality Management
- ENGR 5760G - Software Metrics

Concentration Area – Electronics and Control Systems:

- ENGR 5850G - Analog Integrated Circuit Design
- ENGR 5860G - Digital Integrated Circuit Design
- ENGR 5910G - Embedded Real-Time Control Systems
- ENGR 5920G - Analysis and Control of Nonlinear Systems
- ENGR 5930G - Adaptive Control
- ENGR 5940G - Intelligent Control Systems
- ENGR 5970G – Power Electronics

The core area of automotive systems (ENGR 53xxG) focuses on courses specifically aimed at engineering systems for automobiles, unlike the other concentration areas that have general applications to other mechanical, electrical and non-automotive systems. For example, ENGR 5310G (Automotive System Dynamics) covers systems and components unique to automobiles, while ENGR 5240G (Advanced Dynamics) and ENGR 5263G (Advanced Control) cover more general topics such as variational mechanics and Hamilton's equations, which are applied to non-automotive systems. Another example is ENGR 5320G (Automotive Aerodynamics). It differs considerably from ENGR 5120G (Advanced Fluid Mechanics), which covers advanced theory of fluid mechanics, boundary layers and turbulence, whereas ENGR 5320G focuses on drag correlations and aerodynamics specifically for automobiles. It also differs from ENGR 5122G (Computational Fluid Dynamics), which focuses on algorithm and software development, rather than automotive simulations. Similar explanations can be given for ENGR 5340G (Automotive Noise, Vibrations and Harshness) and ENGR 5242G (Advanced Vibrations), as well as ENGR 5350G (Automotive Materials and Manufacturing) and similar courses offered in the concentration area of mechatronics and manufacturing (ENGR 5012G, ENGR 5221G, ENGR 5222G and ENGR 5223G). In these examples, the ENGR 53xxG set of courses is specifically focused on automotive systems, whereas the ENGR 50xxG, 51xxG and 52xxG courses have more generalized applicability and non-automotive applications.

In addition to the required courses from the ENGR 53xxG set of courses (described in section 4.2.3), it will be beneficial for students to take some of the remaining electives from the same concentration area. For example, after completing ENGR 5310G (Automotive System Dynamics), it could in some instances be beneficial for students to take follow-up

courses of ENGR 5240G and/or ENGR 5263G, which cover other advanced topics of dynamics and control. These courses also give greater depth of understanding that would be useful for subsequent research. Courses have been grouped into several areas of concentration. However, it is not required that all electives are completed from a single concentration area, as it is also valuable for students to receive breadth of knowledge at the graduate level.

4.5 Graduate course descriptions

Detailed course decriptions in the Automotive Engineering graduate programs are listed on the following pages.

Course Title: ENGR 5001G – MASc Thesis

Year and Semester: N/A

- **Course Description and Content Outline:** The thesis is the major component of the MASc program and is carried out under the direction of the student's supervisor. The thesis may involve an investigation which is fundamental in nature, or may be applied, incorporating creative design. Through the thesis, candidates are expected to give evidence of competence in research and a sound understanding of the area of specialization involved.
- **Delivery Mode and Teaching Method(s):** N/A
- **Student Evaluation:** The student is required to write a research thesis. Upon completion, the student must defend the thesis in front of an examination committee comprised of his or her supervisory committee plus an external examiner.
- **Resources to be purchased by students:** None
- **Textbook requirements:** None
- **Learning Outcomes.** Students who successfully complete the MASc thesis have reliably demonstrated the ability to:
  Outcome 1: understand and explain the essential facts, concepts, principles, and theories relating to their research topic.
  Outcome 2: learn to effectively use advanced tools for research.
  Outcome 3: apply the principles of effective data management, information organization, and information-retrieval skills to data of various types.
  Outcome 4: critically evaluate advanced information and knowledge and their implementation.
  Outcome 5: understand, explain, and solve problems using quantitative and qualitative methods.
  Outcome 6: know how to design and conduct experiments, analyze and interpret experimental data, and/or computational results.
  Outcome 7: effectively write a large research document.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: S. Nokleby, PhD, PEng, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
All Faculty Members

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: None

Equipment requirements: Dependent on the Topic

Course Title: ENGR 5002G – MEng Project

Year and Semester: N/A

- **Course Description and Content Outline:** The MEng Project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study. The chosen topic will be dependent on the area of specialization of the student.
- **Delivery Mode and Teaching Method(s):** N/A
- **Student Evaluation:** Students are required to write a report and give a presentation on their completed project. Upon completion, the student must defend the project in front of an examination committee.
- **Resources to be purchased by students:** None
- **Textbook requirements:** None
- **Learning Outcomes.** Students who successfully complete the MEng project have reliably demonstrated the ability to:
  Outcome 1: understand and explain the essential facts, concepts, principles, and theories relating to their research topic.
  Outcome 2: identify problems and opportunities for system analysis, design, improvement, and optimization
  Outcome 3: understand, explain, and solve problems using quantitative and qualitative methods.
  Outcome 4: write large technical reports.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: S. Nokleby, PhD, PEng, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
All Faculty Members

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: None

Equipment requirements: Dependent on the Topic

Course Title: ENGR 5003G – Seminar

Year and Semester: N/A

- **Course Description and Content Outline:** Participation in a program of seminars by internal and external speakers on current research topics. All MASc students will be required to give a seminar on their thesis research during the second year of their program.
- **Delivery Mode and Teaching Method(s):** Mandatory attendance in a series of seminars by internal and external speakers.
- **Student Evaluation:** Pass/Fail
- **Resources to be purchased by students:** None
- **Textbook requirements:** None
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: recognize and be guided by the social, professional, and ethical issues involved in advanced education and research.
  Outcome 2: have an understanding of contemporary issues as well as professional and ethical responsibility.
  Outcome 3: have the appreciation of the need and ability to further their education through lifelong learning.
  Outcome 4: effectively communicate ideas via a research seminar.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: S. Nokleby, PhD, PEng, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
N/A

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course: N/A

Classroom requirements: Seminars will require the use of a classroom/meeting with VRC, DVD, data projectors, and internet access.

Equipment requirements: None

Course Title: ENGR 5004G – Directed Studies

Year and Semester: N/A

- **Course Description and Content Outline:** Faculty permission may be given for supervised research projects, individual study, or directed readings. Students wishing to pursue a course of directed studies must, with a faculty member who is willing to supervise such a course, formulate a proposal accurately describing the course content, the intended method and extent of supervision, and the method by which work will be evaluated. This course may only be taken once.
- **Delivery Mode and Teaching Method(s):** Dependent on the Topic
- **Student Evaluation:** Dependent on the Topic
- **Resources to be purchased by students:** Dependent on the Topic
- **Textbook requirements:** Dependent on the Topic
- **Learning Outcomes:** Dependent on the Topic

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: S. Nokleby, PhD, PEng, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
All Faculty Members

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: None

Equipment requirements: Dependent on the Topic

Course Title: ENGR 5005G – Special Topics
Year and Semester: N/A
• **Course Description and Content Outline:** Presents material in an emerging field or one not covered in regular offerings. May be taken more than once, provided the subject matter is substantially different. • **Delivery Mode and Teaching Method(s):** Dependent on the Topic • **Student Evaluation:** Dependent on the Topic • **Resources to be purchased by students:** Dependent on the Topic • **Textbook requirements:** Dependent on the Topic • **Learning Outcomes:** Dependent on the Topic
Information About Course Designer/Developer: Course designed by faculty eligible to teach this course: S. Nokleby, PhD, PEng, Faculty of Engineering and Applied Science
Identify faculty to teach the course and/or statement "faculty to be hired": All Faculty Members
If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A
Faculty qualifications required to teach/supervise the course: PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.
Classroom requirements: Dependent on the Topic
Equipment requirements: Dependent on the Topic

Course Title: ENGR 5010G – Advanced Optimization

Year and Semester: N/A

- **Course Description and Content Outline:** The objective of this course is to understand the principles of optimization and its application to engineering problems. Topics covered include: the steepest descent and Newton methods for unconstrained optimization; golden section, quadratic, cubic and inexact line searches; conjugate and quasi-Newton methods; the Fletcher-Reeves algorithm; fundamentals of constrained optimization theory; simplex methods for linear programming; modern interior-point methods; active-set methods and primal-dual interior-point methods for quadratic and convex programming; semidefinite programming algorithms; sequential quadratic programming and interior-point methods for nonconvex optimization. In addition, implementation issues and current software packages/algorithms for optimization will be covered. Global optimization, including genetic algorithms and simulated annealing, will be introduced.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** The principal form of assessment will be two major research projects, one counting for 30% and the other counting for 50% of the course mark. Assignments will count for the remaining 20%. The exact weighting of the various components will be presented to the students in the first week of lectures.
- **Resources to be purchased by students:** N/A
- **Textbook requirements (sample):**
  Antoniou, A. and Lu, W.-S., (In-Press), *Optimization: Methods, Algorithms, and Applications*, Kluwer Academic.
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: formulate and solve unconstrained and constrained optimization problems.
  Outcome 2: understand how the major unconstrained, constrained, and global optimization techniques work.
  Outcome 3: use optimization as a tool for solving engineering design problems.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: S. Nokleby, PhD, PEng, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
S. Nokleby, D. Zhang and S. Shahbazpanahi

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: Software requirements include MATLAB with both the Optimization Toolbox and the Genetic Algorithm and Direct Search Toolbox.

Course Title: ENGR 5011G – Advanced Engineering Design

Year and Semester: N/A

- **Course Description and Content Outline:** This course covers the basics of design philosophy, methodology, principles, and theory as a foundation for surveying current research areas in the product development process. A brief introduction to concurrent design and life cycle design is followed by addressing the application of the design process to problem solving. The relationship between creativity and the design process is explored by using tools for solving engineering system design and synthesis problems. Computer, mathematical, and/or physical modeling of the problem and solution, the axiomatic design approach, Taguchi robust design, design of experiments, and prototyping are strongly emphasized topics.
  - **Content outline by topic:**
  1. Introduction to Concurrent Design
  2. Introduction to Life Cycle Design. Design for X
  3. Axiomatic Design. The independence axiom. The information axiom. Design Matrix. Design hierarchy. Mapping from functional to physical to process domains.
  4. Functional Decomposition
  5. Modeling
  6. Taguchi Robust Design
  7. Design of Experiments
  8. Prototyping
  9. Analysis of Engineering Experiments
- **Delivery Mode and Teaching Method(s):** Classroom presentation, laboratories, and tutorials. Guest lectures by engineers from industry on selected topics. Lectures: 3 hours/week and Tutorials/Laboratory: 2 hours/week
- **Student Evaluation:** Teamwork and communication skills are strongly encouraged and developed through group assignments. Students will be actively involved in hands-on design and execution of original individual and group projects under faculty supervision. Student project teams will prepare a demanding final group project involving both analytical techniques and some computational techniques that will be supported with a detailed report and an oral presentation.
- **Resources to be purchased by students:** To be Determined by Professor
- **Textbook requirements:** None.
- **References:**
  Suh, N. P., 1990, *The Principles of Design*, Oxford Series on Advanced Manufacturing.
- **Learning Outcomes.** At the conclusion of the semester the student should be able to:
  Outcome 1: synthesise solutions to open-ended design problems
  Outcome 2: demonstrate the ability to define the problem, review current research, generate multiple solutions to a defined problem, analyze possible solutions, and develop the best possible solution to the defined problem.
  Outcome 3: demonstrate the ability to model the problem, generate a computer model of the problem / solution or create a physical model of the solution.
  Outcome 4: develop criteria for testing, analyze how well the model fits the defined solution, optimize the solution, document the solution, demonstrate the ability of the design to meet the original problem statement, develop a technical presentation of the solution.
  Outcome 5: identify the principles of good teamwork and effective communication and demonstrate those skills during a series of interactive exercises.

Information About Course Designer/Developer:

Course designed by faculty eligible to teach this course: R. Pop-Iliev, PhD, PEng, Faculty of Engineering and Applied Science
Identify faculty to teach the course and/or statement "faculty to be hired": R. Pop-Iliev
If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A
Faculty qualifications required to teach/supervise the course: PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.
Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.
Equipment requirements: Stationary desktop PC units (or laptops) having a specific suite of software installed and wireless internet access will be preferred.

Course Title: ENGR 5012G – Advanced and Smart Materials

Year and Semester: N/A

- **Course Description and Content Outline:** The core material will consist of: basic features of physical transducer behavior, mathematical constitutive models and material properties, characterization methods and experimental data, sensor and actuator devices, translation of material behavior to device behaviour, solid state devices, non-solid state devices (motors and pumps), mesoscale and MEMS devices, adaptive structures. However, due to the rapid evolutions in the field, the syllabus will be dynamic to respond to the new developments in materials and their applications. The topics will be continually reviewed and monitored for currency. Some of the topics from the following list will be also be included, covering fundamental principles, mechanisms and applications: a) Piezoelectric materials, b) 'Negative' materials, c) Conductive polymers, d) Advanced composites, e) Shape-memory materials, f) Magneto-rheological fluids, and g) Intelligent textiles.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** Reports 35%, presentations 35% exam 30%
- **Resources to be purchased by students:** N/A
- **Textbook requirements:** None
- **Learning Outcomes.** On successful completion of course, the students will have demonstrated the ability to:
  Outcome 1: understand the issues relating to a range of advanced and smart materials, and the fundamental principles and mechanisms responsible for their characteristic behaviours.
  Outcome 2: discuss the role and critical importance of the underlying mechanisms responsible for advanced and smart behaviour.
  Outcome 3: critically assess a given scenario and produce a scientific report that is effective in terms of content and structure.
  Outcome 4: select and use materials based upon the properties and characteristics of materials and their influences on the design of solutions to technological challenges.
  Outcome 5: undertake case studies into the area of advanced and smart materials and identify and retrieve relevant information from various sources with minimal assistance.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: G. Rizvi, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
R. Pop-Iliev and G. Rizvi

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: None

Course Title: ENGR 5100G – Advanced Energy Systems

Year and Semester: N/A

- **Course Description and Content Outline:** Advanced power and refrigeration cycles. Advanced gas turbine systems. Combustion systems and applications. Energy storage. Nuclear reactor technology. Fuel cells. Solar power. Wind power. Hydro power. Co- and tri-generation. Geothermal district heating systems. Energy and exergy analysis of advanced energy systems.
  - **Content outline by topic:**
    - Advanced power and refrigeration cycles.
    - Advanced gas turbine systems.
    - Combustion systems and applications.
    - Energy storage.
    - Nuclear reactor technology.
    - Fuel cells.
    - Solar power, Wind power, Hydro power.
    - Co- and tri-generation.
    - Geothermal district heating systems.
    - Energy and exergy analysis of advanced energy systems.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam (20%), project and presentation (25%), weekly homework assignments (15%), and final exam (40%).
- **Resources to be purchased by students:** None
- **Textbook requirements:**
  Kharchenko, N. V., 1999, *Advanced Energy Systems*, New York, NY.
- **Learning Outcomes.** This course is designed to give graduates in Engineering theoretical and practical background on how to design, analyze, rate and evaluate advanced energy systems, particularly for practical applications and provide them with the necessary practical solution methodologies and tools.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: I. Dincer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
I. Dincer and M. Rosen

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? Course materials and details will be available on WebCT. Numerical and analytical methods will be used.

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: Engineering Equation Solver (EES) and MATLAB will be provided to the students.

Course Title: ENGR 5101G – Thermal Energy Storage

Year and Semester: N/A

- **Course Description and Content Outline:** General Introductory Aspects for Thermal Engineering. Energy Storage Systems. Thermal Energy Storage Methods. Thermal Energy Storage and Environmental Impact. Energy Storage and Energy Savings. Solar Energy and Thermal Energy Storage. Heat Transfer and Stratification in Sensible Heat Storage Systems. Latent Heat Storage Systems. Heat Storage with Phase Change. Thermodynamic Optimization of Thermal Energy Storage Systems. Energy and Exergy Analyses of Thermal Energy Storage Systems. Thermal Energy Storage Case Studies.
  - **Content outline by topic:**
    - General Introductory Aspects for Thermal Engineering.
    - Energy Storage Systems. Thermal Energy Storage Methods.
    - Thermal Energy Storage and Environmental Impact.
    - Energy Storage and Energy Savings.
    - Solar Energy and Thermal Energy Storage.
    - Heat Transfer and Stratification in Sensible Heat Storage Systems.
    - Latent Heat Storage Systems. Heat Transfer with Phase Change.
    - Thermodynamic Optimization of Thermal Energy Storage Systems.
    - Energy and Exergy Analyses of Thermal Energy Storage Systems.
    - Thermal Energy Storage Case Studies.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam (20%), project and presentation (25%), weekly homework assignments (15%), and final exam (40%).
- **Resources to be purchased by students:** None
- **Textbook requirements:** Dincer, I. and Rosen, M. A., 2002, *Thermal Energy Storage Systems and Applications*, Wiley: New York, NY.
- **Learning Outcomes.** This course is designed to give graduates in Engineering theoretical and practical background on thermal energy storage systems and applications and provide them with the solution methodologies and tools for practical thermal energy storage systems design, analysis and performance evaluation.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: I. Dincer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
I. Dincer and M. Rosen

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? Course materials and details will be available on WebCT. Numerical and analytical methods will be used.

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: Engineering Equation Solver (EES).

Course Title: ENGR 5102G – Fuel Cells and Hydrogen Systems

Year and Semester: N/A

- **Course Description and Content Outline:** Introduction to hydrogen and hydrogen fuel cells. Efficiency and open circuit voltage. Operational fuel cell voltages. Proton exchange membrane fuel cells. Alkaline electrolyte fuel cells. Direct methanol fuel cells. Medium and high-temperature fuel cells. Fuelling fuel cells. Components of fuel cell power systems. Delivering fuel cell power. Analysis of Fuel cell systems. Fuel cell calculations. Tests.
  - **Content outline by topic:**
    - Introduction to hydrogen and hydrogen fuel cells.
    - Efficiency and open circuit voltage. Operational fuel cell voltages.
    - Proton exchange membrane fuel cells.
    - Alkaline electrolyte fuel cells. Direct methanol fuel cells.
    - Medium and high-temperature fuel cells. Fuelling fuel cells.
    - Components of fuel cell power systems, system design.
    - Delivering fuel cell power. Analysis of Fuel cell systems.
    - Fuel cell modeling and calculations. Tests and industry standards.
    - Reliability, durability, and engineering challenges.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam (20%), project and presentation (25%), weekly homework assignments (15%), and final exam (40%).
- **Resources to be purchased by students:** None
- **Textbook requirements:** Larminie, J. and Dicks, A., 2003, *Fuel Cell Systems Explained – 2nd Edition*, Wiley: New York, NY.
- **Learning Outcomes.** Upon completion of this course, students should be able to:
  Outcome 1: apply fundamentals of electrochemistry, thermodynamics, fluid dynamics, and heat and mass transfer, to examine various issues of interest to mechanical engineers including electrode flooding (water management), temperature, and species distribution.
  Outcome 2: articulate the basic fundamentals of electrochemistry in terms of electrode processes, electrochemical potential, thermodynamics and kinetics of electrode reactions applicable to electrochemical systems.
  Outcome 3: describe, explain, and model the various types of electrochemical overpotential occurring within the electrochemical system including ohmic, concentration, and activation overpotentials.
  Outcome 4: describe, explain, and model the effects of mass transfer in electrochemical systems by migration, diffusion, and convection.
  Outcome 5: describe and use Nernst equation to model cell EMF as a function of product and reactant activities.
  Outcome 6: understand the meaning, use, and experimental derivation of the Tafel slope for determination of the transfer coefficient and the exchange current density.
  Outcome 7: understand the concepts and fundamentals behind basic experimental electrochemical methods used to determine various key parameters including, mass and ionic transport coefficients, exchange current density, and internal resistances.
  Outcome 8: Identify the main components, advantages, and limitations of gas-fed PEM, direct inject PEM, molten carbonate, alkaline, phosphoric acid, and SO fuel cell systems.
  Outcome 9: visualize current, temperature and species distributions in an operating fuel cell under various operating conditions.
  Outcome 10: apply basic software tools to the analysis of experimental data and mathematical models.

Information About Course Designer/Developer: Course designed by faculty eligible to teach this course: I. Dincer, PhD, Faculty of Engineering and Applied Science
Identify faculty to teach the course and/or statement "faculty to be hired": P. Berg, I. Dincer, and M. Rosen
If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? Course materials and details will be available on WebCT. Numerical and analytical methods will be used.
Faculty qualifications required to teach/supervise the course: PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.
Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.
Equipment requirements: Engineering Equation Solver (EES) and MATLAB will be provided to the students.

Course Title: ENGR 5120G – Advanced Fluid Mechanics

Year and Semester: N/A

- **Course Description and Content Outline:** Derivation of three-dimensional conservation equations of mass, momentum and energy for compressible viscous fluids. General properties of Navier-Stokes equations. Examples of exact solutions of the Navier-Stokes equations. Approximate solutions for creeping motions. Laminar boundary layer equations and methods of solution: derivation of boundary layer equations, boundary layer separation, general properties of boundary layer equations; Von Karman momentum-integral equations; finite-difference solutions. Stability of laminar flows: theory of small disturbances; Orr-Summerfield equation, transition. Introduction to turbulence. Applications.
  - **Content outline by topic:**
    - Derivation of three-dimensional conservation equations of mass, momentum and energy for compressible viscous fluids.
    - General properties of Navier-Stokes equations.
    - Examples of exact solutions of the Navier-Stokes equations.
    - Approximate solutions for creeping motions.
    - Laminar boundary layer equations and methods of solution: derivation of boundary layer equations, boundary layer separation, general properties of boundary layer equations; Von Karman momentum-integral equations; finite-difference solutions.
    - Stability of laminar flows: theory of small disturbances; Orr-Summerfield equation, transition.
    - Introduction to turbulence. Applications.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam (20%), project and presentation (25%), weekly homework assignments (15%), and final exam (40%). A term project will be assigned to develop and use numerical techniques to solve the governing equations.
- **Resources to be purchased by students:** None
- **Textbook requirements:**
  Schlichting, H., 1989, *Boundary Layer Theory – 8th Edition*, McGraw-Hill: New York, NY.
  White, F. M., 1991, *Viscous Fluid Flow*, McGraw-Hill, New York, NY.
- **Learning Outcomes.** This course is designed to give graduates in Engineering insight into the phenomena of viscous fluid flow, to enable them to derive the governing equations for practical cases, and to show how the boundary layer theory can make flows involving fluids of small viscosity amenable to successful theoretical analyses.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: I. Dincer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
K. Gabriel and G. Naterer

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? Course materials and details will be available on WebCT. Computer-based simulations will be conducted.

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.
Equipment requirements: Simulation software.

Course Title: ENGR 5121G – Advanced Turbo Machinery

Year and Semester: N/A

- **Course Description and Content Outline:** Basic Thermodynamics and Fluid Mechanics equations and definitions of efficiencies in turbomachines. Two-dimensional cascades (cascade analysis, performance of cascades and cascade correlations). Axial flow turbines. Radial flow turbines. Axial flow compressors. Centrifugal compressors and fans. Applications of turbomachinery to engineering problems. Design, analysis and performance analyses of turbomachines. Transport phenomena aspects. Software use and tests.
  - **Content outline by topic:**
    - Basic Thermodynamics and Fluid Mechanics equations and definitions of efficiencies in turbomachines.
    - Two-dimensional cascades (cascade analysis, performance of cascades and cascade correlations).
    - Axial flow turbines, radial flow turbines, axial flow compressors.
    - Centrifugal compressors and fans.
    - Applications of turbomachinery to engineering problems.
    - Design, analysis and performance analyses of turbomachines.
    - Transport phenomena aspects.
    - Software use and tests.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam (20%), project and presentation (25%), weekly homework assignments (15%), and final exam (40%).
- **Resources to be purchased by students:** None
- **Textbook requirements:**
  Wilson, G. and Korakianitis, T., 2002, *The Design of High-Efficiency Turbomachinery and Gas Turbines – 2nd Edition*, Pearson: New York, NY.
- **Learning Outcomes.** It is aimed to teach students the principles used in analyzing/designing compressors and turbines. Students will be expected to design a gas turbine to meet specific mission requirements. Upon completion of the course, students will be able to understand the design systems and techniques used in the aeropropulsion and gas turbine industries.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: I. Dincer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
M. Rosen

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? Course materials and details will be available on WebCT. Numerical and analytical methods will be used.

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: Engineering Equation Solver (EES) and MATLAB will be provided to the students.

Course Title: ENGR 5122G – Computational Fluid Dynamics

Year and Semester: N/A

- **Course Description and Content Outline:** Introduction to CFD modelling and mesh generation software. Basic equations of fluid flow and commonly used approximations. Turbulence modelling (one and two equation models, and higher order models). Iterative solution methods and convergence criteria. Practical analysis of turbulent pipe flow / mixing elbow and turbomachinery blade problems. Software use and tests.
  - **Content outline by topic:**
    - Introduction to CFD modelling and mesh generation software.
    - Basic equations of fluid flow and commonly used approximations.
    - Turbulence modelling (one and two equation models, higher order models).
    - Iterative solution methods and convergence criteria.
    - Practical analysis of turbulent pipe flow / mixing elbow and turbomachinery blade problems.
    - Software use and tests.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam (20%), project and presentation (25%), weekly homework assignments (15%), and final exam (40%).
- **Resources to be purchased by students:** None
- **Textbook requirements: (i)** Chung, T. J., 2002, *Computational Fluid Dynamics*, Cambridge University Press: (ii) Oxford, UK. Ferziger, J. H., and Peric, M., 2003, *Computational Methods for Fluid Dynamics*, Springer: New York, NY.
- **Learning Outcomes.** The aim of this course is to develop practical skills in Computational Fluid Dynamics and the use of FLUENT, the most widely used commercial CFD code available. Students are expected to apply these skills to relevant Engineering applications and gain an appreciation of the limitations and advantages of CFD modelling. On completion of the course a successful student should be able to: (i) Set up a numerical model (including mesh generation) using FLUENT. (ii) Identify and define the correct boundary conditions and most appropriate turbulence model. (iii) Interpret the results and validate them using experimental and theoretical data.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: I. Dincer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
P. Gulshani and G. Naterer

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? Course materials and details will be available on WebCT. Numerical and analytical methods will be used.

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: Special CFD software (e.g., FLUENT) will be provided to the students.

Course Title: ENGR 5140G – Advanced Heat Transfer

Year and Semester: N/A

- **Course Description and Content Outline:** Introduction and conservation equations. Conservation equations and gas kinetics. Unidirectional Steady Conduction.Multidirectional Steady Conduction. Time-Dependent Conduction. External Forced Convection. Internal Forced Convection. Natural Convection. Convection with Change of Phase. Heat Exchangers. Radiation. Mass Transfer Principles.
  - **Content outline by topic:**
    - Introduction and conservation equations.
    - Conservation equations and gas kinetics.
    - Unidirectional Steady Conduction. Multidirectional Steady Conduction.
    - Time-Dependent Conduction.
    - External Forced Convection. Internal Forced Convection.Natural Convection.
    - Convection with Change of Phase.
    - Radiation.
    - Mass Transfer Principles.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam (20%), project and presentation (25%), weekly homework assignments (15%), and final exam (40%).
- **Resources to be purchased by students:** None
- **Textbook requirements:**
  Bejan, A., 1998, *Heat Transfer – 2nd Edition*, Wiley: New York, NY.
  Bejan, A. and Kraus, A. D., 2003, *Heat Transfer Handbook*, Wiley: New York, NY.
- **Learning Outcomes.** This course is designed to give graduates in Engineering insights and theory into the phenomena of advanced heat transfer topics in conduction, convection and radiation, phase change heat transfer and mass transfer and provide them with the background to solve advanced heat transfer problems both analytically and numerically.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: I. Dincer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
I. Dincer, K. Gabriel, P. Gulshani, G. Naterer, and M. Rosen

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? Course materials and details will be available on WebCT. Numerical and analytical methods will be used.

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: Engineering Equation Solver (EES) will be provided to the students.

Course Title: ENGR 5141G – Heat Exchanger Design and Analysis

Year and Semester: N/A

- **Course Description and Content Outline:** Basic mechanisms of heat transfer, such as conduction, convection, boiling, condensation and radiation. Classification of heat exchangers according to flow. Heat exchanger analysis using LMTD, 2–NTUc–R–P–F and ε-NTU methods. Selection criteria of heat exchangers. Thermal-hydraulic and mechanical design of shell-and-tube heat exchangers. Design and analysis of double-pipe heat exchangers. Design and performance evaluation of finned-tube heat exchangers. Energy and exergy analyses of heat exchangers. Performance evaluation of plate-fin heat exchangers. Design considerations in boilers and condensers. Fouling growth models and its impact on heat exchanger performance and life-cycle analysis. Flow-induced vibration. Software Use/Tests.
  - **Content outline by topic:**
    - Basic mechanisms of heat transfer, such as conduction, convection, boiling, condensation and radiation.
    - Classification of heat exchangers according to flow.
    - Heat exchanger analysis using LMTD, 2–NTUc–R–P–F and -NTU methods.
    - Selection criteria of heat exchangers.
    - Thermal-hydraulic and mechanical design of shell-and-tube heat exchangers.
    - Design and analysis of double-pipe heat exchangers.
    - Design and performance evaluation of finned-tube heat exchangers.
    - Energy and exergy analyses of heat exchangers.
    - Performance evaluation of plate-fin heat exchangers.
    - Design considerations in boilers and condensers.
    - Fouling growth models and its impact on heat exchanger performance and life-cycle analysis.
    - Flow-induced vibration.
    - Software Use/Tests.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam (20%), project and presentation (25%), weekly homework assignments (15%), and final exam (40%).
- **Resources to be purchased by students:** None
- **Textbook requirements:**
  Hewitt, G. F., 2002, *Heat Exchanger Design Handbook*, Begell House: New York, NY.
- **Learning Outcomes.** This course is designed to give graduates in Engineering theoretical and practical background on how to design, analyze, rate and evaluate heat exchangers, particularly for thermal applications and provide them with the solution methodologies and tools for practical applications.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: I. Dincer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
I. Dincer, K. Gabriel, G. Naterer, and M. Rosen

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? Course materials and details will be available on WebCT. Numerical and analytical

methods will be used.
Faculty qualifications required to teach/supervise the course: PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.
Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.
Equipment requirements: Engineering Equation Solver (EES) and MATLAB will be provided to the students.

Course Title: ENGR 5160G – Advanced Thermodynamics

Year and Semester: N/A

- **Course Description and Content Outline:** Axiomatic representation of fundamentals of classical thermodynamics. First law of thermodynamics. Equilibrium. Euler and Gibbs-Duhem relations. Second law of thermodynamics. Entropy production. Exergy and Irreversibility. Energy and exergy analysis of advanced power and refrigeration cycles. Legendre transformations and Extremum principle. Maxwell relations and thermodynamics derivatives. Stability. Phase transformations. Nernst postulate. Chemical reactions and equilibrium. Case study problems.
  - **Content outline by topic:**
    - Axiomatic representation of fundamentals of classical thermodynamics.
    - First law of thermodynamics.
    - Equilibrium.
    - Euler and Gibbs-Duhem relations.
    - Second law of thermodynamics.
    - Entropy production.
    - Exergy and irreversibility.
    - Energy and exergy analysis of advanced power and refrigeration cycles.
    - Legendre transformations and extremum principle.
    - Maxwell relations and thermodynamics derivatives.
    - Stability. Phase transformations.
    - Nernst postulate.
    - Chemical reactions and equilibrium.
    - Case study problems.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam (20%), project and presentation (25%), weekly homework assignments (15%), and final exam (40%).
- **Resources to be purchased by students:** None
- **Textbook requirements:**
  Bejan, A., 1997, *Advanced Engineering Thermodynamics – 2nd Edition*, Wiley: New York, NY.
  Winterbone, D. E., 1997, *Advanced Thermodynamics for Engineers*, Elsevier: London, UK.
  Wark, K., 1994, *Advanced Thermodynamics for Engineers*, McGraw-Hill: New York, NY.
- **Learning Outcomes.** This course is designed to give graduate students in engineering selected advanced subjects in thermodynamics. The students are also expected to learn the main laws and concepts of thermodynamics and apply these over the whole range of conventional and new systems and technologies covered by engineering thermodynamics.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: I. Dincer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
I. Dincer, G. Naterer, and M. Rosen

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? Course materials and details will be available on WebCT.

Faculty qualifications required to teach/supervise the course: PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.
Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.
Equipment requirements: None

Course Title: ENGR 5161G – HVAC and Refrigeration Systems Design and Analysis

Year and Semester: N/A

- **Course Description and Content Outline:** Basic Concepts. Elements of Heat Transfer for Buildings. Thermodynamic Processes in Buildings. Energy use and Environmental Impact. Human Thermal Comfort and Indoor Air Quality. Fluid Mechanics in Building Systems. Solar Radiation. Heating and Cooling Loads. Annual Energy Consumption. Heat Transfer Equipment. Cooling Equipment. Thermal Energy Storage. Software Use/Tests.
  - **Content outline by topic:**
    - Basic Concepts
    - Elements of Heat Transfer for Buildings
    - Thermodynamic Processes in Buildings
    - Energy use and Environmental Impact
    - Human Thermal Comfort and Indoor Air Quality
    - Fluid Mechanics in Building Systems
    - Solar Radiation, Heating and Cooling Loads
    - Annual Energy Consumption
    - Heat Transfer Equipment, Cooling Equipment
    - Thermal Energy Storage. Software Use/Tests.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam (20%), project and presentation (25%), weekly homework assignments (15%), and final exam (40%).
- **Resources to be purchased by students:** None
- **Textbook requirements:**
  Dincer, I., 2003, *Refrigeration Systems and Applications*, Wiley, New York, NY.
  Kreider, J., Rabl, A., 2002, *Heating and Cooling of Buildings*, McGraw-Hill, New York, NY.
  ASHRAE, 1999, *Handbook of Fundamentals*, Atlanta, GA.
- **Learning Outcomes.** This course is designed to give graduates in Engineering theoretical and practical background on HVAC and refrigeration systems, particularly for building applications and provide them with the solution methodologies and tools for practical HVAC and refrigeration systems design, analysis and performance evaluation.

Information About Course Designer/Developer: Course designed by faculty eligible to teach this course: I. Dincer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
I. Dincer and M. Rosen

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? Course materials and details will be available on WebCT. Numerical and analytical methods will be used.

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: Engineering Equation Solver (EES) will be provided to the students. The second software will be provided with the book.

Course Title: ENGR 5221G – Computer-Integrated Manufacturing

Year and Semester: N/A

- **Course Description and Content Outline:** This course is about Computer-Integrated Manufacturing (CIM) with a particular focus on automated manufacturing process planning. It provides advanced instruction in design and implementation of integrated CAD/CAM, robotics, and flexible manufacturing systems. It also provides emphasis on concurrent engineering principles, manufacturing process engineering, computer-aided process planning, NC programming, and CAD/CAM integration. The course provides experience with CAD/CAM software and NC machines.
  - **Content outline by topic:**
    1. Computer evolution
       - Computer architecture
       - Boolean algebra
       - Logic design
    2. Concurrent engineering principles
    3. Analysis of product definition processes
    4. Manufacturing process engineering
    5. Communication in manufacturing environments
    6. Technological and organizational requisites for CIM
    7. Manufacturing requirements planning
    8. CAD/CAM integration
       - NC programming
    9. Just-in-time manufacturing
    10. Future directions for factory automation
- **Delivery Mode and Teaching Method(s):** Classroom presentation, laboratories, and tutorials. Guest lectures by engineers from industry on selected topics. Lectures: 3 hours/week and Tutorials/Laboratory: 2 hours/week.
- **Student Evaluation:** Students will be actively involved in hands-on design and execution of original individual and group projects under faculty supervision. Student project teams will prepare a demanding final group project involving a detailed report and an oral presentation.
- **Resources to be purchased by students:** To be Determined by Professor
- **Textbook requirements:**
  None
- **Learning Outcomes.** At the conclusion of the semester the student should be able to:
  Outcome 1: explain the issues relating to automation in a manufacturing setup and the abilities and limitation of computerized systems in dealing with them.
  Outcome 2: explain the function of software commonly used in manufacturing and demonstrate their ability to use that software to design a flexible manufacturing process.
  Outcome 3: access and use a variety of resources (human, equipment, tools, plans, vendors and materials) to plan and complete CIM projects according to process and time requirements.
  Outcome 4: analyze and execute a flexible manufacturing process, identify problems in the process, and redesign the process for improvement during a simulated manufacturing line.
  Outcome 5: to demonstrate proficiency in these skills through a variety of shop projects and in a final exercise that uses a combination of these skills.

Information About Course Designer/Developer:

Course designed by faculty eligible to teach this course: R. Pop-Iliev, PhD, PEng, Faculty of

Engineering and Applied Science and G. Rizvi, PhD, Faculty of Engineering and Applied Science
Identify faculty to teach the course and/or statement "faculty to be hired": R. Pop-Iliev and G. Rizvi
If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A
Faculty qualifications required to teach/supervise the course: PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.
Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.
Equipment requirements: Stationary desktop PC units (or laptops) having a specific suite of software installed and wireless internet access will be preferred.

Course Title: ENGR 5222G – Polymers and Composite Processing

Year and Semester: N/A

- **Course Description and Content Outline:** Polymer structure-property relations, linear and nonlinear viscoelasticity, dynamic mechanical analysis, time temperature superposition, creep and stress relaxation, mechanical models for prediction of polymer deformation, rubber elasticity, experimental methods for viscosity-temperature-shear rate measurements, application to melts, filled systems and suspensions. Processes for polymers; injection, extrusion, thermoforming, blow molding, rotational molding, compression and transfer molding, calendaring and post-manufacturing operations. Fibre types and properties, fibre forms, polymeric matrix and interfaces, typical composite properties. Processes for long fibre/thermoset composites, pre-pregging, resin transfer moulding, filament winding, pultrusion, autoclave cure.
- **Delivery Mode and Teaching Method(s):** one-term course, 3 hours of lectures per week
- **Student Evaluation:** Assignments 15%, Midterm 35% Final 50%
- **Resources to be purchased by students:** N/A
- **Textbook requirements:** None
- **Learning Outcomes.** On successful completion of course, the students will
  Outcome 1: relate the significance of polymer structures to their physical, mechanical and thermal properties.
  Outcome 2: use linear and nonlinear viscoelasticity, dynamic mechanical analysis, time temperature superposition and creep and stress relaxation principles to predict polymer behaviour due to applications of stress and strain.
  Outcome 3: mechanical models for prediction of polymer deformation and rubber elasticity.
  Outcome 4: explain experimental methods for measuring viscosity-temperature-shear rate.
  Outcome 5: describe the basic processes for polymers; i.e. injection, extrusion, thermoforming, blow molding, rotational molding, compression and transfer molding, calendaring and post-manufacturing operations.
  Outcome 6: assess and recommend fibre types and properties, fibre forms, polymeric matrix and interfaces, typical composite properties for applications.
  Outcome 7: describe the processes for long fibre/thermoset composites, pre-pregging, resin transfer moulding, filament winding, pultrusion, autoclave cure.

Information About Course Designer/Developer: Course designed by faculty eligible to teach this course: G. Rizvi, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
R. Pop-Ileiv and G. Rizvi

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: None

Course Title: ENGR 5223G – Advanced Manufacturing Processes and Methodologies

Year and Semester: N/A

- **Course Description and Content Outline:** This course is about implementing advanced manufacturing processes and methodologies into production operations as the strategy for achieving reductions in inventory costs, faster manufacturing turnaround times, fewer faulty products, and using less floor space for production. It addresses the next generation manufacturing and production techniques that take advantage of the opportunities offered by selective use of new materials and emerging technologies for high efficient machining, coating, forming, assembly operations, etc. Virtual manufacturing methodologies and multi-objective optimization in terms of design, performance, safety, cost, and environment as well as advanced manufacturing methodologies such as lean manufacturing are also addressed.
  - **Content outline by topic:**
    1. Overview of emerging materials and technologies: Ceramics and intermetallics for high temperature, Advanced aluminium, magnesium and cast iron alloys, Aluminium and polyurethane foams for crash energy absorption, Powder metallurgy, Metal and ceramic matrix composites
    2. Machining: High speed and dry, Materials and coatings for high efficiency tools, Machining centers
    3. Forming: Sheet metals and plastics, Low investment metal forming, Innovative casting, Rapid prototyping and tooling
    4. Assembly: Laser welding of steels, Laser welding of thermoplastics, Laser processes monitoring, Adhesive and mechanical joining
    5. Surface treatments and coatings: Laser treatments, Eco-compatible and sustainable, Wear prevention coatings
    6. Virtual manufacturing: Metal forming and machining (e.g., sheet metal stamping, advanced forming technologies such as double-sheet hydroforming, high speed, and dry machining), Plastic molding, Casting and forging (e.g., semi-solid casting and local forging)
    7. Lean Manufacturing
    8. Kanban: Demand driven, pull-based flow manufacturing, Demand Flow Technology (DFT)
    9. Relationship between Lean manufacturing and Six Sigma
- **Delivery Mode and Teaching Method(s):** Classroom presentation, laboratories, and tutorials. Guest lectures by engineers from industry on selected topics. Lectures: 3 hours/week and Tutorials/Laboratory: 2 hours/week
- **Student Evaluation:** Teamwork and communication skills are encouraged and developed through group assignments. Students will be actively involved in hands-on execution of original individual and group assignments under faculty supervision. Student project teams will prepare a final group project involving a detailed report and oral presentation.
- **Resources to be purchased by students:** To be Determined by Professor
  Textbook requirements: None

- **Learning Outcomes.** At the conclusion of the semester the student should be able to:
  Outcome 1: master the main concepts of the major advanced manufacturing processes and display competence in a range of advanced manufacturing methodologies.
  Outcome 2: apply a broad-based knowledge of the various areas of advanced manufacturing processes to both simulated and real world manufacturing processes.
  Outcome 3: apply advanced improvement methodologies and techniques to both simulated and real world manufacturing processes.

Outcome 4: to critically evaluate and communicate both orally and in writing primary literature articles in the area of advanced manufacturing processes and methodologies. Outcome 5: identify the principles of good teamwork and effective communication in an manufacturing environment and demonstrate those skills during interactive exercises.
Information About Course Designer/Developer: Course designed by faculty eligible to teach this course: R. Pop-Iliev, PhD, PEng, Faculty of Engineering and Applied Science
Identify faculty to teach the course and/or statement "faculty to be hired": R. Pop-Iliev and G. Rizvi
If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A
Faculty qualifications required to teach/supervise the course: PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.
Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.
Equipment requirements: Stationary desktop PC units (or laptops) having a specific suite of software installed and wireless internet access will be preferred.

Course Title: ENGR 5240G Advanced Dynamics

Year and Semester: N/A

- **Course Description and Content Outline:** This course builds upon the knowledge students have gained in a first dynamics course to cover more advanced dynamical systems. Topics covered will include: 3-D kinematics and kinetics of particles and systems of particles using Newton's method; equations of motion in normal and tangential, cylindrical, and spherical coordinates; two body central force motion with applications in orbital dynamics, and particle on a rotating earth. 3-D kinematics and kinetics of rigid bodies, Euler angles, single and multiple rotating reference frames, Coriolis acceleration, inertial reference frames, equations of translational motion, angular momentum, rotational motion, body axes and rotation relative to a coordinate system, Euler's and modified Euler's equations of motion with applications in dynamics of gyroscopes, robots, and vehicles. Variational mechanics, constraints, generalized coordinates, principles of virtual work, D'Alembert, and Hamilton's principle, concept of Hamiltonian, Hamilton's canonical equations. Lagrange's equation for system of particles and rigid bodies, generalized force and moment, calculus of variations, concepts of Lagrangian and Lagrange multiplier, Lagrange's equations for holonomic and non-holonomic systems, stability analysis of autonomous and non-autonomous dynamical systems. Numerical solutions of dynamic systems, explicit methods include finite difference and Rung-Kutta, and implicit methods are Houbolt, Wilson-theta, Park stuffy stable, and Newark-beta.
- **Delivery Mode and Teaching Method(s):** one-term course, 3 hours of lectures per week
- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one research project worth 20% of the course mark. Assignments will count for 10% and a mid-term exam will count for the remaining 20%. The exact weighting of various components will be presented to the students in the first week of the lectures.
- **Resources to be purchased by students:** None
- **Textbook requirements (sample):** Ginsberg, J. H., 1995, Advanced Engineering Dynamics – 2nd Edition, Cambridge University Press: New York, NY.
- **Learning Outcomes.** Students who successfully complete the course will
  Outcome 1: model and analyze systems of rigid bodies in three dimensions.
  Outcome 2: use Lagrange's equations to solve complex dynamical problems.
  Outcome 3: understand the applications of Hamiltonian and Hamilton's canonical.
  Outcome 4: determine the stability of 3-D motions of many dynamical systems.
  Outcome 5: apply numerical methods to obtain solutions of dynamical systems.

Information About Course Designer/Developer: Course designed by faculty eligible to teach this course: E. Esmailzadeh, Ph.D., Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
E. Esmailzadeh, S. Nokleby, and D. Zhang

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: To Be Determined by Professor

Course Title: ENGR 5241G – Advanced Mechanics of Materials

Year and Semester: N/A

- **Course Description and Content Outline:** This course builds upon the knowledge students have gained in the first solid mechanics course to cover more advanced mechanics of materials. Topics covered will include: The general state of stress and strain in three dimensions; formulation of general equilibrium equations; compatibility conditions; constitutive relationships; elasto-plastic relationships; Airy stress function; analytical solutions of special problems including thick-walled cylinders, rotating disks, bucking of columns, stress concentration, and curved beams; energy methods in elasticity; torsion problem; bending of beams; contact stresses; analysis of flat plates; creep and relaxation; introduction to fracture mechanics; fatigue and failure theories.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one research project worth 20% of the course mark. Assignments will count for 10% and a mid-term exam will count for the remaining 20%. The weighting of the various components will be presented to the students in the first week of lectures.
- **Resources to be purchased by students:** None
- **Textbook requirements (sample):** Boresi, A. P. and Schmidt, R. J., 2003, *Advanced Mechanics of Materials – 6th Edition*, John Wiley & Sons, Inc.
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: understand and apply transformation of stress and strains in three dimensions and failure theories for isotropic materials.
  Outcome 2: apply energy methods to determine the values of load and deflection of indeterminate structures.
  Outcome 3: design flexible structures based on the principles of fracture mechanics and predict the critical load and crack length.
  Outcome 4: estimate fatigue life of the structures subjected to cyclic loadings.
  Outcome 5: understand and apply the principles of shear and torsion of beams, shafts, and thin-walled structures.
  Outcome 6: analyze the stress distribution in curved beams, rotating disks, thick-walled cylinders, and flat plates.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: E. Esmailzadeh, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
E. Esmailzadeh and D. Zhang

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: To Be Determined by Professor

Course Title: ENGR 5242G - Advanced Vibrations

Year and Semester: N/A

- **Course Description and Content Outline:** This course builds upon the knowledge students have gained in a first vibration course to cover more advanced vibrating systems. Topics covered will include: Lagrange's equations of motion, generalized coordinates and force, virtual work, linearization of equations for small oscillations, multi-degree of freedom linear systems, mass matrix, flexibility and stiffness matrix, natural frequencies and mode shapes, orthogonality of the mode shapes, modal matrix and decoupling procedure, harmonic force, and series solution for arbitrary excitation. Linear continuous systems, free vibration of strings, rods and shafts, lateral vibration of Euler-Bernoulli beams, effect of rotary inertia and shear on the vibration of beams, orthogonality of the mode shapes, harmonic excitation of beams, mode summation method in the case of arbitrary excitation. Approximate methods for free vibration analysis: Rayleigh, Dunkerly, Rayleigh-Ritz, Holzer, Myklestud, and matrix iteration methods. Vibration of plates, free vibration analysis using analytical methods, Rayleigh and Rayleigh-Ritz methods, harmonic excitation, and Galerkin's method in forced vibration analysis of plates.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one research project worth 20% of the course mark. Assignments will count for 10% and a mid-term exam will count for the remaining 20%. The exact weighting of the various components will be presented to the students in the first week of the lectures.
- **Resources to be purchased by students:** None
- **Textbook requirements (sample):** Ginsberg, J. H., 2001, *Mechanical and Structural Vibrations: Theory and Applications*, John Wiley & Sons: Toronto, ON.
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: model and analyze discrete vibrating systems.
  Outcome 2: obtain the transient and steady-state response of m-DOF systems.
  Outcome 3: obtain the eigenvalues and eigenvectors using different techniques.
  Outcome 4: model and analyze continuous systems.
  Outcome 5: solve partial differential equations for flexible structures.

Information About Course Designer/Developer: Course designed by faculty eligible to teach this course: E. Esmailzadeh, Ph.D., Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
E. Esmailzadeh and D. Zhang

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: To Be Determined by Professor

Course Title: ENGR 5260G – Advanced Robotics and Automation

Year and Semester: N/A

- **Course Description and Content Outline:** This course builds upon the knowledge students have gained in a first robotics course to cover more advanced kinematics topics and their application to more complex robotic systems such as redundant manipulators and parallel mechanisms. Topics covered will include: point, direction, line, and screw motion descriptions; homogeneous transformations; line and screw coordinates; quaternion representations; inverse displacement solutions by analytic, root finding, hybrid, and numerical methods; appropriate frames of reference; screw systems and transforms; local and globally optimum solutions of redundant rates; overdetermined and near degenerate solutions; singularity analysis; and parallel manipulator kinematics. Prerequisite: Robotics and Automation (ENGR 4280U) or equivalent.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one research project worth 30% of the course mark. Assignments will count for the remaining 20%. The exact weighting of the various components will be presented to the students in the first week of lectures.
- **Resources to be purchased by students:** N/A
- **Textbook requirements (sample):**
  Davidson, J. K. and Hunt, K. H., 2004, *Robots and Screw Theory: Applications of Kinematics and Statics to Robotics*, Oxford University, Press: Toronto.
  Angeles, J., 2002, *Fundamentals of Robotic Mechanical Systems: Theory, Methods, and Algorithms – Second Edition*, Springer, New York, New York.
  Tsai, L.-W., 1999, Robot Analysis: *The Mechanics of Parallel and Serial Manipulators*, John Wiley & Sons, Inc.: Toronto.
- **Learning Outcomes.** Students who successfully complete the course will
  Outcome 1: understand advanced serial manipulator kinematics and its applications.
  Outcome 2: understand parallel manipulator kinematics and its applications.
  Outcome 3: apply advanced kinematic geometry methods, such as screw theory, to various problems in robotics.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: S. Nokleby, PhD, PEng, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
S. Nokleby and D. Zhang

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: Robot manipulators available in UOIT's Integrated Manufacturing Centre. Software requirements include MATLAB and MAPLE.

Course Title: ENGR 5261G – Advanced Mechatronics: MEMS and Nanotechnology

Year and Semester: N/A

Course Description and Content Outline: This course is designed to be an introduction to MEMS (micro-electro-mechanical systems) and nanotechnology and their applications. Topics covered will include: introduction to MEMS and nanotechnology; working principles of MEMS and nanotechnology; design and fabrication of MEMS and nano-systems; microfabrication and micromachining; materials for MEMS and nanotechnology; and applications of MEMS and nanotechnology.

- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one research project worth 30% of the course mark. Assignments will count for the remaining 20%. The exact weighting of the various components will be presented to the students in the first week of lectures.
- **Resources to be purchased by students:** To Be Determined by Professor
- **Textbook requirements (sample):**
  Senturia, S. D., 2001, Microsystem Design, Kluwer Academic Publishers.
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: understand the basic principles of how MEMS and nano-systems work.
  Outcome 2: design and analyze MEMS and nano-systems.
  Outcome 3: understand the processes for fabricating MEMS and nano-systems.
  Outcome 4: understand applications of MEMS and nanotechnology.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: D. Zhang, PhD, PEng, Faculty of Engineering and Applied Science and S. Nokleby, PhD, PEng, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
S. Nokleby, D. Zhang, and Faculty to be Hired

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: To Be Determined by Professor

Course Title: ENGR 5262G – Manipulator and Mechanism Design

Year and Semester: N/A

- **Course Description and Content Outline:** This course is designed to teach students the necessary skills to design or synthesize mechanisms and manipulators to perform desired tasks. Topics covered will include: synthesis of mechanisms for function generation, path generation, and rigid body guidance; graphical, analytical, and optimization based methods of synthesis; mechanism cognates, Chebychev spacing, Burmister curves; manipulator joint layout synthesis for spatial positioning and orientation; conditions of singularity and uncertainty; and solution of nonlinear problems of kinematics involved in mechanism synthesis using compatibility equations, 1/2 angle substitutions, and dialytic elimination.
- **Delivery Mode and Teaching Method(s):** This one-term course will be delivered using 3 hours of lectures per week.
- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one research project worth 30% of the course mark. Assignments will count for the remaining 20%. The exact weighting of the various components will be presented to the students in the first week of lectures.
- **Resources to be purchased by students:** N/A
- **Textbook requirements (sample):**
  McCarthy, J. M., 2000, *Geometric Design of Linkages*, Springer: New York.
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: design mechanisms for function generation, path generation, and rigid body guidance using graphical, analytical, and optimization based methods.
  Outcome 2: design manipulator joint layouts for specified tasks.
  Outcome 3: solve nonlinear problems in kinematics using compatibility equations, 1/2 angle substitutions, and dialytic elimination.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: S. Nokleby, PhD, PEng, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
S. Nokleby and D. Zhang

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: Software requirements include MATLAB, Working Model, and MSC.visualNastran 4D.

Course Title: ENGR 5263G – Advanced Control

Year and Semester: N/A

- **Course Description and Content Outline:** This course builds upon the knowledge students have gained in a first control course to cover more materials in advanced control systems. Topics covered will include: a. State variables and state space models: Relations between state space models and the transfer-function models (controllable and observable canonical forms, and diagonal form), Jordan form, solutions of linear state equations, transition matrix. b. Controllability and observability: Definition and criteria, state feedback and output feedback, pole assignment via state feedback, design of servo-controlled systems. c. State estimation and observer: Observer state-variable feedback control. d. Multi-input multi-output (MIMO) systems: Pole assignment via state feedback. e. Introduction to nonlinear systems: Describing functions for kinds of nonlinear systems (on/off, dry friction, dead zone, saturation, and hystersis), phase plane trajectories, concept of limit cycle. f. Stability analysis: Lyapunov function, and Lyapunov stability criterion. g. Introduction to optimal control: Linear quadratic regulator (LQR), Riccati equation, properties of LQR systems. h. Sampled data systems: Pulse transfer function, zero and first order hold systems, stability and root locus in the z-plane, transformations, Routh Hurwitz stability criterion in the z-plane, system compensation in the z-plane using root locus, and generalized PID controllers.
- **Delivery Mode and Teaching Method(s):** one-term course, 3 hours of lectures per week
- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one research project worth 20% of the course mark. Assignments will count for 10% and a mid-term exam will count for 20%. The exact weighting of the various components will be presented to the students in the first week of the lectures.
- **Resources to be purchased by students:** N/A
- **Textbook requirements (sample):**
  Ogata, K., 2002, *Modern Control Engineering – 4th Edition*, Prentice Hall: New Jersey.
- **Learning Outcomes.** Students who successfully complete the course will
  Outcome 1: model and analyze the state space descriptions of dynamical systems.
  Outcome 2: apply the concepts of controllability and observability of control systems.
  Outcome 3: utilize pole placement in state feedback control for SISO and MIMO systems.
  Outcome 4: design observer state feedback control.
  Outcome 5: gain knowledge about nonlinear control systems, limit cycle, and instabilities.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: E. Esmailzadeh, Ph.D., Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
E. Esmailzadeh, S. Nokleby, and D. Zhang

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: None

Course Title: ENGR 5300G – Automotive Engineering

Year and Semester: N/A

Course Description and Content Outline: Components of the automobile. Engineering factors in all components and sub-system areas of automobile design. Vehicle characteristics and dynamic interactions. Systems modeling approach and mathematical models for ride, vibration, handling control and powertrains of automobiles. Tire mechanics, including construction, rolling resistances, traction/braking properties, cornering and aligning properties and measurement methods. Vehicle mobility, motion performance of the vehicle, characterization of resistances, propulsion system and tractive efforts. Brake system design, braking performance, brake distribution. Steady state handling. Measurement methods. Suspension system design considerations. Design and performance of an automobile from a systems point of view. External factors such as markets, financing, and sales.

Delivery Mode and Teaching Method(s): This one-term course will be delivered using 3 hours of lectures per week.

- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one project worth 30% of the course mark. Assignments will count for the remaining 20%. The exact weighting of the various components will be presented to the students in the first week of lectures.
- **Resources to be purchased by students:** N/A
- **Textbook requirements (sample):** (i) R. Bosch, *Automotive Handbook*, 6th Edition, John Wiley & Sons, 2004, (i) J. Fenton, *Handbook of Automotive Body and Systems Design*, John Wiley & Sons, 2005
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: analyze overall design of an automobile as an integrated system;
  Outcome 2: address technical issues in the design of automotive components and sub-systems, ranging from diagnosis, engines and mechatronics to automotive braking;
  Outcome 3: conduct theoretical, numerical and experimental analysis of automotive systems;
  Outcome 4: gain detailed knowledge necessary to comprehend journal publications and other archival literature relevant to advanced design of automotive systems;
  Outcome 5: gain knowledge on performance assessment methodologies and interpretations of standards.

Information About Course Designer/Developer:
Course designed by G. F. Naterer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
S. Rakheja, G. Rohrauer

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: N/A

Course Title: ENGR 5310G Automotive System Dynamics

Year and Semester: N/A

Course Description and Content Outline: Introduction to transport systems related to vehicle dynamics behaviour. Pneumatic tire mechanics – ride, cornering and aligning properties. Transient and steady-state directional dynamics and handling analyses of road vehicles. Directional response and stability analysis in small and large perturbation maneuvers; roll dynamics and rollover; braking performance analyses; directional responses to simultaneous steering and braking inputs; performance measures. Characterization of road roughness; ride vibration analyses; assessment of ride comfort. Measurement methods and data analyses techniques. Vehicle-driver interactions – analysis of the closed loop vehicle-driver system. Introduction to typical control strategies for vehicle dynamic control.

Delivery Mode and Teaching Method(s): This one-term course will be delivered using 3 hours of lectures per week. The teaching will be carried out through a combination of classroom-based theory sessions and computer simulation workshops.

- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one project worth 30% of the course mark. Assignments will count for the remaining 20%. The exact weighting of the various components will be presented to the students in the first week of lectures.
- **Resources to be purchased by students:** N/A
- **Textbook requirements (sample):** *Vehicle Dynamics and Control,* by Rajesh Rajamani, Springer, 2006. (ISBN: 0-387-26396-9)
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: well understand vehicle dynamics and control systems.
  Outcome 2: generate typical vehicle dynamic models and control system models and perform dynamic simulations.
  Outcome 3: evaluate vehicle dynamic performance based on numerical simulation results.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: Yuping He, Ph.D., Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
Y. He, S. Rakheja, E. Esmailzadeh, P. Berg

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: Multibody dynamics software packages (e.g. ADAMS) and control system modeling tools (e.g. MATLAB/Simulink).

Course Title: ENGR 5320G – Automotive Aerodynamics

Year and Semester: N/A

Course Description and Content Outline: Formulation of fluid mechanics and aerodynamics for automotive design. Inviscid and viscous flow. Wind tunnels and their applications to external aerodynamics. Aerodynamic drag coefficient and its effect on vehicle performance. Experimental methods, drag force measurements and wind tunnel instrumentation. Computational aerodynamics. Comparisons between experimental results and numerical results. Aerodynamic design for drag reduction. Aerodynamics of engine cooling. Fluid structure interactions. Aerodynamic noise.

Delivery Mode and Teaching Method(s): This one-term course will be delivered using 3 hours of lectures per week.

- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one project worth 30% of the course mark. Assignments will count for the remaining 20%. The exact weighting of the various components will be presented to the students in the first week of lectures.
- **Resources to be purchased by students:** N/A
- **Textbook requirements (sample):** V. Sumantran, G. Sovran, Vehicle Aerodynamics, SAE Publishers, Warrendale, PA, 1996
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: understand methods of automotive aerodynamics for reducing drag, reducing wind noise, and preventing undesired lift forces at high speeds;
  Outcome 2: gain detailed understanding of wind-tunnel testing, computational simulations, thermal analysis, and acoustics.
  Outcome 3: develop innovative methods of improving vehicle aerodynamics, such as integrating the wheel and lights to have a small streamlined surface, which does not have sharp edges crossing the wind stream above the windshield. Also, aerodynamic improvement of engine cooling involves air that enters/exits the engine bay, reaccelerates through a nozzle and exits through the floor.
  Outcome 4: develop methods of computer modelling and wind tunnel testing. Related technologies include tunnels equipped with a rolling road (movable floor for the working section), which prevents a boundary layer forming on the floor of the working section.
  Outcome 5: gain detailed knowledge necessary to comprehend journal publications and other archival literature relevant to automotive aerodynamics.

Information About Course Designer/Developer: Course designed by G. F. Naterer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
G. F. Naterer

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: N/A

Course Title: ENGR 5330G – Automotive Powertrains

Year and Semester: N/A

Course Description and Content Outline: Design of automotive power transmission systems. Loads on the vehicle. Evaluation of various engine and vehicle drive ratios on acceleration performance and fuel economy. Manual transmission and automatic transmission. Combustion in CI and SI engines. Selection of combustion chamber type and shape, intake and exhaust systems. Differences between engine types. Cylinder number, configuration, size and material selection. Selection of mixture preparation, firing order. Mechanism of combustion. Fuel and additive characteristics. Fuel metering and ignition systems. Exhaust emissions and control systems. Heat transfer, friction and lubrication systems. Air pollution. Exhaust systems. Effects of emission on air quality. Sources of auto emission.

Delivery Mode and Teaching Method(s): This one-term course will be delivered using 3 hours of lectures per week.

- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one project worth 30% of the course mark. Assignments will count for the remaining 20%. The exact weighting of the various components will be presented to the students in the first week of lectures.
- **Resources to be purchased by students:** N/A
- **Textbook requirements (sample):** Automotive Powertrains, John Wiley & Sons, New York, 1996 (ISBN 1-86058-020-3)
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: conduct detailed analysis and design of automotive engines, sub-systems and componetns;
  Outcome 2: gain understanding of next-generation engine technologies, including alternative fuels, hybrid vehicles, fuel cells and hydrogen systems.
  Outcome 3: conduct theoretical, numerical and experimental analysis of automotive engines and powertrains;
  Outcome 4: gain detailed knowledge necessary to comprehend journal publications and other archival literature relevant to automotive powertrains.

Information About Course Designer/Developer:
Course designed by G. F. Naterer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
G. Rohrauer

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: N/A

Course Title: ENGR 5340G Automotive Noise, Vibrations and Harshness

Year and Semester: N/A

Course Description and Content Outline: Evaluating the vibration and acoustic characteristics of automotive systems and components. Human comfort and annoyance guidelines and standards. Sound, hearing and physiological effects of noise and vibration. Modeling and experiment methods. Modal analysis and digital signal processing. Noise sources such as gears, bearings, rotating imbalance, gas flow, combustion, impact. Source-path-receiver identification. Sound transmission, air-borne and structure-borne noise. Structural-acoustic interactions. Noise and vibration passive/active control.

Delivery Mode and Teaching Method(s): This one-term course will be delivered using 3 hours of lectures per week.

- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one project worth 30% of the course mark. Assignments will count for the remaining 20%. The exact weighting of the various components will be presented to the students in the first week of lectures.
- **Resources to be purchased by students:** N/A
- **Textbook requirements (sample):** 1) *Vehicle Refinement* (*Controlling Noise and Vibration in Road Vehicles)*, by Matthew Harrison, Elsevier, 2004. 2) *Introduction to Modern Vehicle Design*, by Bertrand D Hsu, SAE, 2002. 3) *Modal Analysis*, by Zhi-Fang Fu and Jimin He, Elsevier, 2001. 4) *Theory of Vibration with Applications,* by W.T. Thomson, Prentice-Hall, 1981.
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: understand the fundamental theory in the areas of vibration and acoustics.
  Outcome 2: evaluate the effects of vibration and acoustic on vehicle systems or components and identify popular approaches for reducing the vibration and acoustic.
  Outcome 3: gain knowledge on human perception to noise, vibration, guidelines and assessment methods;
  Outcome 4: apply popular computational methods for automotive NVH applications.

Information About Course Designer/Developer:
Course designed by faculty eligible to teach this course: Yuping He, Ph.D., Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
Y. He, S. Rakheja, E. Esmailzadeh

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: N/A

Course Title: ENGR 5350G – Automotive Materials and Manufacturing

Year and Semester: N/A

Course Description and Content Outline: Materials in the automotive industry. Selection of materials and shapes. Materials processing and design. Interaction of materials. Performance of materials in service. Examples of new materials. Role of environmental regulations and societal pressures on the selection of alternate materials. Manufacturing processes, including casting, forging, forming, machining and molding for the automotive industry. Quality control and techniques, process selection and methods. Manufacturing considerations for various lightweight automotive structural materials. Stiffness, fatigue, vibrations, dent resistance and crush resistance. Methods of producing lightweight automotive structures are discussed. Design for manufacturing, assembly, disassembly and recycling.

Delivery Mode and Teaching Method(s): This one-term course will be delivered using 3 hours of lectures per week.

- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one project worth 30% of the course mark. Assignments will count for the remaining 20%. The exact weighting of the various components will be presented to the students in the first week of lectures.
- **Resources to be purchased by students:** N/A
- **Textbook requirements (sample):** Automotive Manufacturing, John Wiley & Sons, New York, 1997 (ISBN 1-86058-113-7)
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: understand the advanced technologies, theory and engineering systems used for automotive manufacturing;
  Outcome 2: identify characteristics, properties and processing of materials used in automotive components and susb-systems;
  Outcome 3: gain detailed knowledge of computational tools and experimental methods for testing of automotive materials;
  Outcome 5: acquire knowledge needed to comprehend journal publications and other archival literature relevant to advanced technologies in automotive materials and manufacturing.

Information About Course Designer/Developer:
Course designed by G. F. Naterer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
G. Rizvi

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: N/A

Course Title: ENGR 5360G – Automotive Software and Electronics

Year and Semester: N/A

Course Description and Content Outline: Automotive design software tools, including FEA, CFD, Unigraphics and other packages. Software development and integration for design and manufacturing of automobiles. Electrical systems in automobiles, including power supplies, junction transistors, sensors and rectifiers. Signal amplifiers, gain-bandwidth limitations and circuit models. Motor drive control, inverters, actuators, PWM controllers, active filters, signal conditioners, power electronics and regulators. Battery chargers and solar cells. Automotive applications and case studies.

Delivery Mode and Teaching Method(s): This one-term course will be delivered using 3 hours of lectures per week.

- **Student Evaluation:** The principal form of assessment will be a final exam worth 50% of the course mark and one project worth 30% of the course mark. Assignments will count for the remaining 20%. The exact weighting of the various components will be presented to the students in the first week of lectures.
- **Resources to be purchased by students:** N/A
- **Textbook requirements (sample):** R. Bosch, *Automotive Electrics and Automotive Electronics*, John Wiley & Sons, New York, 2004 (ISBN 1-86058-436-5)
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: have detailed understanding of electronics with applications to automotive systems, including microelectronics, sensors and control systems;
  Outcome 2: design of automotive electrical systems, including effects of electromagnetic compatibility and interference suppresion;
  Outcome 3: analysis of alternators, batteries, starter motors and lighting systems;
  Outcome 4: understand sensor technologies for speed, rpm, acceleration, temperature, vibrations and force sensors;
  Outcome 5: design and operation of automotive software packages;
  Outcome 6: understand data processing, software and data transfer between automotive electronic systems;
  Outcome 7: gain detailed knowledge necessary to comprehend journal publications and other archival literature relevant to automotive software and electronics.

Information About Course Designer/Developer:
Course designed by G. F. Naterer, PhD, Faculty of Engineering and Applied Science

Identify faculty to teach the course and/or statement "faculty to be hired":
Faculty to be hired

If the method of instruction includes on-line delivery (technology-based, computer-based and web-based), what percentage of the course content will be offered on-line? N/A

Faculty qualifications required to teach/supervise the course:
PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Classroom requirements: Standard computer enabled UOIT classroom equipped with VRC, DVD, data projectors, and internet access.

Equipment requirements: N/A

Course Title: ENGR 5610G – Stochastic Processes

- **Course Description and Content Outline:** Review of probability theory including, random variables, probability distribution and density functions, characteristic functions, convergence of random sequences, and laws of large numbers. Random processes, stationarity and ergodicity, correlation and power spectral density, cross-spectral densities, response of linear systems to stochastic input, innovation and factorization, Fourier and K-L expansion, mean square estimation, Markov chains and processes, queuing theory. Applications in communications and signal processing, emphasis on problem solving using probabilistic approaches.
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week.
- **Student Evaluation:** assignments: 10%, mid-term test: 20%, research project: 20%, and final exam: 50%.
- **Textbook requirements:** A. Papoulis and S.U. Pillai, *Probability, Random Variables and Stochastic Processes*, McGraw-Hill, 2003, ISBN 0-07-366011-6
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome-1: know the fundamentals of probability Theory and random variables.
  Outcome-2: understand the meaning and importance of the laws of large numbers.
  Outcome-3: distinguish between strict-sense and wide-sense stationary random processes
  Outcome-4: analyze systems with stochastic inputs.
  Outcome-5: obtain the correlation functions of practically important stochastic processes and analyze it.
  Outcome-6: derive power spectral density for stationary signals.
  Outcome-7: expand the stochastic process.
  Outcome-8: factorize stochastic processes and whiten them.
  Outcome-9: grasp the importance of Markov process and basic renewal processes.
  Outcome-10: analyze birth-death processes.
  Outcome-11: appreciate and benefit from applying their knowledge on stochastic processes to the applications in Communications and Signal Processing.

Information About Course Designer/Developer:
Course designed by Shahram Shahbazpanahi, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  S. Shahbazpanahi, A. Grami

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5620G – Digital Communications

- **Course Description and Content Outline:** Optimum receiver principles: AWGN, geometric representation of signals, maximum likelihood criterion and optimum decision regions, correlation receivers and matched filters, probability of error and union bound; digital bandpass modulation (ASK, FSK, PSK, QAM, CPFSK, CPM), baseband systems (PAM, PRS), performance comparisons: bit error rate, bandwidth, power, complexity; fundamental limits in information theory: entropy and the source coding theorem; channel capacity and the channel coding theorem; information capacity theorem and design trade-offs
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week.
- **Student Evaluation:** assignments: 20%, mid-term test: 30%, and final exam: 50%.
- **Textbook requirements:** J.G. Proakis, *Digital Communications*, McGraw-Hill, 2001, ISBN 0-07-232111-3.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome-1: understand Gram-Schmidt orthogonalization procedure.
  Outcome-2: categorize classes of noise and characterize Additive White Noise Gaussian Noise and its impact on performance.
  Outcome-3: analyze coherent detection of signals in noise.
  Outcome-4: grasp the fundamentals of optimum receivers.
  Outcome-5: derive probability of error and assess bit error rate and symbol error rate.
  Outcome-6: find spectra for various modulation schemes and line codes.
  Outcome-7: identify trade-offs for coherent and non-coherent detection schemes.
  Outcome-8: know theoretical aspects design trade-offs for all M-PSK and M-QAM systems in use.
  Outcome-9: appreciate Shannon's theorems, their limits, roles, benefits, and design trade-offs.
  Outcome-10: obtain insights into rate distortion theory and its applications.

- **Information About Course Designer/Developer:**
  Course designed by Ali Grami, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology.

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  A. Grami, S. Shahbazpanahi.

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5630G – Statistical Signal Processing

- **Course Description and Content Outline:** Detection Theory: fundamentals of detection theory, Neyman-Pearson theorem, receiver operating characteristics, minimum probability of error, Bayes risk, binary multiple hypothesis testing, minimum Bayes risk detector, Maximum Likelihood detector, Chernoff bound, detection of deterministic and random signals. Estimation Theory: mathematics of estimation theory, minimum variance unbiased estimation, Cramer-Rao lower bund, linear models, general minimum variance unbiased estimation, best linear unbiased estimators, Maximum Likelihood estimation.
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week.
- **Student Evaluation:** mid-term test: 20%, research project: 40%, and final exam: 40%.
- **Textbook requirements:** H.L. Van Trees, *Detection, Estimation, and Modulation Theory, Part I*, John Wiley, 2004, ISBN 0-471-09517-6.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome-1: know the fundamentals of detection and estimation.
  Outcome-2: characterize the operation of a detector.
  Outcome-3: understand the concepts of consistency and bias in estimation.
  Outcome-4: decide which criteria to use to estimate or to detect a parameter.
  Outcome-5: derive performance bounds for estimation or a detection problem.
  Outcome-6: analyze the performance of different estimation or detection techniques by comparing the performance of the estimator or detector with the corresponding bounds.
  Outcome-7: appreciate the Maximum Likelihood approach in detection and estimation.
  Outcome-8: apply the theory of estimation and detection to communication systems.
  Outcome-9: grasp the basic idea of linear estimators.
  Outcome-10: apply the theory of estimation to spectral analysis and array processing.
- **Information About Course Designer/Developer:** Course designed by S. Shahbazpanahi, PhD, Faculty of Engineering and Applied Science
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  S. Shahbazpanahi, A. Grami
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5640G – Advanced Wireless Communications

- **Course Description and Content Outline:** Wireless communications systems, technologies, and standards; propagation environments (indoor/outdoor, fixed/mobile, cordless/wireless, voice/data/video/multimedia, radio/infra-red/optical, terrestrial/satellite); spread spectrum techniques; multiple access schemes (TDMA, OFDM, MC-CDMA), duplexing methods and diversity techniques; mobile cellular systems: frequency reuse, cell splitting, cellular traffic, call processing, hand-off, roaming, location determination; radio link analysis; multipath fading and fading models; wireless security and protocols, ad hoc mobile and sensor networks; link design aspects for emerging techniques (UWB, RFID)
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week.
- **Student Evaluation:** assignments: 10%, mid-term test: 20%, research project: 20%, and final exam: 50%.
- **Textbook requirements:** S.G. Glisic, *Advanced Wireless Communications*, Wiley, 2004, ISBN 0-470-86776-0.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome-1: know the fundamentals of IEEE wireless standards (WLAN, WPAN, WMAN).
  Outcome-2: describe the principles of operations of cellular mobile systems (IS-95, I-136, GSM, 3G-WCDMA).
  Outcome-3: assess diversity techniques (time, space, polarization, frequency, angle, multipath).
  Outcome-4: characterize various fading channels and appreciate various fading models and parameters.
  Outcome-5: know how equalization and synchronization methods are employed in wireless environments.
  Outcome-6: analyze Orthogonal Frequency Division Multiplexing and Multi-Carrier CDMA.
  Outcome-7: carry out network modeling, analysis, and simulation.
  Outcome-8: research major issues in mobile ad hoc and sensor networks and provide potential solutions.
  Outcome-9: conduct thorough link budgets for emerging wireless systems.
  Outcome-10: grasp the basics of space-time coding and their benefits and applications.
- **Information About Course Designer/Developer:**
  Course designed by A. Grami, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology.
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  A. Grami, S. Shahbazpanahi.
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5650G – Adaptive Systems and Applications

- **Course Description and Content Outline:** This course covers algorithms, filter structures, and applications in adaptive systems. Basic information-processing operations and recursive algorithms are discussed. Also, distinct methods for deriving recursive algorithms for the operation of adaptive filters are identified. Lastly, applications of adaptive filters, mainly to digital communication systems, are explored in details.
- **Content Outline by Topic:**
  - Linear filtering problem and their types
  - Recursive algorithms and their parameters
  - Methods for deriving algorithms
  - Applications of adaptive filters to communications
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam: 20%, research project and presentation: 40%, assignments: 20%, and final exam: 20%.
- **Textbook requirements:** S. Haykin, *Adaptive Filter Theory*, Pearson Education, 2001, ISBN 0130901261.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: model filtering, smoothing, and prediction problems.
  Outcome 2: analyze algorithms based on various performance measures, such as rate of convergence, mis-adjustment, robustness, computational requirements, structure, and numerical properties.
  Outcome 3: understand methods for deriving recursive algorithms, namely Wiener filter theory, Kalman filter theory, and least squares.
  Outcome 4: assess performance of transversal and lattice structures in adaptive systems.
  Outcome 5: apply adaptive filters to communications, namely to system identification, adaptive equalization, spectrum estimation, noise and echo cancellation, adaptive beam forming, and carrier and symbol synchronization.
  Outcome 6: carry out numerical analysis and computer simulations for various adaptive systems and a variety of scenarios.

- **Information about Course Designer/Developer:**
  Course designed by A. Grami, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  S. Shahbazpanahi, A. Grami

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in electrical engineering, and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5670G – Cryptography and Secure Communications

- **Course Description and Content Outline:** This course covers diverse topics on cryptography and security including classical encryption, symmetric and public-key cryptography, key management, message authentication, digital signatures, denial-of-service (DoS), distributed DoS, malicious software, and intrusion detection systems.
- **Content Outline by Topic:**
  - o Introduction to security and cryptography
  - o Classical cryptography and block ciphers and Data Encryption Standard
  - o Advanced Encryption Standard
  - o Confidentiality using symmetric encryption
  - o Public-key cryptography and RSA, and key management
  - o Message authentication and hash functions and authentication applications
  - o Web security, malicious software & denial-of-service attacks
  - o Firewalls & intrusion detection systems
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** mid-term test: 20%, research project and presentation: 30%, assignments: 25%, and final exam: 25%.
- **Textbook requirements:** W. Stallings. *Cryptography and Network Security: Principles and Practices (4th edition)*. Prentice Hall, 2006. ISBN: 0131873164.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  - Outcome 1: apply fundamentals of security, and symmetric and public-key cryptography, including block ciphers, RSA, key management, hash functions, detection of and reaction to mal-code attacks, mitigation of denial-of-service attacks, and network disruptions.
  - Outcome 2: articulate the basic fundamentals of number theory applied to cryptography in order to provide confidentiality, integrity and availability in information systems.
  - Outcome 3: assess the security of information systems based on the quality of cryptographic algorithms and protocols, authentication systems, firewalls, and intrusion detection systems.
  - Outcome 4: design secure information systems using symmetric and public-key cryptography applied to Web services and transactions.
  - Outcome 5: determine the suitability of a security system based on its cryptographic strengths and vulnerabilities, and the value and significance of the protected information.
  - Outcome 6: evaluate the security of commercial applications by understanding the fundamentals of their underlying cryptographic algorithms.

- **Information about Course Designer/Developer:**
  Course designed by M. Vargas Martin, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  M. Vargas Martin, R. Liscano

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering/computer science, & relevant experience in teaching & research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5720G – Real-Time and Embedded Computing

- **Course Description and Content Outline:** The term ``real-time'' can be used to describe any information processing activity or system which has to respond to externally generated input stimuli within a finite and specified period. A key feature of all these applications is the role of the computer as an information processing component within a larger engineering system. For this reason, such applications have become known as ``embedded computer systems''. The course provides the opportunities to the students to learn various fundamental issues as well as practical developments in the area of real-time embedded systems.
- **Content outline by topic:**
  - o Issues and concepts: definition of real-time, temporal and event determinism, architecture review and interfacing, Interrupts, traps and events, response times and latency, real-time clocks
  - o Operating systems: structure of an RTOS, nucleus, servers, schedulers and dispatchers, Synchronization and communication: priority and distribution queues, device drivers
  - o Languages in real-time: concurrency Issues, real-time programming in high-level languages, e.g. C, Java, C#
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam: 20%, research project: 30%, assignments: 15%, and final exam: 25%, paper review: 10%.
- **Textbook requirements:** Jane Liu, *Real-time Systems*, Prentice Hall; ISBN: 0130996513; 2000; Douglass B P, *Real Time UML: Advances in the UML for Real-time Systems*, ISBN 0321160762, Addison-Wesley (2004).
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: embedded systems tools and techniques.
  Outcome 2: aspects of high level languages appropriate to embedded systems.
  Outcome 3: features of real-time schedulers, kernels and operating systems.
  Outcome 4: alternative real-time strategies not based on operating systems.
  Outcome 5: applications that are subject to critical timing constraints.
  Outcome 6: design and implementation of simple real-time systems based on real-time OS kernels.
  Outcome 7: work on projects related but not limited to data acquisition and embedded controlling systems, embedded system software development, scheduling analysis, and hardware/software co-design.

- **Information About Course Designer/Developer:**
  Course designed by R. Liscano, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement “faculty to be hired”:**
  R. Liscano, C. Martin

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in Engineering or Computer Science with relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR5730G – Algorithms and Data Structures

- **Course Description and Content Outline:** This course studies the mathematical foundations of algorithms and data structures, covering sorting and searching algorithms, stacks, queues, lists, trees, hash tables, search trees, binomial heaps, minimum spanning trees, shortest paths, the theory of NP-completeness, and approximation algorithms.
- **Content Outline by Topic:**
  - o Functions, summations, recurrences, set theory, counting
  - o The heap sort algorithm and the quick sort algorithm
  - o Lower bounds for sorting
  - o Stacks and queues
  - o Linked lists, trees
  - o Hash tables and functions
  - o Insertion and deletion in binary search trees
  - o Message authentication and hash functions
  - o Binomial trees and breadth-first and depth-first search, minimum spanning trees
  - o Dijkstra's algorithm and the Bellman-Ford algorithm
  - o Theory of NP-completeness proofs and problems
  - o Approximation algorithms to NP problems
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 25%, homework assignments: 15%, and final exam: 40%.
- **Textbook requirements:** T.H. Cormen, *et al. Introduction to Algorithms (2nd ed.)*. MIT Press, McGraw-Hill, New York, USA, 2006.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: apply the fundamentals of algorithms analysis and design, and data structures.
  Outcome 2: articulate the fundamentals of sorting and searching algorithms for data structures.
  Outcome 3: analyze problems from the perspective of computational efficiency.
  Outcome 4: design solutions that involve efficient algorithms to perform fundamental computation tasks that operate on appropriate and efficient data structures.
  Outcome 4: analyze the algorithmic complexity of problems and be able to design approximation algorithms for NP problems.

- **Information About Course Designer/Developer:**
  Course designed by M. Vargas Martin, PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  M. Vargas Martin, R. Liscano

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in electrical/software engineering or computer science, and relevant experience in teaching & research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5750G – Software Quality Management

- **Course Description and Content Outline**: An intensive investigation into software quality engineering issues, including testing techniques, defect detection and prevention, reliability engineering, examination of maintenance issues and configuration management. Software evolution issues, including planning for evolution, round out the course. Students will do a major team project examining issues in defect reduction. The course will have a strong industrial flavour.
- **Content outline by topic:**
  - Introduction to software quality engineering
  - Software Quality Standards
  - Testing: concepts, issues and techniques
  - Life cycle testing
  - Coverage and usage testing
  - Software quality metrics
  - Defect reduction, defect classification
  - Software inspection
  - Developing a software quality plan
  - Safety and quality Issues
  - Software reliability engineering
  - Software evolution
  - Maintenance issues
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam: 10%, research project and presentation: 20%, assignments: 30%, and final exam: 40%.
- **Textbook requirements:** J. Tien, *Software Quality Engineering,* John Wiley 2005
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: understand the importance of good quality in software.
  Outcome 2: explain and use the basic Quality Life Cycle.
  Outcome 3: use the 7 basic tools of quality control.
  Outcome 4: write a software quality management plan.
  Outcome 5: use software quality metrics.
  Outcome 6: implement defect reduction programs.
  Outcome 7: manage safety-software issues.
  Outcome 8: plan for the evolution of software.
  Outcome 9: manage software maintenance.
  Outcome 10: analysis case studies in software quality.
- **Information About Course Designer/Developer:**
  Course designed by J.M. Bennett, PhD, Faculty of Engineering and Applied Science
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  J.M. Bennett, R. Liscano, C. Martin
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering/computer science & relevant experience in teaching & research. Faculty members may be registered Professional Engineers.

Course Title: ENGR 5760G – Software Metrics

- **Course Description and Content Outline**: Analysis of software metrics. Introduction to the techniques of measurement. Syntax and semantics of software metrics. Planning a metrics program. Using metrics for prediction (quality, project time estimations). Case studies.
- **Content outline by topic:**
  - Fundamentals of Measurement and Experimentation.
  - Visualizing Metrics
  - Software Metrics
  - Estimation Metrics
  - Process Control with Software Metrics
  - Project Control with Software Metrics
  - Implementing and Managing a Metrics Program
  - Case Studies
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** Mid-term exam: 10%, research project and presentation: 20%, homework assignments: 30%, and final exam: 40%.
- **Textbook requirements:** *Software Metrics, 2nd ed.* Fenton, N.E. & Pfleeger, S.L.
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to
  Outcome 1: measure in an engineering way.
  Outcome 2: use the Goal-Question-Metric paradigm.
  Outcome 3: capture meaningful metrics.
  Outcome 4: display the reduced data in a meaningful way.
  Outcome 5: apply control theory to software metrics.
  Outcome 6: handle metrics related to product and process, internally and externally.
  Outcome 7: plan and execute a measurement program.
  Outcome 8: predict the outcome of software activities using appropriate metrics.
  Outcome 9: control and predict software project management.
  Outcome 10: analyze case studies.

- **Information About Course Designer/Developer:**
  Course designed by J.M. Bennett, PhD, Faculty of Engineering and Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  J.M. Bennett, C. Martins, R. Liscano

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research.
  Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5850G – Analog Integrated Circuit Design

- **Course Description and Content Outline:** This course covers modeling of IC devices, current sources and mirrors, gain stages, level shifters, analysis and design of BJT and MOS operational amplifiers, current-feedback amplifiers, wideband amplifiers and comparators. Frequency response of amplifiers, feedback techniques, analysis and design, stability and compensation of amplifiers, high slew-rate topologies, noise in IC circuits, fully differential circuits, analog multipliers and modulators, CAD tools for circuit design and testing.
- **Content Outline by Topic:**
  - o Operational amplifiers modeling, applications and topologies
  - o CAD simulation tools, IC fabrication technology and device models
  - o Gain stages, current sources and active loads
  - o Frequency response: single-stage frequency response; multistage frequency response; frequency/time response relationship
  - o Feedback: gain sensitivity; effect on distortion; feedback configurations; effect of loading
  - o Frequency response and stability of feedback amplifiers
  - o Noise in integrated circuits: noise sources; noise models; circuit noise calculations; equivalent input noise generators; noise bandwidth; noise figure and noise temperature.
  - o Translinear and current-mode circuits
  - o Analog multipliers: Gilbert multiplier; multiplier specifications; multiplier applications
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 20%, homework assignments: 20%, and final exam: 40%.
- **Textbook requirements:** P.R. Gray, P.J. Hurst, S.H. Lewis, R.G. Meyer, J., *Analysis and Design of Analog Integrated Circuits*, Wiley & Sons, 2001, ISBN 0-471-32168-0, 4th Ed.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: analyze and design transistor-based op amp filter and oscillator topologies.
  Outcome 2: analyze and design multi-device gain stages in bipolar and MOS technologies.
  Outcome 3: analyze and design bandgap reference circuits.
  Outcome 4: analyze the frequency response of transistor-based amplifier topologies.
  Outcome 5: analyze and design feedback circuits & establish stability in feedback amplifiers.
  Outcome 6: analyze the noise performance of analog circuits.
  Outcome 7: analyze and design translinear circuits.
  Outcome 8: design an analog circuit of the students choosing to meet desired specifications.

- **Information about Course Designer/Developer:**
  Course designed by A. Grami PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  To be hired

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in electrical engineering, and relevant experience in teaching & research.
  Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5860G – Digital Integrated Circuit Design

- **Course Description and Content Outline:** This course covers the analysis and design of digital integrated circuits. Students are instructed in methods and the use of computer-aided design tools for the design and testing of large-scale integrated digital circuits.
- **Content Outline by Topic:**
  - o CMOS devices and manufacturing
  - o Integrated circuit inter-connect
  - o CMOS combinational and sequential logic design
  - o CMOS design implementation and timing
  - o Static and dynamic characteristics
  - o DC and transient modeling
  - o CMOS datapath and control subsystems
  - o CMOS memory subsystems
  - o CMOS testing
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 20%, homework assignments: 20%, and final exam: 40%.
- **Textbook requirements:** Rabaey, Chandrakasan & Nikolic, *Digital Integrated Circuits: Design*, Prentice Hall, 2003., ISBN 01309009963
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  - Outcome 1: apply in depth understanding of CMOS inverter, CMOS combinational and CMOS sequential circuits.
  - Outcome 2: study and design the arithmetic building blocks, memory and array structures.
  - Outcome 3: explore and explain about the effect of interconnect on the performance of the circuits.
  - Outcome 4: consider the timing issues in high speed digital circuits and implement methods to overcome the issues.
  - Outcome 5: understand and apply the concepts of design methodologies and VLSI implementations.
  - Outcome 6: use CAD tools to design and verify typical digital circuits.

- **Information about Course Designer/Developer:**
  Course designed by A. Grami PhD, Faculty of Engineering and Applied Science and Faculty of Business and Information Technology

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  To be hired

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in electrical engineering, and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5910G – Embedded Real-Time Control Systems

- **Course Description and Content Outline:** This course focuses on the design and implementation techniques for embedded real-time control systems. It covers embedded system design, instruction sets for microprocessor architecture, I/O, interrupts, hardware and software of embedded systems, program design and analysis, practical issues, multi-tasking operating systems, scheduling and system design techniques.
- **Content outline by topic:**
  - o Embedded system design process
  - o Instruction sets for microprocessor architecture
  - o Mechanisms for input, output, and interrupts
  - o Basic hardware and software platforms and Embedded computing
  - o Program design and analysis
  - o Practical issues related to computer based control systems
  - o Multi-tasking operating systems for embedded applications
  - o Priority scheduling and System design techniques
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 25%, homework assignments: 15%, and final exam: 40%.
- **Textbook requirements:** Wittenmark, K.J. 2000, *Principles of Embedded Computing System Design,* Wayne Wolf, Morgan Kaufmann Publishers. ISBN 1-55860-541-X
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  - Outcome 1: articulate the characteristics of embedded and real-time systems in terms of functionality, time constraints, power consumption, cost and development environment.
  - Outcome 2: become familiar with the design process in real-time applications; use UML modeling language to design real-time applications.
  - Outcome 3: describe architecture features of ARM RISC processor and SHARC processor; understand the difference between the two processors; and use instruction sets of these processors to accomplish simple operations.
  - Outcome 4: understand major challenges in embedded computing system design.
  - Outcome 5: get familiar with practical issues related to computer based control systems: PID tuning, anti-aliasing filters, integrator saturation and windup, switch de-bouncing, selection of sampling rates.
  - Outcome 6: write simple programs with multi-tasking operating systems.
  - Outcome 7: design, build and integrate hardware and software for simple real-time embedded applications.
  - Outcome 8: use industry-grade tools & development environment for embedded applications.
- **Information About Course Designer/Developer:**
  Course designed by J. Ren, PhD, Faculty of Engineering & Applied Science and L. Lu, PhD, School of Energy Systems & Nuclear Science and Faculty of Engineering & Applied Science
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  J. Ren, L. Lu
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5920G – Analysis and Control of Nonlinear Systems

- **Course Description and Content Outline:** Introduction to nonlinear systems, phase plane analysis, stability determination by Lyapunov direct method, advanced stability theory, existence of Lyapunov functions, describing function analysis, nonlinear control system design by feedback linearization, sliding control, variable structure control, adaptive control of linear and nonlinear systems, control of multi-output systems, control of multi-input multi-output systems.
- **Content outline by topic:**
  - o Introduction to nonlinear systems
  - o Planar systems and their phase space
  - o Lyapunov stability theory
  - o Input-output stability
  - o Absolute stability
  - o Passivity
  - o Perturbed systems
  - o Feedback linearization
  - o Sliding mode control
  - o Back-stepping control
  - o Lyapunov based adaptive control
  - o Nonlinear observers
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 25%, homework assignments: 15%, and final exam: 40%.
- **Textbook requirements:** Khailil, H.K. *Nonlinear Systems – 3rd Edition*. Prentice Hall, 2002.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  - Outcome 1: get familiar with the basic fundamentals of nonlinear phenomena: multiple equilibria, limit cycles, complex dynamics, bifurcations.
  - Outcome 2: identify second order nonlinear systems: phase plane techniques, limit cycles-Poincare-Bendixson theory, index theory.
  - Outcome 3: understand Input-output analysis and stability: small gain theorem, passivity, describing functions.
  - Outcome 4: understand Lyapunov stability theory: basic stability and instability theorems, LaSalle's theorem, indirect method of Lyapunov.
  - Outcome 5: linearize a system by state feedback: input-output and full state linearization, zero dynamics, inversion, tracking, stabilization.
  - Outcome 6: apply basic software tools to the analysis of nonlinear systems.
- **Information About Course Designer/Developer:**
  Course designed by L. Lu, PhD, School of Energy Systems and Nuclear Science and Faculty of Engineering and Applied Science
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  L. Lu and E. Esmailzadeh
- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5930G – Adaptive Control

- **Course Description and Content Outline:** This is a course on the general principles of adaptive control and learning. This course will cover real-time parameter estimation, deterministic self-turning regulators, stochastic & predictive self-tuning regulators, model reference adaptive systems, gain-scheduling, properties of adaptive systems, robust adaptive control schemes, adaptive control of nonlinear systems, practical issues and implementation.
- **Content outline by topic:**
  - Real-time parameter estimation
  - Deterministic self-turning regulators
  - Stochastic & predictive self-tuning regulators
  - Model reference adaptive systems
  - Gain-scheduling
  - Properties of adaptive systems
  - Robust adaptive control schemes
  - Adaptive control of nonlinear systems
  - Practical issues and implementation
- **Delivery Mode and Teaching Method:** 3 hours of lectures per week.
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 25%, homework assignments: 15%, and final exam: 40%.
- **Textbook requirements:** K. J. Astrom and B. Wittenmark, *Adaptive Control*, 2nd , Addison-Wesley, 1995
- **Learning Outcomes.** Students who successfully complete the course have reliably demonstrated the ability to

  Outcome 1: understand the fundamental concepts of adaptive control and learning.
  Outcome 2: understand and apply the concepts of convergence, stability, and robustness to analyze control systems.
  Outcome 3: estimate parameters and learn models from empirical data.
  Outcome 4: understand and analyze the behavior of adaptive control schemes such as model reference.
  adaptive control and self tuning regulators.
  Outcome 5: articulate perturbation and averaging theory.
  Outcome 6: use advanced stability theory to analyze adaptation schemes.
  Outcome 7: design of gain-scheduling controllers.
  Outcome 8: be familiar with practical issues in implementation of adaptive controllers.

- **Information About Course Designer/Developer:**
  Course designed by J. Ren, PhD, Faculty of Engineering & Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  J. Ren, L. Lu

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in engineering and relevant experience in teaching and research.
  Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5940G – Intelligent Control Systems

- **Course Description and Content Outline:** With the advance of increasingly faster computing hardware and cheaper memory chips, computational intelligence, also known as a part of "soft computation", is becoming more and more important in control engineering. This course will equip the student with the essential knowledge and useful resources to solve some of the systems control problems not easily solved using conventional control methods. This course will cover: fundamentals of fuzzy set theory, structures of fuzzy logic controllers, structures of neural networks, learning algorithms, genetic algorithms.
- **Content outline by topic:**
  - General characteristics of intelligent control systems.
  - Fundamentals of fuzzy set theory.
  - Application of fuzzy logic in control.
  - Basic and complex structures of fuzzy logic controllers.
  - Automated design and self-organization of fuzzy controllers.
  - Basic structures of neural nets.
  - Static and dynamic neural nets.
  - Learning algorithms.
  - Application of neural nets in modeling, identification and control of systems.
  - Optimization by using genetic algorithms.
  - Examples of intelligent control systems in industry.
- **Delivery Mode and Teaching Method:** One-term 3 hours of lectures per week.
- **Student Evaluation:** mid-term exam: 20%, research project and presentation: 25%, homework assignments: 15%, and final exam: 40%.
- **Textbook requirements:** C.T.Lin, C.S.G.Lee (1996): *Neural Fuzzy systems - A Neuro-Fuzzy Synergysm to Intelligent Systems*, Prentice Hall, New York.
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome 1: understand fundamental concepts of fuzzy logic (FL), neural network (NN) and genetic algorithm (GA).
  Outcome 2: use NN/FL to model the complex static/dynamic systems.
  Outcome 3: use NN/FL as a tool to construct the complex nonlinear controller to better control the complex dynamics systems.
  Outcome 4: use GA to solve global optimization problem.
  Outcome 5. gain hands-on experience on MATLAB toolboxes for NN and FL to solve practical control design problems.
  Outcome 6: get familiar with the Internet resources on computational intelligent related to control engineering.

- **Information About Course Designer/Developer:**
  Course designed by J. Ren, PhD, Faculty of Engineering & Applied Science

- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  J. Ren

- **Faculty qualifications required to teach/supervise the course:**
  PhD degree in electrical engineering and relevant experience in teaching & research.
  Faculty members will normally be registered Professional Engineers.

Course Title: ENGR 5970G – Power Electronics

- **Course Description and Content Outline:** This course covers fundamentals of lossless switching techniques: zero-voltage switching, zero-current switching; resonant converters: series, parallel and series-parallel topologies; soft-switching converters: natural and auxiliary commutation converter topologies control techniques: variable frequency phase-shift and hybrid control; applications to single-phase three-phase and multi-level converters; line- and force-commutated converters; high power ac/dc and dc/ac converter structures and switching techniques; principles of HVDC and HVAC systems.
- **Delivery Mode and Teaching Method:** 3 hours of class lectures per week.
- **Student Evaluation:** assignments: 25%, mid-term test: 25% and final exam: 50%.
  Textbook requirements: R.W. Erickson, D. Maksimovic, *Fundamentals of Power Electronics*, Springer, 2001, ISBN: 0792372700
- **Learning Outcomes:** Students who successfully complete the course have reliably demonstrated the ability to:
  Outcome-1: derive averaged equivalent circuit models of converters operating in steady state
  Outcome-2: apply Middlebrook's Extra Element Theorem to the input filter design and the resonant inverter design.
  Outcome-3: understand the dynamics of discontinuous conduction mode converters and current-mode control.
  Outcome-4: present the basic magnetics theory necessary for informed design of magnetic components in switching power converters.
  Outcome-5: model various classes of converters and identify their technical requirements, applications and characteristics.
  Outcome-6: appreciate engineering design process and the need for design-oriented analysis.
  Outcome-7: develop design techniques for practical applications.
  Outcome-8: carry out computer simulation of power electronics systems.
- **Information About Course Designer/Developer:**
  Course designed by A. Grami, Ph.D., Faculty of Engineering and Applied Science and Faculty of Business and Information Technology.
- **Identify faculty to teach the course and/or statement "faculty to be hired":**
  R. Marceau, additional faculty to be hired
- **Faculty qualifications required to teach/supervise the course:**
  Ph.D. degree in Electrical Engineering and relevant experience in teaching and research. Faculty members will normally be registered Professional Engineers.

4.6 Collateral and supporting departments

The School of Energy Systems and Nuclear Science, which is affiliated with the Faculty of Engineering and Applied Science, is an important component of this program. Also, the Faculty of Business and Information Technology, and the Faculty of Science at the University of Ontario Institute of Technology are supporting the proposed programs, in part by providing faculty members who contribute their expertise and time to the proposed programs, as well as sharing resources where mutually beneficial.

5 OUTCOMES

5.1 Enrolment and graduations

This is an application for a new program, so this section is not applicable.

5.2 Employment

Employment records of the graduates from the program will be maintained on an ongoing basis.

5.3 Publications

Publication records of the graduates from the program will be maintained on an ongoing basis.

5.4 Projected graduate intake and enrolments

Table 5-1 shows the projected graduate student enrolment (both full-time and part-time students) over the next seven years. As additional faculty are hired over the next few years, the planned enrolment in the program is expected to increase.

Table 5-1 Projected Intake and Enrolments for MASc and MEng Programs

YEAR	FULL-TIME				PART-TIME				TOTAL ENROLMENT	
	Intake		Enrolments		Intake		Enrolments		MASc	MEng
	MASc	MEng	MASc	MEng	MASc	MEng	MASc	MEng		
2007	5-10	5-10	5-10	5-10	1-3	5-10	1-3	5-10	6-13	10-20
2008	10-15	5-10	15-25	10-20	1-3	5-10	2-6	10-20	17-31	20-40
2009	10-15	5-10	20-30	10-20	1-3	5-10	3-9	10-20	23-39	20-40
2010	10-20	10-15	20-35	10-25	1-3	5-10	3-9	10-20	23-44	20-45
2011	10-20	10-15	20-40	10-30	1-3	5-10	3-9	10-20	23-49	20-50
2012	10-20	10-15	20-40	10-30	1-3	5-10	3-9	10-20	23-49	20-50

2013	10-20	10-15	20-40	10-30	1-3	5-10	3-9	10-20	23-49	20-50

In the spring of 2007, the first class of students will graduate from UOIT's undergraduate programs in Manufacturing Engineering and Nuclear Engineering, followed by the first Mechanical Engineering and Energy Engineering graduates in 2008, and the first Automotive Engineering graduates in 2009. As more students successfully complete their undergraduate degrees at UOIT, it is expected that the enrolments in the Automotive Engineering master's programs will rise, as some of these students pursue post-graduate degrees.

APPENDIX A: Survey of Worldwide Graduate Programs in Automotive Engineering

Many graduate programs in automotive engineering are offered in the United States. For example, the University of Michigan offers an MEng degree in Automotive Engineering. Recent figures indicate that the number of enrolled graduate students is 33 full-time students (7 women) and 38 part-time students (7 women), including 14 international students. The MEng degree requires 30 credit hours of course work (or 10 courses). In addition to a mandatory course (Automotive Engineering), students have courses from required areas of powertrains and vehicle dynamics, plus additional elective courses. There is an Automotive Engineering Seminar and Project, which is graded.

At the University of Michigan, Dearborn, an MSE degree in Automotive Systems Engineering is offered. Recent figures have approximately 20 full-time students and 65 part-time students enrolled in the program. Students take 4 courses from a core area, plus courses in a concentration area (such as automotive manufacturing or materials). Capstone projects are team-oriented and they emphasize the interdisciplinary nature of the program. A capstone project or thesis is conducted over a period of two semesters. Also, a thesis is submitted by each individual student.

Kettering University in Flint, Michigan, offers an MSEng in Automotive Systems Engineering. The key faculty research areas include computational fluid dynamics (CFD), emission materials science, plasma, fuel cells and engine combustion. Recent figures indicate that there are about 44 students enrolled in the program, plus 8 international students. The curriculum requires ten four-credit courses for completion of the MSEng degree. This includes MATH 601 (Advanced Engineering Mathematics) and 4 core courses from a group of 6 courses. Also, 4 additional elective courses from a group of 10 courses are required. A thesis or 600-level elective course is also required.

A graduate program in automotive engineering at Clemson University (Clemson, South Carolina) emphasizes product development and vehicle systems integration. The program begins in the Fall of 2006. It will be located in a dedicated state-of-the-art facility. Current plans call for four senior, world-class chaired faculty members in automotive engineering: systems integration, design and development, electronic systems, and manufacturing (hired). In addition, six tenure-track faculty members, closely associated with senior faculty members will be hired.

Outside North America, most auto-making countries have graduate programs in Automotive Engineering. An MSc programme in Automotive Systems Engineering at Loughborough University, UK, is aimed at engineers working in the automotive industry, to extend and deepen their skills and understanding of automotive systems. The MSc comprises 180 modular credits, made up from six modules valued at 15 credits each, plus a Master's Project valued at 90 credits. From the group of six taught modules, two modules are compulsory and four more electives are chosen from a list of available options. The course is also attended by graduate engineers working in the automotive industry. It runs as a series of intensive week-long modules conducted at an on-site University conference centre. The compulsory modules are (1) Vehicle Functional Performance and (2) Vehicle Systems Analysis. The elective modules (select four) are (1) Vehicle NVH, (2) Electronic Systems Integration, (3) Powertrain Engineering, (4) Vehicle Platform Engineering, (5)

Engine Performance Advanced Technologies, (6) Design Integrated Manufacture, (7) Systems Safety and Reliability Engineering and (8) Manufacturing Systems.

Cranfield University in Bedfordshire, UK, offers an MSc degree in Automotive Product Engineering. The program requirements include a course, individual project and 30 hours of industrial lectures, which provide an overview of a wide range of aspects of automotive industry practices. The course runs from early October of one year to mid-September of the next year. It contains a range of subject materials, including vehicle dynamics, design, powertrains, controls and management. Entry to the program requires an undergraduate degree in Engineering, Physics or Mathematics. Various other universities in the UK offer graduate studies in Automotive Engineering. For example, Coventry University in the UK offers the degree of MSc in Automotive Engineering Design, as well as an MSc degree in Automotive and Automotive Component Manufacture.

Esslington University of Applied Science in Germany offers an MSc degree in Automotive Engineering. The first semester provides foundation courses in Automotive Engineering. The modules of the first semester are (i) Principles of Intelligent Design, (ii) Modern Manufacturing, (iii) Advanced Electronic Systems and (iv) Advanced Propulsion Technology. Besides technical subjects, these modules also cover management and engineering issues, including the subjects of quality management, project management and global engineering.

At the end of the first semester, the students decide on their area of specialization (Design / Manufacturing or Mechatronics) and they complete a project in this field. Elective courses are taken in the second semester. For students pursuing a Major in Design/Manufacturing, this module consists of lectures combined with exercises organized individually or in groups in the subjects of Design, Integrity of Structures, Material Technology, Production Systems, Operation Management, Quality Assurance and Maintenance. For a Major in Mechatronics, this module consists of lectures combined with exercises organized individually or in groups in the subjects Multi Body Systems, Powertrain Management, Mechatronic Systems, Sensors and Measurement Technology and Computer Simulation. Project 2 is carried out in small groups usually in one of the university laboratories or in industry. Project work has crucial importance in the MSc curriculum. Companies require that engineers are experienced in teamwork, have skills and flexibility regarding more than one technical area, have social competence and the fluent command of at least one second language. In the third semester, students will work on their Master´s Thesis. In their final thesis, Master's candidates demonstrate the full extent of their scientific and practical engineering knowledge of a specific subject. The Master´s thesis has a duration of six months and it is performed preferably in industry.

The MA program in Automotive Engineering at Bogazici University, Turkey, covers a range of automotive engineering courses. This includes inner workings of the automobile engine to external aspects such as vehicle aerodynamics, properties of materials used in automobiles and transportation analysis. Practical applications of the theory of mechanics, dynamics, combustion, aerodynamics and heat transfer are also covered. For the completion of the program, students are required to take 30 credits of coursework consisting of 10 courses and a research project (2 credits). The research project is selected jointly by the student, faculty member and a representative from an industrial partner. There are no required courses. Students can typically finish the program in 3 or 4 semesters.

South Korea has several universities offering graduate programs in automotive engineering. For example, Keimyung University in Taegu offers a Master's Degree in Automotive

Engineering. Another example, Kyung Hee University, Seoul, South Korea, which also offers a Master's Degree in Automotive Engineering. In Australia, the Royal Melbourne Institute of Technology offers a Master's degree in Automotive Engineering, as part of a University International Partnership for the collaborative development and training of automotive engineering students.

APPENDIX B: Registrar's Office
Graduate Studies Procedures and Policies

1. Admission Policies and Regulations

1.1 Application procedure

Applications for admission to graduate studies programs are normally submitted online at www.uoit.ca. Where paper applications are required, they shall be submitted to:

Registrar's Office UA 2071
University of Ontario Institute of Technology
2000 Simcoe St. North
Oshawa, Ontario L1H 7K4

Programs currently requiring paper applications include the Master of Information Technology Security.

1.2 Application deadline dates

Prospective students should consult the university academic schedule and/or program information for application deadlines relating to specific programs.

1.3 Admissions

In order to be eligible for admission to any graduate degree program at the University of Ontario Institute of Technology, applicants must meet the following requirements:

a) Hold a four-year honours degree or its equivalent from a recognized institution in the area of graduate study or a closely related subject.
b) Overall academic standing of at least a B (GPA = 3.0 on a 4.0/4.3 scale), with a minimum B in the last two full-time years (four semesters) of undergraduate work or equivalent.
c) A minimum of two letters of reference from persons having direct knowledge of the applicant's academic competence. Some faculties may require 3 letters. Academic references are preferred; however professional references will be accepted. Letters of reference should come from individuals under whom the applicant has worked closely or studied.
d) Proof of English proficiency for those applicants whose first language is not English (see current policy on English proficiency in the Academic Calendar).
e) Submission of one certified copy of each previous undergraduate and graduate transcript directly from the granting institute. It is the student's responsibility to provide a certified English translation of the transcript if the original is in another language.
f) Applicants may be required to submit a brief description of the courses listed on their official transcripts or provide a copy of the relevant calendar where they are listed.

The aforementioned requirements are the minimum required for entry into Graduate Studies

at the University of Ontario Institute of Technology. Some faculties may have additional requirements for entry into a specific program.

1.3.1 Offers of admission

All offers of admission are based on the recommendation of the Graduate Committee of the graduate program in question and, for consistency, the approval by the Dean of Graduate Studies.

1.3.2 Conditional admission

Applicants producing an acceptable record, but whose application is incomplete to date, may receive conditional admission to the program. Satisfactory documents supporting the admission decision must be received prior to the commencement of the program. Should the documents not be received in time or deemed to be unsatisfactory, admission will be revoked.

1.3.3 Refusal of admission

Due to enrolment limitations and additional requirements in some programs, meeting the minimum requirements does not guarantee admission to the program. The University may, at its sole discretion, refuse admission to an applicant even if the above minimum admission criteria have been met.

1.3.4 Appeal of admission decisions

Individuals may appeal their admission decision in writing within 10 working days to the registrar's office. There may be a charge assessed for such appeals. Admission appeals are referred to the Admissions and Scholarship Committee of Academic Council.

1.3.5 Letters of permission (students from other universities)

Students completing graduate programs at universities outside of Ontario may apply to complete individual courses on a Letter of Permission (LOP) from their home university should it be necessary for the completion of their degree. Such students shall be admitted to UOIT as non-degree students.

LOP students will still be required to complete the UOIT Application for Admission form, as well as submit a letter from the Dean of Graduate Studies at the student's home university to the office of graduate studies at UOIT, outlining the expectations of work to be completed while at UOIT.

1.3.6 Ontario visiting student graduate plan (OVSGP)

The Ontario Visiting Student Graduate Plan (OVSGP) permits a graduate student to take courses at other Ontario universities while remaining a registered student at his or her home institution. UOIT students must complete the OVSGP form (available from their faculty) and provide an outline of the course, desired term, and the reasoning for requesting such permission. The course must be a requirement of the student's program and must be formally approved by the program director as well as

the student's supervisor before submission to the registrar's office. Students from other universities wishing to register for graduate level courses at UOIT should contact the office of graduate studies at their home institution for more information regarding the process.

1.4 Description of graduate students

1.4.1 ***Regular student***: Applicants meeting the minimum admission requirements are considered for admission as a regular student.

1.4.2 ***Probationary student***: Applicants who do not meet the minimum admissions requirements may be considered for admission to a probationary year. Applicants must be approved by the program director who will prescribe a program of studies in order to meet the admission requirements for a Master's program. During this time, the student will be admitted as a non-degree student until (s)he has met the qualifications outlined and can be moved into regular student status.

1.4.3 ***Special student:*** Applicants who are non-degree-seeking students may apply to take graduate level courses for professional upgrading and/or personal interest. Applicants will apply through the registrar's office and successful students must receive faculty consent prior to registering for the course.

2. Registration

2.1 Classification of graduate students[6]

2.1.1 ***Full-time****:* Graduate students are considered full-time if they meet the following criteria:

a) pursue their studies as a full-time occupation;
b) formally identify themselves as full-time students on all documentation;
c) maintain regular contact with their graduate supervisor, be geographically available and visit the campus regularly ; and
d) if employed by the University, work no more than 10 hours per week per term for which they are registered as a full-time student

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6 Registration Classification is presently under review by OCGS. The following is the proposed classifications for full/part-time students;

A full-time graduate student must:

(1) be pursuing his or her studies as a full-time occupation;

(2) identify himself or herself as a full-time graduate student;

(3) be designated by the university as a full-time graduate student;

(4) be geographically available and visit the campus regularly. Without forfeiting fulltime status, a graduate student, while still under supervision, may be absent from the university (e.g., visiting libraries, doing field work, attending a graduate course at another institution, etc.) provided that, if any such period of absence exceeds four weeks in any one term, written evidence shall be available in the Graduate Studies Office to the effect that the absence has the approval of the Chairman of the Department and the Dean of Graduate Studies;

(5) be considered to be a full-time graduate student by his/her supervisor or equivalent (designated by the university);

(6) As well as meeting the requirements for full-time status listed above, a student reported as belonging to the special category known as "summer school graduate student", must have been enrolled in a graduate full-time summer program of not less than six week's duration. The full-time equivalents of summer school graduate students are arrived at by multiplying student numbers by a conversion factor of 0.50.

(7) If reported as a full-time summer school graduate in the enrolment for a term report, a student could not also, for that term, be reported as a part-time student. The general rule is that no student may be counted in more than one basic category (full-time, part-time or summer school) in any one term.

All active graduate students other than full-time graduate students as defined above are part-time graduate students.

2.1.2 *Part-time:* Graduate students who do not meet the above criteria are deemed part-time students. Part-time students may have course load restrictions. Students should consult the individual faculty with regard to the availability of part-time studies within their program.

2.2 Absences from studies

Graduate students are expected to be uninterruptedly registered in their designated program of study in order to support the timely completion of their degree. However, the university recognizes that under certain circumstances the student may need to absent themselves from regular study while maintaining their relationship with the University. Such circumstances must have sufficient cause and an official leave of absence must be requested through the office of graduate studies and approved by the Dean of Graduate Studies.

Acceptable circumstances include:

a) Exceptional circumstances
   - medical, extraordinary demands of employment, compassionate circumstances

b) Maternity Leave
   - available to students during or following a pregnancy

c) Parental Leave
   - available to students who face extraordinary demands in parental responsibilities, or whose duties require that they be absent from their studies for a period of time

3. Registration Policies and Regulations

3.1 Session dates

Graduate students normally register for three academic semesters per year: fall (September – December), winter (January – April), and summer (May – August).

3.2 Registration

Students must be registered in all terms commencing with the term specified in their letter of acceptance and continuing until graduation. Failure to register in all terms will result in withdrawal from the program. If a student does not register within one term of acceptance, readmission to the program is required. All courses in the student's program must be approved by the program director.

Students will be automatically registered in a graduate continuance course until graduation, withdrawal, or program termination. Students must actively register for all other program courses.

3.3 Changes in course registration

Students may add courses with approval of the program director within the first two weeks of lectures in any given semester. Students may drop courses without academic penalty

within the first 75% of the semester with the approval of the Dean of Graduate Studies. Students should see the academic timetable for specific add and drop deadlines. Financial deadlines may differ from these dates.

3.4 Residency requirement

At least half of a graduate student's courses must be from among the University of Ontario Institute of Technology course offerings in order to meet the residency requirements for graduation.

The minimum time allowed for full-time students to complete a Master's program is one year. The maximum time allowed for completion of a Master's degree is five years on a part time basis.

3.5 Program changes

Changes to a graduate student's program must be approved by the program director.

3.6 Transfer credits

All course credit transfers into graduate programs require the approval of the program director of the faculty delivering the equivalent course. Transfer courses may not have been used to satisfy other degree requirements. Graduate transfer courses will not be considered for transfer if they were completed more than 8 years prior to admission or if the grade received in the course is below a B- (70%).

3.7 Letters of permission (UOIT students)

To benefit from a full array of course selection, a University of Ontario Institute of Technology student may wish to take a course at another institution. Such a course must be approved in advance by the student's supervisor. A letter of permission ensures that the courses to be taken at the host institution will be recognized for credit at the University of Ontario Institute of Technology and are applicable to the student's program of study. This allows the student to attend the host institution without formal admission. If the student is in clear academic standing (see section 4.7 for policies on academic standing) and has the necessary prerequisite courses, (s)he shall complete a letter of permission request form and submit a course outline or outlines to the registrar's office. Students are responsible for having copies of the final transcript from the host institution forwarded to the UOIT registrar's office for award of transfer credit. The minimum mark a student must achieve to have the course transferred is a B- (70%).

University of Ontario Institute of Technology students must apply for a letter of permission before taking a course elsewhere. Failure to do so could result in revocation of admission.

3.8 Repeating courses

Students who have failed one course required for their program of study may be permitted to continue their program with permission of their program director. Students who do not successfully complete the second attempt at the course, or who fail more than one course will be required to withdraw from their program of study immediately.

3.9 Supplemental examinations

In some circumstances students may be allowed to write one supplemental examination. The mark from a supplemental examination may replace or otherwise augment a mark previously obtained in an examination in the same course. Students should contact their program director for regulations concerning supplemental examinations.

4. Degree Requirements

All candidates pursuing a Master's degree shall enroll in an advanced course of study approved by the program director where the graduate student is registered. Each student must meet the program requirements laid out by the host faculty, while maintaining the required average to qualify to graduate in a timely manner.

4.1 Time limits

All requirements for a Master's degree must be completed within three years of initial registration as a full-time student. Students registering on a part-time basis have a maximum of five years to complete the degree. Terms for which a student is granted a leave of absence shall not be included in these time limits.

Students needing to exceed the normal allotted time for completion of their program must formally request an extension to their program. Extension requests are to be made after the normal program length to the Dean of Graduate Studies.

Students who do not complete degree requirements within the allotted time and have not been granted an extension may be required to withdraw from the program. Under exceptional circumstances and on the recommendation of the chair of the supervisory committee, a student who did not complete the degree requirements within the allotted time may be readmitted for one semester only to complete those requirements. Final approval for readmission must be granted by the Dean of Graduate Studies.

4.2 Thesis defense

Master's candidates pursuing a thesis based degree will be required to defend their thesis orally in front of an examining committee. Students are expected to follow the advice of their supervisor and their supervisory committee in establishing when a thesis is ready for examination. In exceptional circumstances students may request that the Dean of Graduate Studies arrange for an examination of the thesis without the support of the supervisor and supervisory committee. As it is the student's responsibility to ensure that all materials are prepared and assembled in all copies of the thesis, students should contact their faculty for specific regulations on preparation and presentation of materials.

4.3 Oral examination

Before an oral examination can be held, the supervisory committee of the student's faculty must approve the thesis for examination (no more than one negative vote and/or abstention). The thesis must be submitted at least four weeks prior to the proposed defense. The examining committee will meet at least one week prior to the scheduled date of examination and will determine if the thesis in its form and content is ready to be examined. If the thesis is deemed not ready for defense, the committee must provide to the

candidate, the supervisor and the Dean of Graduate Studies in writing their reasoning for disagreement within 72 working hours. In this instance, the oral exam shall be postponed for a period of time not exceeding one year from the scheduled date.

4.3.1 Outcomes of completion of the oral examination

1. Acceptable without change
2. Acceptable with minor change
3. Acceptable with major change
4. Not acceptable

1. Acceptable without change

A grade of pass is given if there is acceptance of the thesis with no required revisions by the committee as a whole.

2. Acceptable with minor change

A grade of pass is given if there is acceptance of the thesis with minor revisions to be completed within four weeks; revisions must not alter or drastically change the content of the thesis.

3. Acceptable with major change

A thesis which is not acceptable as a pass but not deemed a fail is referred for major revision. A thesis cannot be referred for a major revision and a second oral exam more than once; no further defense is permitted. In order to qualify for a decision of major revision, a thesis must meet one of the following requirements:

a) the committee agrees that the thesis requires considerable change in order to be deemed a pass
b) there is a majority vote in favour of major revision
c) there is one or more votes to fail it (if the vote of failure comes from an external examiner, the thesis is deemed failed).

In the case of a major revision, the examining committee will reconvene within six months to continue the examination including the revisions. The revised thesis will be distributed within four to six weeks prior to the meeting to all members of the committee for review and assessment.

4. Not acceptable

A thesis is deemed failed if:

a) there is a majority vote to fail it
b) the thesis is deemed unacceptable after major revisions
c) there is a vote to fail it by the external examiner

Detailed reasons for failure must be submitted by the chair of the examining committee to the Dean of Graduate Studies, the program director, and the

candidate within two weeks.

The student presentation component of the oral examination is an open event that can be attended by all interested parties at the discretion of the chair. However, only members of the examining committee may be present for the evaluation and oral examination and can vote at the conclusion of the student's defense.

4.4 Thesis notation

Upon acceptance of a Master's or doctoral thesis, the title of the thesis and date of approval will be recorded on the transcript.

4.5 Provision for waiver of regulations

Waivers of course prerequisites/co-requisites may be granted by the program director. Waivers of faculty, degree or general regulations may be granted by the Dean of Graduate Studies.

4.6 Deferral of course examinations

Students who, because of religious obligations, are unable to write a final examination when scheduled, will be permitted to write a deferred examination. Such students are required to give three weeks notice to the program director concerned and to document the religious obligations involved.

Program directors may grant deferred examinations on medical or compassionate grounds where sufficient documentation exists. A request for deferral on medical or compassionate grounds, along with supporting documentation, must be provided to the program director within four days after the scheduled writing of the examination.

A program director may also grant a deferred examination to a student who is scheduled to write three examinations in a 24 hour period. In this case, the exam in the middle of the three is normally the one that will be considered for deferral. Scheduling is conducted in such a way as to minimize the instance of consecutive examinations for students.

If a technical difficulty prevents the writing of a computer-based examination, the program director may arrange for a deferred examination for all students in the class. Such an examination will be scheduled no later than the end of the first week of classes in the following semester.

4.7 Grading Scheme

Grade	Percentage	Grade Points	Description
A+	90-100	4.3	Very Good to Excellent – Student demonstrated mastery of the course
A	85-89	4.0	
A-	80-84	3.7	

			material
B+	77-79	3.3	Acceptable to
B	73-76	3.0	Good –
B-	70-72	2.7	Student demonstrated adequate knowledge of course material
F	0-69	0	Inadequate – Student did not perform to academic expectations

4.8 Minimum average

In order to continue in a prescribed program of study at the Graduate level, a student must maintain a B- average overall.

4.9 Grade changes

After grades have been officially approved and released, any grade changes must be submitted in writing to the registrar. Grade changes may result from the submission of course work, the writing of a deferred examination, clerical errors, or an approved examination reread. All grade changes must be approved by the course instructor and the program director or his/her designate.

If a student's grade is not available when final grades are approved at the end of the term because of special circumstances, a special designation will be temporarily added to his/her record. If a deferred examination has been granted, a grade of DEF will be assigned. If a portion of the work required for the course is incomplete, a grade of INC may be recorded. These grades may satisfy prerequisites for further courses on a temporary basis, but not beyond the end of the subsequent term after which these grades revert to "F".

Graduate continuance courses will be assigned a grade of CO (continuance) and will not be included in grade point average calculations.

4.10 Grade appeals

Students may, with sufficient academic grounds, request that a final grade in a course be appealed (which will comprise only the review of specific pieces of tangible but not oral work). Grounds not related to academic merit are not relevant for grade appeals.

Students are normally expected to contact the course director first to discuss the grade received and to request that their tangible work be reviewed. Students should be aware that a request for a grade appeal may result in the original grade being raised, lowered or confirmed. The deadline for submitting grade appeals is three weeks after the release of final grade reports in any term.

If the condition of sufficient academic grounds has been met, the student shall lodge a request with the registrar's office, which will contact the relevant program director and collect any fees incurred for the appeal. Students must specify the rationale for their appeal by making clear the component of the final grade upon which they seek appeal. The program director will be responsible for ensuring that the work is reappraised by an appropriate faculty member, ensuring anonymity of both the student and the reappraiser, and for communicating the result of the appeal (including the reappraiser's comments) and the route of appeal to both the student and the course director. The reappraiser will be given the nature of the assignment and the rationale for the original grade. It is expected that every effort will be made to render the decision within 30 days of the reviewer having received the work.

In the event that a student is still not satisfied with the final grade, or the course director is not available to review the work, a student may submit, in writing, a formal request for a grade appeal to the Academic Appeals Committee. Such appeals can only be considered only on the grounds of procedural irregularity. Appeals must be submitted within 15 working days of notification of the decision. At the discretion of the relevant faculty committee, the student and/or the faculty member may be invited to meet with the committee to present their case(s) orally. The committee's decision will be taken in camera and it is expected that parties will be informed of the decision in writing within 20 working days of the filing of the appeal.

4.11 Conferral of degrees

Students expecting to graduate in any given term are required to contact the registrar's office to complete the necessary forms. All applications must be received no later than January 15 for June graduation.

Degrees will be conferred at the time of academic council approval and notation of the degree awarded will be entered on the students' records. All students who are awarded a degree are eligible to attend the session of Convocation that immediately follows the date of conferral.

5. Academic Conduct

5.1 Code of academic conduct

Faculty members and students share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness, and mutual respect for the aims and principles of the pursuit of education. Academic misconduct impedes the activities of the university community, and is punishable by appropriate disciplinary action.

The university and its members have the responsibility of providing an environment which does not facilitate the inadvertent commission of academic misconduct. Students and faculty should be made aware of the actions which constitute academic misconduct, the procedures for launching and resolving complaints, and the penalties for commission of acts of misconduct.

5.1.1 Academic misconduct: offenses

Academic misconduct includes, but is not limited to:

- Unreasonable infringement on the freedom of other members of the academic community (e.g., disrupting classes or examinations, harassing, intimidating, or threatening others).

- Violation of safety regulations in a laboratory or other setting.

- Cheating on examinations, assignments, reports, or other work used to evaluate student performance. Cheating includes copying from another student's work or allowing one's own work to be copied, submitting another person's work as one's own, fabrication of data, consultation with an unauthorized person during an examination, or use of unauthorized aids.

- Impersonating another student or allowing oneself to be impersonated for purposes of taking examinations, or carrying out laboratory or other assignments.

- Plagiarism, which is the act of presenting the ideas, words, or other intellectual property of another as one's own. The use of other people's work must be properly acknowledged and referenced in all written material.

- Obtaining by improper means examination papers, tests, or similar materials; use or distribution of such materials to others.

- Falsifying academic records, including tests and examinations, or submitting false credentials for purpose of gaining admission to a program or course, or for any other purpose.

- Misrepresentation of facts, whether written or oral, which may have an effect on academic evaluation. This includes making fraudulent health claims, obtaining medical or other certificates under false pretenses, or altering certificates for the purposes of misrepresentation.

- Submission of work when a major portion has been previously submitted or is being submitted for another course, without the express permission of all instructors involved.

- Professional unsuitability, i.e., behaviour inconsistent with the norms and expectations of the profession.

5.1.2 Procedure for resolution

With respect to all accusations of academic misconduct, students are presumed innocent until the contrary has been established. Decisions regarding the

commission of academic misconduct are based on the balance of probabilities. A record of all allegations of misconduct, along with details of the resolution, will be entered into the central academic records kept by the registrar's office.

Faculty, staff, or students who have reason to believe that an academic offence has been committed should report the matter promptly to the Dean of Graduate Studies. A written report of the alleged offence shall be prepared, together with any relevant evidence.

The Dean of Graduate Studies must decide promptly whether an attempt is to be made to resolve the matter informally; otherwise, the Dean of Graduate Studies shall follow the procedures for formal resolution. In either case, a student will not be permitted to withdraw from the course in which the offence was alleged to have been committed until the matter is resolved and penalty imposed, if applicable.

5.1.3 Informal resolution

The Dean of Graduate Studies must inform the student that he/she has been accused of academic misconduct. The student will have five working days in which to respond to these allegations. If the alleged offender responds with an admission of guilt and agrees to the terms of a resolution as set out by the Dean of Graduate Studies, the matter will be considered closed. The terms of the resolution shall be detailed in writing and signed by both the Dean of Graduate Studies and the student in question.

Informal resolution may not result in the expunging of grades, the revoking of degrees, or in the student being suspended or expelled.

5.1.4 Formal resolution

When an attempt at informal resolution fails or is deemed inappropriate, the Dean of Graduate Studies must inform the student in writing of the charge, the possible penalties, and a copy of the pertinent policy statement. The student will be given five working days to prepare a response. The Dean of Graduate Studies will then meet with the student to hear the response. Both the Dean of Graduate Studies and the student are entitled to be accompanied by up to two advisors at this meeting, provided 48 hours advanced notice is given of the identity of the advisors.

The Dean of Graduate Studies shall then conduct a thorough investigation of the allegations and response, to be concluded within 10 further working days. The Dean of Graduate Studies will notify the parties of the decision in writing. A copy of the decision will be provided on a need to-know basis to administrative units (e.g., the program director, other faculties, the registrar).

5.1.5 Penalties

If a student is deemed to have committed academic misconduct, one or more of the following disciplinary penalties may be imposed. The severity of the penalty will be determined by the nature of the offence and the student's past record of conduct. Students found guilty of successive acts of misconduct will receive increasingly

severe penalties.

- Resubmission of the piece of academic work in respect of which the misconduct was committed, for evaluation.

- A written reprimand, warning the student that the behaviour was unacceptable and that further misconduct will lead to additional penalties. A copy of the reprimand will be placed in the student's file, but no notation will appear on the academic record.

- Submission of a failing grade in an examination, test, assignment or course.

- Disciplinary probation for the remainder of the student's registration in his current program of study. A note to this effect will be placed in the student's file, but no notation will appear on the academic record. Any further offence will lead to a more severe penalty.

- Expunging of grades or revoking of degrees.

- Restraining orders or monetary restitution where appropriate in the case of threats, harassment, or damage to property.

- Suspension from attendance in a course, a program, a faculty, or the University, for a period not exceeding three years as deemed appropriate. While suspended, a student may not register, and loses the right to attend lectures, write examinations, and receive payment from University sources. Courses taken elsewhere during the period of suspension are not eligible for transfer credit. Notice of suspension will be placed in the student's file and will appear on his/her academic record. The conditions of suspension will specify the length of time such notice will remain on the student's academic record.

- Permanent expulsion from the university. A note to this effect will be placed in the student's file and will remain on his academic record.

- Such other penalty as deemed appropriate.

5.2 Termination of graduate program

The university may terminate a student’s enrolment in a graduate program on any of the following grounds:

- failure to achieve the required grades to continue as outlined in the degree regulations
- failure to achieve the required grade on a comprehensive exam or project
- failure to successfully complete a thesis or project
- failure to register in any semester

- failure to report, in advance, courses being taken at another institution
- lack of progress toward completion of the program
- recommendation of termination from the supervisory committee
- failure to meet the conditions of admission
- academic misconduct
- professional unsuitability as defined by the program
- research misconduct and/or noncompliance with the University's research ethics guidelines or policies.

5.3 Academic appeals

All decisions of the university relating to academic conduct or program termination may be appealed. The student will be given 10 working days to gather new evidence and to submit a letter of appeal to the academic appeals committee. Under normal circumstances, disciplinary penalties will not be imposed before an appeal is decided; however, official transcripts will not be issued during this period. Formal registration may be revoked where warranted. In the case of suspected professional unsuitability, a student may be withdrawn from classes, practica, work placements or other program-related activities pending resolution of the case.

A student may apply to the Dean of Graduate Studies for continued attendance in classes and related activities while the appeal is being heard. In order for such a request to be granted, the Dean of Graduate Studies must be satisfied that there would be no detrimental effect of such continued attendance. If the appeal is granted, formal registration will be reinstated.

5.4 Student-supervisor conflicts

It is the responsibility of UOIT and its faculties to ensure that all graduate students receive appropriate and fair supervision. Due to the nature of the relationship between the student and supervisor, conflicts may arise. In such instances, the first step must be to attempt to resolve the conflict informally between the student and supervisor. It is the responsibility of the program director to act as a mediator and (s)he should be contacted as soon as the conflict arises.

A graduate student who believes the conflict has not been resolved should contact the Dean of Graduate Studies, to pursue an appropriate resolution.

6. Financial aid

6.1 External scholarships/fellowships

- Natural Sciences and Engineering Research Council (NSERC) Awards: Postgraduate scholarships and Canada Graduate Scholarships from the Natural Sciences and Engineering Research Council (NSERC) are tenable in faculties offering graduate studies in science and engineering. These scholarships are awarded to students undertaking graduate study and research leading to advanced degrees, and a limited number of postdoctoral fellowships for those wishing to add to their experience by specialized training. They are open to Canadian citizens or permanent residents and awarded on the basis of high

scholastic achievement and evidence of capacity to do research. Deadline: October. For further information and online application see www.nserc.ca.

- Social Sciences and Humanities Research Council (SSHRC) Awards Master's level Canada Graduate Scholarships, Doctoral Fellowships and Doctoral level Canada Graduate Scholarships from the Social Sciences and Humanities Research Council (SSHRC) are offered each year to Canadian citizens or persons who have obtained landed immigrant status in Canada by December 1. The scholarships and fellowships program aims to develop research skills and assist in the training of highly-qualified academic personnel by supporting students who demonstrate a high standard of scholarly achievement in undergraduate and graduate studies in the social sciences and humanities. The fellowships are tenable at any recognized university in Canada or abroad. Deadline: October. For further information and online application see www.sshrc.ca.

- Ontario Graduate Scholarships (OGS) The Government of Ontario offers up to 2,000 Ontario Graduate Scholarships (OGS) per year which are tenable at the Ontario university of the student's choice. The awards are tenable in all disciplines and the scholars must have a high level of academic achievement. The awards are intended primarily for Canadian citizens as well as those who hold permanent resident status at the time of application; however, up to 60 awards may be made to students who, by the application deadline, have been admitted to Canada as visitors with student authorization. Awards will be for two or three consecutive terms; one-term awards will not be made. Application deadline is in October. All eligible candidates who are interested in studying at UOIT are urged to apply for one of these awards. For further information and online application see www.osap.gov.on.ca

- Commonwealth Scholarship and Fellowship Plan: Awards are provided opportunities for Commonwealth students to pursue advanced studies in other Commonwealth countries. Awarded to graduates of recognized universities for a period of two academic years and the intervening summer, and intended to cover the holder's travel, living, and study expenses during the period of tenure. Application forms and full information concerning details of the award may be obtained from the Canadian Scholarship and Fellowship Plan, c/o Canadian Bureau for International Education, 85 Albert Street, Suite 1400, Ottawa, Ontario KIP 5N1, or through the Canadian high commissioner in Commonwealth countries. Persons intending to apply are advised to enquire not later than September, approximately one year before the date of tenure. See also www.scholarships-bourses-ca.org.

6.2 Internal scholarships, fellowships, and entrance awards

The University may offer scholarships, fellowships and entrance awards to entering graduate students who present high admission averages and test scores, or who demonstrate exceptional potential for research. Please check the appropriate program web site for current information. The title of any scholarships awarded will be noted on the graduate student transcript along with the date of the award.

6.3 Ontario student assistance program

The Ontario Student Assistance Program (OSAP) program provides repayable loan assistance to qualified students. Students can apply for OSAP online at **http://osap.gov.on.ca**. OSAP is interest free until one month after the individual is no longer a full-time student and the principle repayment begins six months after the individual is no longer a full-time student.

OSAP provides financial assistance to help students and their families finance their education. By completing an OSAP application, students will be assessed for loan assistance from both the federal and provincial governments. A variety of government bursary programs are available through the OSAP application process.

7. Proposed Schedule of fees

7.1 Tuition

Proposed UOIT Annual Tuition Fees 2005-2006

Graduate Program7

Domestic		International8
FT	PT	FT
TBA	TBA	TBA

7.2 Other Fees

Fee	Amount
Ancillary9	550.00
Student Organization	189.75
Health/ Dental10	157.23
UHIP11	532.85

7 MITS tuition fees are assessed on a program basis for the normal program length of four terms and for any subsequent term of registration.

Master's of Information Technology Security
Annual Fees

Domestic		International
FT	PT	FT
6 700	3 350	21 000
Mobile Computing		1,765.00

8 International students must study full-time.

9 Part-time fee ancillary and student organization fees are assessed at 50% of the full-time fee.

10 Estimate only, actual fee set by insurer.

11 University Health Insurance Plan, mandatory for international students – estimate only, actual fee set by insurer (2004/05 rate shown).

7.3 Miscellaneous Service Fees

Graduate Studies Application Fee	$100
ID card replacement fee (waived if card defective or theft can be established)	$10
Letter of Permission fee (for taking courses at another post-secondary institution)	$25
Grade appeal fee (refundable if appeal successful)	$30
Late payment fee	$40
NSF cheque fee	$25
Parchment replacement fee	$50
Supplemental/Special examination fee	$25
T2202A replacement fee	$10
Transcript fee	$8
Verification of enrolment fee	$10
Verification of fees paid	$10

Fees in bold are new or not previously approved.
All other fees are the same as in 2004-05.

8. Method of Delivery

The University of Ontario Institute of Technology is Ontario's first laptop-based university. Although all undergraduate students are required to participate in the laptop program, certain graduate level programs may have other technological requirements in lieu of the laptop program. It is the final decision of each program whether to integrate the laptop program into the curriculum.

Appendix A

Roles and Responsibilities

1. Student Supervisory Committee

a. Composition

- Normally, each committee consists of two UOIT faculty members plus one chair; in addition to the above, it may include one additional member external to the student's program
- The chair of the committee may be someone other than the student's direct supervisor
- Faculty members from other units who have direct experience with the subject matter may serve on the supervisory committee at the discretion of the program director

b. Mandate

- The Student Supervisory Committee will advise the student, help define their course of study and monitor their progress in their program
- The Committee shall review the student's progress toward successful completion of their thesis with scheduled meetings normally twice per year but not less than once per year
- The Committee shall report progress to the graduate program and recommend continuation in the program based on satisfactory performance. In the case of reports of unsatisfactory progress, students

may be required to withdraw from the graduate program in which they are enrolled
    - The Committee shall assess and approve the student's research proposal
    - The Committee shall recommend to the appropriate graduate program director and Dean of Graduate Studies whether a thesis is should move to oral examination; this stage must be completed no less than three months prior to the date set for examination

c. Chair of Supervisory Committee

- The Chair must remain reasonably accessible to the student
- The Chair will ensure that a copy of the student's thesis is forwarded to each member of the relevant examining committee as quickly as possible after receiving it, but no less than three weeks prior to examination.

2. Examining Committee

- The Examining Committee evaluates the academic merit of each student who defends a thesis, and decides whether the student has satisfactorily passed the defense
- The Committee consists of all members of the supervisory committee plus one external examiner (see below)
- The Committee is chaired by the program director or his/her designate

3. External Examiner

- An external examiner is typically a member of another program outside of which the student is registered at the University
- The examiner must not have had any direct or indirect supervision of the student's thesis
- This person will have considerable direct knowledge in the field of study of the subject matter
- The external examiner is appointed by the Dean of Graduate Studies, upon recommendation of the chair of the supervisory committee
- When an external examiner from outside the university is recommended, a CV and written rationale for the choice must be provided to the Dean of Graduate Studies
- Conflicts of interest must be avoided when recommending the names of external examiners to the office of graduate studies. External examiners must not be teaching or supervising family members or relatives, must not be closely linked in a personal or research capacity, nor shall they have shared financial interests with either the student or the supervisor. Should the student's thesis contain chapters or sections of previously published works, the external examiner shall not have been involved in the review or editing of this material in any capacity.

APPENDIX C: Library

LIBRARY SUBMISSION TO ONTARIO COUNCIL OF GRADUATE STUDIES (OCGS) FOR:

THE MASTER OF APPLIED SCIENCE AND MASTER OF ENGINEERING PROGRAMS IN AUTOMOTIVE ENGINEERING
University of Ontario Institute of Technology (UOIT)

Compiled by: Carol Mittlestead, B.A. (Hon), M.L.S., Acting University Librarian / Associate Librarian

Introduction

With respect to the University of Ontario Institute of Technology's Master of Applied Science and Master of Engineering in Automotive Engineering as offered by the Faculty of Engineering and Applied Science and its affiliated School of Energy Systems and Nuclear Science, the following document discusses the Library in relation to the collection; the accessibility of resources and services; and research support, staffing, and partnerships. The collection is defined as including both the traditional paper book or periodical, and the more nontraditional – but increasingly common - electronic index, book or journal database. Librarian recommended web sites are also a unique part of the collection in that they direct students and staff to valid academic sources. A subscription to the Data Liberation Initiative (DLI), a detailed comprehensive series of data sets offered through Statistics Canada, was recently acquired in response to expanded research initiatives at UOIT. Similarly, D-Space, an institutional repository system that captures, stores, indexes and preserves digital research material is also being launched by the UOIT Library. Accessibility addresses the physical presence of the Library, onsite reference assistance, the Library web page www.uoit.ca/library as a 24/7 portal, and interlibrary loan and document delivery. Research support, staffing, and partnerships emphasize the Library's role in teaching students, liaising with faculty, and connecting with government and corporate agencies.

Collections

It is understood that the Library's acquisition plan must be based on evolving pedagogical needs as determined by the academic schools. In close liaison with the Deans and Professors, subject specialist Librarians will define collection development strategies for the ongoing curriculum-based purchase of resources as well as for the evaluation and review of existing material. Given the two streams of the Automotive Engineering program, it is realized that both research-oriented and applied resources are required:

> The main objective of the MASc program is to prepare students for a career as an R & D engineer…[or to prepare them to] continue their education and pursue a PhD degree…The main objective of the MEng program is to provide the opportunity for engineers in industry to upgrade and expand their skills. Graduates of the program will apply their education to various advanced technologies in the automotive sector or other industries (OCGS Appraisal Brief, August 31, 2006).

Books

The Library offers a small but comprehensive collection. At present, there are approximately 73,000 volumes on the shelves. In August 2004, the Library took possession of its new building (described below) and this additional space will allow for the relatively quick expansion of the collection to 160,000 texts. Currently, there are approximately 8,500 volumes focusing on pure and applied science topics many of which relate directly to the Automotive Engineering masters program. For example, books on materials, thermodynamics, engineering design, robotics and automation, digital communications, and noise, vibrations and harshness are already available. Please note that in the Fall of 2005, the Faculty of Engineering and Applied Science launched undergraduate programs in Automotive, Electrical, and Software Engineering. The Library obviously had to be prepared for these students and Faculty. Although this is only the third year that UOIT has offered courses, with the Library understandably being in a significant growth phase, this Masters program is particularly well placed in terms of resources. From its onset, UOIT has been building its reputation on science- based programming in mathematics, physics, chemistry and biology; Library collection development has echoed this.

More specialized and academically focused books are being bought in preparation for year four of UOIT's operation and for postgraduate programs. This includes texts that address the drafting of research proposals, grant writing, public speaking and presentation techniques, technical communications including abstracting, and university teaching. The Library's goal is to increase its holdings by 2,000 to 3,000 volumes per year for several successive years with a current projected cost of $400,000. to $450,000. per annum. Books are selected primarily (Faculty suggestions are most welcome) by Subject Specialist Librarians both directly from noteworthy academic publishers (e.g. Wiley, CRC Press, Sage, Elsevier, Academic Press, Addison-Wesley, Kluwer, Springer-Verlag, Pearson Prentice Hall) and from Blackwell's Book Services, an arrangement that allows for the simultaneous purchase of titles from a wide array of vendors.

The importance of specialty publishers for both print and online documents is also recognized. The Library will access and/or purchase as necessary standards, proceedings, and technical reports from key scientific organizations. Example sources include the American Society for Testing and Materials (ASTM), the Society of Automotive Engineers (SAE), the American Society of Mechanical Engineers (ASME), the Canadian Standards Association (CSA), the American National Standards Institute (ANSI), and the National Research Council – Canada Institute for Scientific and Technical Information (NRC-CISTI).

With over 15,000 titles (not included in the total above), e-books are an integral part of the UOIT library collection. Currently, Access Science and the Encyclopedia of Materials Science and Technology are the databases most likely to interest the Program's students and faculty. Especially given UOIT's commitment to the laptop university concept, the Library's e-book collection is destined to grow.

Journals, Transactions and Conference Proceedings

In addition to the indexing and abstracting that the Library provides for thousands of periodicals (journals, magazines, newspapers) through its electronic databases, 30,000 of these titles are available in full text electronically and 350 in paper. Of relevance to the Automotive Engineering masters program is that over 2,800 full text titles are categorized

under the heading of Science with approximately 200 of these titles designated as chemistry, 250 as physics, and 270 as mathematics. There are nearly 11,000 full text Technology journals of which approximately 100 each focus directly on manufacturing and mechanical engineering, and another 20 are particular to the automotive industry. Electronic databases are not only a venue for periodicals. Many such as IEEE and SAE also offer technical reports, conference proceedings, and standards.

UOIT library databases believed to support this postgraduate program are categorized and then listed alphabetically below. Top priority is of course given to those products exclusively focused on Engineering.

Extremely Relevant:
Compendex
IEEE (Institute of Electrical and Electronics Engineers)
Inspec (IEE- Institution of Electrical Engineers)
SAE (Society of Automotive Engineers)

Very Relevant:
ACM (American Computing Machinery)
CCOHS (Canadian Centre for Occupational Health & Safety – collection of databases focusing on chemicals highlighting their properties, uses, hazards and availability – includes MSDS (Material Safety Data Sheets) and associated Ontario and federal legislation and standards
Elsevier Science/Science Direct
IOP (Institute of Physics)
Materials Science: A Sage Full-text Collection
MathSciNet
Proquest Science
RSC (Royal Society of Chemistry)
Science Citation Index Expanded (Part of ISI Web of Science)
Scitation (AIP – American Institute of Physics and ASME – American Society of Mechanical Engineers)

Relevant (multidisciplinary databases):
Academic Search Premier
Cambridge University Press
Kluwer
Sage
Springer-Verlag
Wiley/Interscience

Please note that there are several ways to access electronic journals. UOIT is a member of both OCUL (Ontario Council of University Libraries) and CRKN (Canadian Research Knowledge Network) – the provincial and national university library consortia, respectively, that provide for the effective group purchase and distribution of electronic resources. Scholars Portal and E-Journals at Scholars Portal are OCUL platforms that allow an individual to access a number of databases simultaneously. The UOIT Library also provides Faculty and subject guides highlighting pertinent indexes and databases, a searchable alphabetical list of all indexes and databases, a searchable alphabetical list of all periodical (journal, magazine and newspaper) titles, and a citation locator that checks for either journal or article availability. Further, cross-referencing amongst databases is

provided by a federated search engine or linking software called “Find It @ UOIT”. If a patron is searching one database, but the article is available in another, he/she will be redirected to this resource. If the article is not available at UOIT, the option to request an ILL (interlibrary loan) is displayed.

The Library also hosts Refworks, a software tool that allows for citations to be “harvested” from various periodical databases or imported directly so bibliographies can be easily prepared. The user selects the appropriate bibliographic format (e.g. MLA, APA) and Refworks applies it to the references that have been assimilated. The complementary component is Refshare; it allows for bibliographies to be shared amongst colleagues and/or to be used as electronic reserve listings. Students are directed to an article by their professor and simply authenticate into the Library system.

Following the mandate of the University of Ontario Institute of Technology as a laptop university with “round the clock” accessibility to resources, wherever possible, the Library will purchase significant holdings to a journal including archives in electronic format. It is, however, realized that paper copies may sometimes be essential, and must be purchased accordingly.

Internet:

While the prevalence and importance of the Internet is recognized, it is also realized that not all information on the Internet is of equal value and/or prominence, and that not all people have equal search skills. The Library, therefore, strives to make staff and students aware of quality web sites appropriate to their Program. Listings of Recommended Web Sites are part of the Library Faculty Guides that are prepared with each UOIT program in mind. Posted on the Library web site www.uoit.ca/library , these Faculty Guides are discussed in detail under “Accessibility”. For example, amongst the relevant sites for this Masters program are: EEVL (Edinburgh Engineering Virtual Library – Heriot Watt University), efunda (Engineering Fundamentals), Project Euclid (Cornell University) and Scirus (Elsevier) along with specific societal sites such as SAE International (Society of Automotive Engineers), ASTM (American Society for Testing and Materials), and ASME (American Society of Mechanical Engineers – Manufacturing Engineering Division).

Data Liberation Initiative:

The DLI is an expansive collection of detailed statistical sets assimilated and maintained by Statistics Canada and offered through the IDLS (Internet Data Library System) hosted by the University of Western Ontario’s Social Science Computing Laboratory. Those files that relate to manufacturing will be of interest to researchers in the Automotive Engineering masters program.

D-Space:

The Library has already acquired the necessary server and is planning to launch its own D-Space within the next few months. This is an open archive initiative (OAI) developed by the Massachusetts Institute of Technology (MIT) that allows for the capturing, storing, indexing, preserving and distributing of digital research material. Faculty members are invited to post their research findings and papers in this institutional repository thus encouraging collaboration amongst colleagues.

Accessibility

The Building:

A new state-of-the-art, 73,000 square foot Library was opened in August 2004. The intent of the design is to create a print/electronic library that accommodates new and emerging technologies without sacrificing the personal warmth of a traditional library. The building offers various types of study and activity spaces to accommodate different learning styles and user needs. These spaces include:

- Quiet public study spaces as well as a formal Reading Room, all within a "wireless" environment
- Collaborative learning spaces for groups of various sizes
- Common spaces and public service research workstations that facilitate intellectual interaction and engagement
- Electronic classrooms for regular ongoing educational sessions on library resources and research strategies
- Attractive and appealing display areas for art and library exhibitions
- Special needs adaptive technology equipment

Staff, students and faculty have welcomed this new building with its seating for over 500 patrons and 150 public access workstations with Internet access. The grand opening was October 29, 2004.

ON CAMPUS REFERENCE ASSISTANCE:

Reference services are provided by professional librarians for 68 hours of the 89 hours per week that the Library is physically open or 76.5% of the time. Librarians liaise with professors so classes specific to student research topics can be offered, and general information literacy sessions are offered campus-wide throughout the year. Topics such as the research process, Internet site evaluation, and bibliographic citation are addressed. Making individual or small group appointments with a librarian is encouraged too.

Library Web Page:

The Library web page is available at www.uoit.ca/library and is accessible 24 hours a day, seven days a week. Both a general Library e-mail address and a Reference Desk e-mail are provided as well as telephone information so individuals can leave messages at any time. In collaboration with other Ontario University Libraries, the Library is also currently investigating a web-based service such as the Virtual Reference Desk (www.lssi.com) which uses chat software to deliver reference service to users regardless of time and location. The Librarian can "push" pages to patrons so they can literally see both the steps involved and the results achieved with a given search. Consequently, this technology promises to be more effective than e-mail and telephone. Beginning with limited hours and an after-hours e-mail default, the ultimate goal is to make virtual reference a "round the clock" service.

General reference assistance is provided through Library web page sections that explain topics such as computer search techniques, article searching, internet evaluation, and bibliographic citation. Amongst the services outlined are circulation procedures, reserves,

and interlibrary loan. What makes the UOIT Library web page truly unique is its Faculty Guides. Prepared with each program in mind for a particular Faculty, every Guide outlines and links to pertinent Electronic Databases and Indexes; provides sample listings with links to relevant journals along with subject headings for further investigation; highlights the Catalogue with suggestions from the Reference collection; describes and links to the most appropriate E-book databases; and offers Recommended Web Sites. These Guides are indeed resource portals. As UOIT's Faculties are becoming more and more diverse, Subject Guides are also being launched. These are of particular assistance to students taking electives from areas outside their discipline.

Interlibrary Loan and Document Delivery:

As UOIT is still in its developmental stages, Interlibrary Loan is currently available free of charge to students, staff and faculty. Individuals have the option of making their requests online or in person. RACER (rapid access to collections by electronic requesting) is a VDX (Virtual Document Exchange) interlibrary loan system implemented in OCUL member libraries; this obviously includes both UOIT and Trent. Searches are performed throughout all Ontario university libraries and CISTI (Canada Institute for Scientific and Technical Information). As part of OCUL and the IUTS (Inter University Transit System), the Library now receives book loans in a very reasonable amount of time, and Ariel, an electronic transmission system for periodical articles, allows journal requests to be filled within a few days.

Faculty and students from UOIT may also visit any of Canada's university libraries and may borrow books (Reciprocal Borrowing Agreement) directly from them upon presentation of their UOIT photo identification card. Materials may be returned directly to the lending library or may be left at the UOIT Library where they will be returned to the appropriate lending library.

Since a postgraduate program is being discussed here, the borrowing restrictions that the University of Toronto Libraries have on undergraduates are obviously not applicable.

Research Support, Staffing and Partnerships

The following strategies are established and/or being developed:

1. As described above, the Library as part of a newly formed institution (June 2002) has already made significant progress in terms of collection development, instruction and resource accessibility. Continued efforts will be made to improve and expand information services. As professors arrive on the UOIT campus, librarians are meeting with them to identify their teaching and research objectives.

2. A professionally qualified librarian (M.L.S.) with subject expertise in the sciences and health sciences joined the UOIT Library staff in August 2002. Given the anticipated appearance and evolution of more UOIT postgraduate programs, the hiring of a Graduate Studies Librarian will occur within the next two years.

3. The importance of liaising with the UOIT Centre for Academic Excellence and Innovation (CAEI), a facility where faculty are introduced and mentored in the use of instructional technology such as computerized teaching packages, presentation software, web development, and distance learning delivery is recognized. This would ensure that the

Library's resources, in digital format, are included amongst the links for courses developed within the Faculty of Science. A link to the Library Web Page Faculty Guides from each student's "My WebCT" template is planned.

4. The Library will connect to national and global resources that both enhance student employment opportunities and that support high levels of applied scholarly research.

The Library is indeed preparing for the University of Ontario Institute of Technology's initial postgraduate degree offerings, and lends its support to the resource and research needs of both faculty and students.

CM
March 20, 2006

APPENDIX D: Additional Information

1. PROGRAM DEGREE-LEVEL STANDARD

1.1 Degree-Level Summary

UOIT is committed to providing high quality, challenging graduate programs which clearly meet and/or exceed the standards required for master's degrees. The MASc and MEng programs in Automotive Engineering are master's-level programs as defined in the *Handbook for Public Organizations, 7.1.4*. and their design is guided by benchmarks described in the *Postsecondary Education Quality Assessment Board Handbook for Applicants.* The MASc is a research-oriented master's degree, and the MEng is a professional master's degree program. Both build upon the knowledge and skills of well qualified applicants from relevant undergraduate programs.

The mission of the Faculty of Engineering and Applied Science is to contribute to society through excellence in education, scholarship, and service. We will provide for our graduate students a rigorous education and endeavour to instil in them the attitudes, values, and vision that will prepare them for a lifetime of continued learning and leadership in their chosen careers. We engage in scholarship of discovery, application, and integration.

The master's programs in Automotive Engineering are planned to achieve the following goals:

- *Depth. To provide students with a detailed understanding for the practice and advanced study of advanced technologies related to automotive systems. This includes scientific principles, analysis techniques, and design methodologies.*

- *Breadth – To provide students with the broad and advanced education necessary for productive careers in the public or private sectors and in academia.*

- *Professionalism – To develop skills necessary for clear communication and responsible teamwork, and to inspire professional attitudes and ethics, so that students are prepared for modern work environments with diverse needs and for lifelong learning and enrichment.*

- *Learning Environment – To provide an environment that will enable students to pursue their goals through innovative graduate programs that are rigorous, challenging, and supportive.*

In order for students and faculty engage to in scholarship of discovery, application, and integration UOIT has made every effort to provide state-of-the-art learning resources including the library, learning technologies, and laboratories. For example, students in the MASc and MEng programs will have access to major equipment and state of the art facilities such as: IMC, and ACE. Details about these resources are described in Section 3.2.

The learning outcomes for the MASc program are achieved through a combination of course work, supervised research, a research seminar, and a research thesis.
The main purpose of the MEng program is to provide the opportunity for engineers in industry to

upgrade and expand their skills. Graduates of the program will be able to apply what they have learned in a variety of applications in industry. The learning outcomes for the MEng program are achieved through either a combination of course work and a project, or solely course work depending on which option the student selects. MEng students are exposed to research through course-based research projects.

The combination of courses and/or projects and research, will be designed collaboratively between the student and an assigned faculty advisor/mentor. Each learner will have the opportunity to develop the prerequisites for specialized practice of, or for advanced study in areas within Automotive Engineering, such as Energy, Thermofluids, Mechatronics and Manufacturing, including their scientific principles, analysis techniques, and design methodologies. Learning activities and materials in graduate courses will be carefully designed to ensure that learners are deliberately exposed to study, the majority of which is at, or informed by, the forefront of engineering theory and practice.

The courses have been designed to give students in depth learning in a specialized area of engineering, opportunity for advanced development of generic skills such as communication and teamwork, as well as participation in the scholarly activities of research, seminars, and presentations. Throughout the curriculum, learning activities are planned, and student progress will be monitored to ensure that safety, professional guidelines, and ethical responsibilities relevant to engineering and for specific areas of advanced study are modelled, developed, and evaluated.

UOIT's faculty of Engineering and Applied Science has assembled a team of highly qualified and experienced faculty who will deliver the curriculum in interesting and challenging ways and ensure that students are exposed to knowledge and technical applications which are at the forefront of the discipline.

Successful completion of a master's program in Automotive Engineering will require the students to advance their knowledge and understanding of complex issues in a specialized area of engineering, to identify problems and to search for approaches in systematic and innovative ways.

Relevant Knowledge and Understanding

The master's program is designed to enable students to acquire a high level of knowledge and to develop skills to tackle problems in the rapidly evolving discipline of automotive engineering. The program draft has been reviewed by academics and industry professionals. Courses have been designed to help students develop an advanced expertise which incorporates current theory, research, and practice in a specialized area of engineering. The proposed program emphasizes excellence in engineering knowledge and practice and builds upon transferable skills (i.e., interpersonal relations, leadership and team building, communication, critical analysis and decision making) from undergraduate education.

To achieve the overall goals of the program and to ensure that graduates achieve the learning outcomes, the curriculum provides students with advanced theory, research, project management, and technical and laboratory skills, as well as opportunities to apply this learning. The graduate programs in engineering will incorporate relevant lab and technical skills into learning activities and assignments. Graduate students will develop an

in-depth understanding of the technological, social, political, economic, and global issues that affect engineering in general, and in particular, their area of specialization.

Application

Students will acquire a systematic knowledge of inquiry and research methods, including qualitative and quantitative approaches. They will use technology models and state of the art equipment, including current versions of Computer-Aided Engineering (CAE) tools and techniques used for engineering practice. They will be expected to demonstrate sound decision-making strategies to address problems.

The MASc Thesis offers students the opportunity to apply core course concepts and techniques to a substantial investigation under the guidance of a faculty expert. Those students who choose the MEng-Project program plan will be required to work with a faculty member in conducting a significant project. Students from both of these program plans will be required to present their findings to a panel of faculty assessors. Their understanding of relevant theory related to a specialized area of engineering, their ability to use appropriate qualitative and quantitative methods of analysis and to create and evaluate a range of options, and their research and project management skills will all be challenged during the design and implementation of the project or thesis and during seminars and presentations. Students who follow the course based MEng will be required, in the majority of their courses, to apply research and project management strategies and to develop professional presentation skills.

Cognitive Skills

Problem solving, critical analysis, and synthesis are cognitive skills essential to success in any discipline. Graduate students in engineering are expected to utilize these skills throughout the program and they will be provided with ample opportunities to refine these skills through such delivery models as problem based learning activities, collaborative and independent work, simulation lab exercises, written critiques of theory and research, debates and discussions in classes, and oral presentations that require justification of decisions. Students will be actively engaged in these intellectual processes as they work with challenges encountered by individuals in the profession. Such realistic and practical assignments will develop and strengthen students' abilities to critically analyze the information they see, hear and read, to identify assumptions and implicit values, to gather appropriate data to inform and guide decision-making, to propose new hypotheses, to create and assess a range of solutions, to predict risks and to evaluate outcomes. Students will be required to work in teams in appropriate courses; they will be exposed to a variety of perspectives and called upon to listen, assess and incorporate the ideas of others into the problem solving process. Collaborative activities will enable them to pose questions, devise and sustain arguments, and, most importantly, to be active participants in the learning process. While engaged in such interactive processes, they will learn from and contribute to the learning of others.

Lifelong Learning

Realistic case studies and lab exercises, presentations by representatives from industry, and the research, projects, and seminars will expose students to the complexities and challenges and dynamics of engineering. Master's level engineering graduates will need to be prepared to work in complex and unpredictable environments, in different types of

corporations and institutions, and with a wide range of colleagues and clients. Change and ambiguity are normal features of an engineering environment and students will develop positive attitudes and pro-active strategies to manage them. Students will come to recognize that a strong foundation of technical knowledge, an ability to locate and utilize up-to-date resources, and ability to make informed decisions will be required in the demanding situations and changing environments of engineering practice, research and education. They will have developed the commitment and strategies necessary for the lifelong learning required for their profession.

Students will learn how to engage in advanced research by using print and electronic publications, including scholarly journals, books, and research websites for the most up-to-date information. They will recognize the need for independent and ongoing learning to maintain currency in a rapidly changing field and to further develop their professional skills. Graduates will have the advanced knowledge base and skill set needed to undertake further education to support and advance their careers.

Transferable Skills

The curriculum has been designed to emphasize the development of qualities and transferable skills which contribute to the students' success as independent learners and as team players. Throughout the program, graduate students will be involved in a variety of tasks that involve the demonstration of effective communication skills using oral, written, graphic and electronic formats. They will be expected to share information in ways which are suitable for both lay and specialist audiences. Students will participate in small and large group activities and hone their skills as both team members and leaders. The coursework in the program will require hours of research along with activities involving practical applications. The demanding workload will require students to organize their time and manage their projects efficiently in order to meet clearly defined standards of performance and expected deadlines.

UOIT is confident that the proposed program is sufficiently comprehensive and rigorous to meet the standards of a master's level graduate degree program. It aims to develop in students the advanced knowledge base, the enhanced technical, cognitive, and interpersonal skills as well as the positive attitudes that will enable them to experience personal, academic, and professional success during their graduate studies at UOIT and beyond.

2. CAPACITY TO DELIVER STANDARD

2.1 Enrolment Projections and Staffing Implications

PROJECTED INTAKE AND ENROLMENTS Master of Applied Science in Automotive Engineering						
YEAR	**Cumulative Enrolment**		**Staff Requirements - Projected**			
	Full-time	**Part-time**	**Cumulative Full-time Faculty FTE**	**Cumulative Part-time Faculty FTE**	**Technical Support**	**Ratio of Full-time Students/ Full-time Faculty**

2007	5-10	1-3	23	0	5	1:2.3
2008	15-25	2-6	38	0	5	1:1.52
2009	20-30	3-9	52	0	5	1:1.73
2010	20-35	3-9	60	0	5	1:1.71

PROJECTED INTAKE AND ENROLMENTS Master of Engineering in Automotive Engineering						
YEAR	**Cumulative Enrolment**		**Staff Requirements - Projected**			
	Full-time	**Part-time**	**Cumulative Full-time Faculty FTE**	**Cumulative Part-time Faculty FTE**	**Technical Support**	**Ratio of Full-time Students/ Full-time Faculty**
2007	5-10	5-10	23	0	5	1:2.3
2008	5-20	10-20	38	0	5	1:1.9
2009	5-20	10-20	52	0	5	1:2.6
2010	10-25	10-20	60	0	5	1:2.4

2.2 Resource Renewal and Upgrading

- **For library renewal and upgrading, refer to Appendix A: Library Resources**

- **Computers and Computer Access:**

Refer to OCGS Appraisal Brief Section 3.4 for details on computers and computer access.

- **Classrooms and Physical Facilities:**

Capital Plans are in place to develop two phases of buildings. The government has invested $60 million in development of the University of Ontario Institute of Technology. Initial construction took place on 115 acres immediately adjacent to Durham College. The University has also purchased a scenic 385 acres to the north of this area to accommodate future development.

The first University building, which was ready for occupancy in September 2003, contains classrooms, laboratories, and academic and staff offices. A 300-bed residence was also ready for the first class of UOIT students in September 2003.The second phase of construction, included one additional (200 bed) residence building, two additional academic buildings comprised of classrooms, laboratories, academic and staff offices and a new library shared by UOIT and Durham College. This phase was completed in September

2004.

In early November 2003, engineers completed drilling of a geothermal well field, and it is the largest heating and cooling system of its kind in Canada and the second largest in North America. This is the first phase in development of a thermal energy system that will use the earth's relatively constant temperature to provide highly efficient heating and cooling for campus buildings. Academic buildings feature an environmentally friendly "green" roof comprised of grass that helps reduce heating and cooling costs and improve storm water management.

The initial core facilities for teaching and research at the UOIT are housed in the three academic buildings. Together with the new University library, these buildings overlook the landscaped campus commons. This precinct is the heart of the University and will be its central crossroads.

A key characteristic of each academic building is the provision of generous student study and lounge space. These are complemented by a faculty lounge, Council room and student club offices. The lounge and study spaces are concentrated around a central skylit atrium which provides a point of orientation, gathering and connection for students and faculty. The buildings are designed to be highly flexible, adaptable to programs and teaching configurations as yet unknown. Wired and wireless connections are provided through all dedicated and informal teaching spaces.

The new University library has been is designed as the intellectual and social commons for this 21st century university. In particular, the library has two points of focus; the provision of access to electronic collections and resources and work and study space for 750 students. While the

library will house a print collection of about 125,000 volume equivalents, with an emphasis on reference materials, it is in the provision of access through wired and wireless connection to electronic collections that the library will be distinguished. The building is designed on three floors with the connectivity and staff resources to fulfill this mission. Much attention has been devoted to the quality and variety of student space. Large study halls overlook the landscape commons and provide a variety of table, carrel and soft lounge seating. Many enclosed rooms are also provided for group study, seminar discussion and quiet work activities.

Construction of the new engineering building was started in early 2005 with completion for student use scheduled for summer 2006.

- **Laboratories/Equipment:**

Refer to OCGS Appraisal Brief Sections 3.2 and 3.3 for details of current and planned laboratory resources.

3 CREDENTIAL RECOGNITION STANDARD

3.1 Program Design and Credential Recognition

UOIT is committed to providing high quality, challenging graduate programs which clearly meet and/or exceed the standards required for master's degrees. The design of the master's programs in Automotiver Engineering has been guided by benchmarks described in the *Postsecondary Education Quality Assessment Board Handbook for Applicants.* ***(Program Degree Level, Benchmark 1, Handbook – Public, 7.1)***

Research was conducted and documentation is on file, to compare the breadth and rigour of the elements of this proposed Master's program in Automotive Engineering to similar programs, in Canada and elsewhere. The plans for the UOIT curriculum certainly achieve the breadth and rigor of these similar programs. Information about programs available at other universities can be found in Section 1.3 of the OCGS brief.

The main objective of the MASc program is to prepare students for a career as a R&D engineer. Graduates of the program will be prepared for a career in research and development or other employment which requires advanced preparation in Automotive Engineering. They will also be able to continue their education and pursue a doctorate degree. It is understood that applications for graduate school are considered on a case-by-case basis by the admitting university.

The main objective of the MEng program is to provide the opportunity for engineers in industry to upgrade and expand their skills. Graduates of the program will be able to apply what they have learned in a variety of applications in industry. This is a terminal degree developed for students who do not intend to proceed to a doctorate degree.

3.2 Consultation

Academic details of the proposed program were submitted to UOIT's Curriculum and Program Review Committee for examination in March 2006. The proposal was then referred to the University's Academic Council and approved by that administrative body in April, 2006. These advisory and decision-making bodies endorsed the design of the MASc and MEng in Automotive Engineering and authorized the submission of this document to OCGS and PEQAB.

UOIT has initiated formal consultation with universities in Ontario which offer related programs, in order to ensure recognition of its degree credentials for students who wish to transfer or to proceed to other graduate degrees.

4 CONFORMITY WITH MINISTERIAL POLICY DIRECTIVES

4.1 Applicant Acknowledgement and Agreement

The Applicant Acknowledgement and Agreement form, signed by the President of the University, is included on the pages that follow.

University of Ontario
INSTITUTE OF TECHNOLOGY

Faculty of Engineering and Applied Science

Business Plan

Master of Engineering and Master of Applied Science in Automotive engineering

This is the business plan for the new Masters (MEng and MASc) programs in Automotive Engineering to be offered by the Faculty of Engineering and Applied Science beginning in the Winter semester 2008. Note that the methodology and set of assumptions are the same as those in the Mechanical Engineering Masters program, which CPRC and Academic Council approved last year.

Rationale for the New Programs
The rationale for offering these programs is outlined in the submission to the UOIT's Curriculum and Program Review (CPRC) Committee. Market needs and attractiveness of the programs are also laid out in the above mentioned document.

Enrollment Projections and Business Plan Assumptions: MEng & MASc
We propose a scenario that we believe to be the most likely for enrollment in the program as a "Most Likely Scenario". The enrolment corridors have been confirmed to be realistic by the Registrar's office.

The following assumptions were included in the proposed business plan:

- [0][1] Tuition for the programs is set to $ 5,400 (to be consistent with the Faculty of Engineering and Applied Science's proposal for its Mechanical Engineering graduate program).
- [0] Enrollment for the second year to be 90 % of the first year enrollment. 50% of the students will stay for six instead of five terms.
- [1] Full Operating Grant (reduced by the 15% deduction for debt service) per full time student is assumed to be $14,321.55 / annum for a maximum of two years. Part time tuition and operating grant at 1/3 of the above (thus allowing the student to stay five instead

[1] References in square brackets [ ] are to the revenue/expenses spreadsheet attached below on page 5.

of two years). Part Time students stay a maximum of five years. This deviates from the proposal that assumes an quicker degree completion, but the presented assumption is more conservative on the budgetary side.

- [2] [7] Salary Cost is set to $90,000 plus 18.5% in benefits for full time faculty.
- [3] A small number of courses with specializations that cannot be staffed with current faculty will be taught by qualified part time faculty (e.g., adjunct professors, specialists from industry, etc.). The priority is to staff graduate courses with full time faculty. There is no cost to "buy" courses from other faculties in the current proposal. All courses will be offered by the FEAS (and SENS).
- [4] A number of Graduate Research Awards will be provided. The total sum available for these Graduate Research Awards is included as a cost line item in this business plan. We assume that $3,000 per full time student (consistent with the Faculty of Science BP) will be available to fund the GRA. The individual GRA will be awarded according to merit and need to bring up the graduate student income to approx $16,000/annum. Other resources (faculty and granting agencies research grants, TA positions, etc) will amount for the rest of the balance.
- [5] Technical Support Staff will be added to the program. There will be one tech support employee when the program has grown to capacity. As funding for graduate research infrastructure is expected to come from research grants, we see an ongoing necessity to maintain a minimal centralized support infrastructure.
- [6] The program will be supported by 1 additional administrative staff,
- [7] Benefits are calculated on a basis of 18.5 for FT faculty and staff and 11% for all other positions.
- The majority of laboratory needs will be satisfied when the new Automotive Centre for Excellence comes on stream.
- [8] Some additional equipment will be required to supplement undergraduate teaching labs for the use in graduate studies, where the scale of the procurement would not warrant applying for an equipment grant.
- [9] A phased in cost of annually $30,000 is assumed for additional teaching resources. This includes hiring of guest lecturers, technical consultants, instructional materials, etc., to support the program.
- [10] A phased in cost of $20,000 for miscellanea is included in the business plan This line item is for purchasing required supplies to support the new graduate program. This also includes a variety of operating costs. Other miscellaneous costs could include, but not limited to, travel to promote the program and for faculty to attend relevant conferences, engagement of technical consultants and part-time instructors to support the program, instructional aides, office and classroom supplies, acquisition of relevant journals and other publications, and other required cost.
- Inflation has an overall effect on the business plan. Salaries and equipment cost are subject to an annual increase, which will has to be countered by tuition increases. Therefore an inflation factor is not included in the business plan.

Enrollment and Staffing Projection

The following enrollment projection is based on average enrollment target. The underlying enrollment corridor (min/max numbers) was confirmed to be realistic by the Registrar's office.

Most likely Scenario

	New Enrollment		Cumulative Enrollment			Cumulative Full-time Faculty Equivalents (F.T.E.)	Cumulative Part-time Faculty Equivalents (F.T.E.)	Additional Support Personal		Government Grant	Tuition	**Total Revenue**
	Full-Time	Part-Time	Full-Time	Part-Time	Total			Tech	Admin			
2007	15	7	15	7	22	1.0	0	0.5	0.5	$248,240.20	$93,600.00	$341,840.20
2008	20	8	31	15	46	1.5	1	1	1	$515,575.80	$194,400.00	$709,975.80
2009	20	8	35	23	58	2	1	1	1	$611,052.80	$230,400.00	$841,452.80
2010	28	8	43	31	74	2	1	1	1	$763,816.00	$288,000.00	$1,051,816.00
2011	28	8	49	39	88	2	1	1	1	$887,936.10	$334,800.00	$1,222,736.10
2012	28	8	49	47	96	2	1	1	1	$926,126.90	$349,200.00	$1,275,326.90

NOTES

1. Government grant is calculated as $14,321.55 * FT enrolment + 1/3rd $14,321.55 * PT enrolment
2. Cumulative FT enrolment = New Intake + 90% of (5/6th previous year's intake)
3. Cumulative PT enrolment is previous years enrolments added for five years
4. Tuition is calculated as $5,400 * FT enrolment + 1/3rd $5,400 * PT enrolment

Projected Revenue vs. Estimated Expenses

	2007	2008	2009	2010	2011	2012
Total Revenue [0,1]	$341,840	$709,976	$841,453	$1,051,816	$1,222,736	$1,275,327
Salaries						
Faculty [2]	$90,000	$135,000	$180,000	$180,000	$180,000	$180,000
Part-Time Faculty [3]	$0	$42,000	$42,000	$42,000	$42,000	$42,000
Course Cost to other Faculties [3]	$0	$0	$0	$0	$0	$0
Teaching Assistants	$0	$0	$0	$0	$0	$0
Graduate Research Awards [4]	$45,000	$93,000	$105,000	$129,000	$147,000	$147,000
Tech Support Staff [5]	$32,500	$65,000	$65,000	$65,000	$65,000	$65,000
Admin Staff [6]	$21,250	$42,500	$42,500	$42,500	$42,500	$42,500
Benefits [7]	$26,594	$49,483	$57,808	$57,808	$57,808	$57,808
Sub-Total	$215,344	$426,983	$492,308	$516,308	$534,308	$534,308
Ratio	63.00%	60.14%	58.51%	49.09%	43.70%	41.90%
Equipment[8]	$10,000	$10,000	$20,000	$30,000	$30,000	$30,000
Other Teaching Rsrc [9]	$10,000	$10,000	$20,000	$20,000	$20,000	$20,000
Miscellaneous [10]	$10,000	$10,000	$20,000	$20,000	$20,000	$20,000
Total Expenses	$245,344	$456,983	$552,308	$586,308	$604,308	$604,308
Ratio	71.77%	64.37%	65.64%	55.74%	49.42%	47.38%
Net Revenue	$96,496	$252,993	$289,145	$465,509	$618,429	$671,019

APPENDIX D

Brief for the Appraisal
of the

Master of Arts (M.A.) in Criminology

Submitted to the
Curriculum Planning and Review Committee

May 15, 2006

VOLUME I: The Program

TABLE OF CONTENTS

TABLE OF CONTENTS continued…

VOLUME II - Curricula Vitae – Faculty Members

TABLE OF CONTENTS continued…

VOLUME III - Curricula Vitae – Prospective Assessors

1. INTRODUCTION

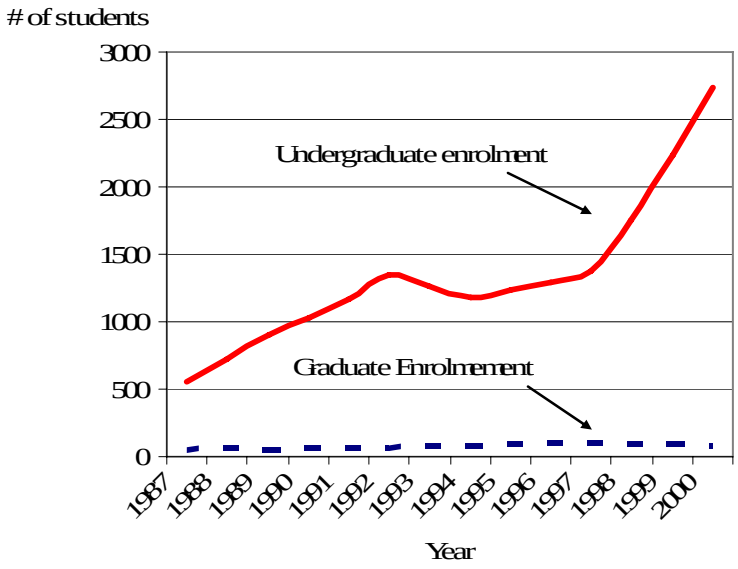
1.1 Brief listing of program

The Master's program in Criminology in the Faculty of Criminology, Justice and Policy Studies at the University of Ontario Institute of Technology (UOIT) is a new program leading to the M.A. degree in Criminology. The M.A. program will have two options: a non-thesis option consisting of a combination of courses and a final major paper, and a thesis option which will consist of specified courses and a thesis. Graduate students in both the non-thesis and thesis programs should be able to complete their studies in 24 months of full-time study. The M.A. program is anticipated to begin in September of 2007, pending all necessary approvals.

Background

In Canada, the U.S., the U.K., and Australia, using publications and course enrolments as the criteria, the popularity of criminology has few rivals. For example, according to the Council of Ontario Universities, between 1987 and 2000 undergraduate enrolment in Criminology programs at Ontario universities increased by 393 percent, while enrolment at the graduate level increased 48 percent (see Figure 1). Over the same period, undergraduate criminology programs enjoyed the fifth largest growth in enrolment of all programs offered in Ontario universities, including the physical and natural sciences, and the largest growth among all general arts and science programs.

Figure 1: Undergraduate and Graduate Student Enrolment in Criminology Programs, Ontario Universities, 1987-2000[1]



1 Source: Council of Ontario Universities, Enrolment Review: Report of the committee on enrolment statistics, projections and analysis, September, 2001, p. 33. Data does not include UOIT enrolments.

It is not surprising, then, that in addition to two established programs in criminology at the University of Ottawa and the University of Toronto, new undergraduate degrees in criminology, or criminology-related disciplines have recently been created at the following Ontario institutions of higher learning:

- York University
- Wilfred Laurier (Brantford Campus)
- Brock University
- University of Guelph
- University of Guelph/Humber College
- UOIT
- Ryerson University
- Waterloo
- Laurentian
- University of Windsor
- Carleton University

Clearly, there is a major demand for an undergraduate degree in criminology. However, throughout Canada, students seeking graduate degrees in this field have few options. For example, the University of Montreal, University of Ottawa, University of Toronto, and Simon Fraser University are the only Canadian schools that offer a Ph.D. in this discipline. Further, only two Ontario universities (University of Ottawa and University of Toronto) offer M.A. degrees in criminology. Given that since their inception, close to 2000 students have graduated in all of Canada from the above doctoral institutions with M.A., M.Sc, M.C.A. or Ph.D. degrees in criminology, there is, indeed, ample room for another M.A. program in Ontario.

In addition to the demand for advanced degrees in Criminology, further rationales for offering a new M.A. in criminology at the University of Ontario Institute of Technology's (UOIT) Faculty of Criminology, Justice, and Policy Studies (FCJPS) are as follows. First, a competitive program requires productive faculty heavily engaged in research and with solid publication records. As evidenced in curricula vitae provided in Volume II, collectively, the FCJPS has published over 20 books, over 100 refereed journal articles, and numerous scholarly book chapters. Note, too, that several faculty consistently receive external funds from major granting agencies and two senior members are the recipients of prestigious awards from divisions of the American Society of Criminology. It should also be noted that a number of our faculty have successfully supervised eight doctoral students to completion and seven of them are now Assistant Professors at U.S. universities. Indeed, members of the FCJPS are well known around the world for generating scholarship that meets the highest disciplinary standards, and the recent hiring of four new energetic young scholars will enhance the program's reputation.

Second, the acquisition of grants enables faculty to hire students as research assistants, and securing external funds is a highly effective way of recruiting talented M.A. students. Currently, several grants based at the FCJPS involve undergraduate students as research assistants and the recent creation of the UOIT Observatory on Sustainable Cities and Urban Communities will be of great benefit to M.A. and undergraduate students alike. More information about this unique resource is provided in Section 1.6.

Third, as recently pointed out by Statistics Canada, the Durham Region is one of the fastest growing Canadian regions. Still, until three years ago, residents of Oshawa, Whitby, Pickering, Ajax and other parts of the Durham Region had to go to schools in other jurisdictions to receive a university education. UOIT was therefore created to address a major need to serve local residents and it has the highest first-year enrolment in Ontario. Moreover, the FCJPS has the second highest number of majors in this new institution, which shows that criminology is not only attractive, but also highly sustainable. Consider, too, that two-thirds of the entire UOIT student population commute from other regions and many of the FCJPS majors who commute chose this school because of its faculty's reputation. Hence, it is reasonable to assume that the proposed M.A. program will attract both local and external students, especially since only two Ontario Universities offer similar degrees. In addition, it should be noted that one of UOIT's mandates is to facilitate the advancement of college students into university degree programs. One of the main areas where this is currently done at UOIT is in the criminology program. Accordingly, UOIT's M.A. in criminology will provide needed capacity and further the options for students originating in college.

Last, but certainly not least, many people working in local public and private sector organizations are seeking post-graduate degrees to assist them in their career development or to satisfy their ongoing intellectual curiosity. Unfortunately, since they have full-time jobs and families, they do not have the time or money to commute to Ottawa or Toronto. Therefore, the UOIT M.A. in Criminology would be very desirable and easily accessible.

Of course, in addition to serving local residents, we seek students from throughout Canada, Ontario, the U.S., and other countries. Since most members of the FCJPS are heavily involved in international research and international professional organizations, we are confident that we will be able to recruit students from around the world. Routinely publishing in major international journals and participating in international conferences is another important recruiting tool. For example, it is well known that the top students select a program that includes faculty who are widely read and cited.

1.2 Objectives of the program

Building on the strengths of existing faculty and in the context of the background presented above, the proposed M.A. program will provide students with a solid foundation of advanced knowledge in criminological theory, sophisticated research methodologies, complex quantitative and qualitative applications, and contemporary substantive issues in criminology. Specifically, the M.A. program seeks to:

1. Provide students with an in-depth and broad understanding of contemporary criminological issues and debates.

2. Provide students with the critical thinking and practical skills necessary to conduct criminological research in the public and private sectors, including but not limited to public policy agencies, social services, government and non-government organizations.

3. Train both mid-career and pre-career students for careers in analysis and research in criminal justice agency settings.

4. Prepare students interested in pursuing advanced graduate work in criminology at the Ph.D. level.

The program is designed to develop and enhance student skills with respect to:

1. Developing the capacity to identify and analyze high priority criminological issues.

2. Identifying and formulating sound research questions, and conducting a sustained piece of independent research.

3. Collecting and analyzing primary and secondary quantitative and qualitative data using advanced analytical techniques and locating data within existing literatures and theoretical frameworks.

4. Reviewing and understanding criminological literature on complex theoretical, methodological, and substantive issues.

5. Evaluating both the implementation and impact of efforts to reduce or control crime.

In addition, upon completion of the program, students will be able to:

- Effectively communicate and organize ideas, arguments and conclusions.
- Seek advice and listen and learn from written and verbal feedback.
- Manage their own learning experiences, develop the capacity to work and research independently, and cultivate the habit of lifelong learning.

To achieve these objectives, students will complete either a thesis or course based program to earn their degree. The thesis option is designed for those students who are planning to continue their graduate studies; it involves a combination of course work, thesis and a professional seminar. The non-thesis option requires students to complete course work (one additional course more than those choosing the thesis option), a major paper and the professional seminar.

All students must complete a core set of four courses; Advanced Quantitative Methods, Advanced Methods in Qualitative Research, Criminological Theory, and Graduate Seminar in Inequality and Crime. (See Section 4 for detailed course descriptions.) Courses will utilize a combination of existing course specific materials (i.e., textbooks and monographs), course readers, and data sets to deliver learning objectives. Assessment of learning objectives will be based on a traditional combination of assignments, essays, and presentations**,** and for the thesis option, an internal committee's assessment of the quality and technical merit of the thesis coupled with the candidate's oral defence of the work before the committee and an external examiner. The thesis committee will consist of at least two faculty, as per university rules. (Graduate policies and procedures are provided in Appendix B.)

The Professional Seminar is designed to help students to prepare for the graduate level work within the program as well as to establish future professional and educational goals following graduation from the program. In addition, it aims to familiarize them with faculty members' research. Special emphasis in the M.A. program will be given to the study of inequality and crime. Also unique to this program is the requirement that

students learn and apply both quantitative and qualitative research skills.

Further details regarding the organization of the program, the proposed schedule of course offerings and individual course outlines are provided in Section 4 of this submission.

1.3 Method used for the self-study and preparation of the brief

This appraisal was prepared by the Graduate Committee of the Faculty of Criminology, Justice and Policy Studies. The appraisal has gone through thorough reviews by the Curriculum Committee and the Faculty Council of the Faculty of Criminology, Justice and Policy Studies, as well as the Dean of Graduate Studies, Associate Provost, Research, and the University's Curriculum and Program Review Committee and Academic Council.

1.4 Fields in the programs

There are no declared fields in this program.

1.5 Review concerns expressed in previous appraisal and actions taken

As this is an application for a new program, this section is not applicable.

1.6 Special matters and innovative features

UOIT's proposed M.A. program is distinct in several ways. The program includes a critical mass of faculty with strong expertise in the areas of woman abuse, homicide, youth crime, hate crime, poverty and inner-city crime, and the ways in which ethnicity shapes crime and its control. All of these topics can be categorized under the heading 'Inequality and Crime', which is a major theme of our program. Accordingly, in contrast to criminology students at the University of Toronto and the University of Ottawa, our students are explicitly required to take a course titled Inequality and Crime.

The emphasis on inequality stems from the fact that the faculty of FCJPS view crime and the response to crime as phenomena conditioned by class, ethnic, patriarchal and other unequal relations that shape modern society. In addition, the FCJPS is the new home of the refereed journal *Critical Criminology*, published by Springer and edited by Dr. Shahid Alvi (who has a 3 year, renewable term as editor). *Critical Criminology* is the official journal of the American Society of Criminology's Division on Critical Criminology and is one of the world's leading academic outlets for work emphasizing inequality and crime. In sum, the UOIT program will be the first choice of students seeking to work on substantive topics addressing the relationship between crime, its control and multiple forms of inequality.

Of course, as is the case at the University of Toronto, the University of Ottawa and elsewhere, UOIT students will also be exposed to a broad range of theoretical perspectives and traditions within criminological inquiry and will be expected to develop a sophisticated understanding of both quantitative and qualitative research methods. This is not surprising, given that most of members of the FCJPS routinely conduct large- and small-scale surveys of various social problems, such as homelessness, woman abuse, poverty in public housing, and hate crime. Note, too, UOIT criminologists are conducting and have conducted major quantitative and qualitative studies, supported by

grants provided by the research wing of the U.S. Department of Justice, the British Home Office, the US Department of Agriculture, and the National Homelessness Initiative.

Another unique feature of the program we are proposing is that most of our faculty study violence, especially violence against women. To the best of our knowledge, except for York University, no other Canadian institution of higher learning is the home to as many social scientific experts on violence. Moreover, York's LaMarsh Research Centre on Violence and Conflict Resolution is primarily driven by psychological perspectives on violence and aggression, while UOIT's faculty are guided by a broader interdisciplinary approach, embracing the contributions of sociology, psychology, political science, cultural studies, critical race theory, and legal studies. This approach will enable students to look at this serious social issue in different contexts and from different perspectives, adding greater depth to their understanding and a broader foundation from which to devise potential strategies and solutions.

Unlike any other Canadian university, UOIT will offer graduate students a unique resource and opportunity in its Observatory on Sustainable Cities and Urban Communities. Despite the obvious importance of studying Canadian urban problems, there is a conspicuous absence of Canadian scholarly research on sustainable cities. Indeed, of the 5,000 academic researchers benefiting from $230 million of grants-in-aid from the SSHRC, only six are marginally focusing on sustainable cities, and one of them is examining sustainability indicators *per se*. Furthermore, only two recipients of the prestigious Canada Research Chair are studying various aspects of urban development and urban sprawl, but their work is not devoted to developing a scientific understanding of urban communities' sustainability indicators. Obviously, then, there is an opportunity for M.A. students in our program to help develop indicators of crime and other urban problems strongly correlated with crime, and to work with archived Canadian data emanating from the Observatory. The data gathered will focus not just on indicators such as levels of victimization or perceptions of public safety, but will also tap into issues that have known relationships to crime and its control, such as levels and contours of poverty, gender and racial disparity, features of built environments, housing, health, education, and transportation issues. The observatory will involve collaboration with other Canadian universities and private and public sector organizations with a vested interest in enhancing the quality of Canadian urban life. Moreover, such work will enhance students' methodological skills, which, in turn, will increase their chances of being admitted to prestigious doctoral programs and/or obtaining research positions in the public or private sector.

The UOIT Observatory on Sustainable Cities and Urban Communities will offer graduate students unique opportunities to hone their research skills and to work with complex quantitative and qualitative data sets containing data on crime specific and crime related issues. This project is specifically designed not only to generate ongoing, useful data for scholarly and policy purposes (particularly around crime and social problems related to crime), but also to provide students with rich research experience and financial support. Since no other Canadian institution of higher learning is doing similar work on sustainable cities indicators, the FCJPS is able to offer M.A. students an opportunity to be involved in "cutting edge" research on topics of major interest to those seeking to enhance the social, economic, and environmental well-being of Canadian urban communities. As well, Dr. Shahid Alvi and Dr. Hannah Scott are currently completing a funded study of homelessness in Durham Region, while Dr. Barbara Perry and Dr.

DeKeseredy have recently obtained funding from SSHRC to conduct research on hate crime on the college campus.

The University of Ontario Institute of Technology provides faculty and students with an advanced technological learning environment. Every graduate student at UOIT will have wireless and wired access to library resources, email, and the internet, in addition to other online services. Classrooms feature full multimedia support.

In conclusion, the proposed M.A. Program in Criminology meets a clearly defined need and offers graduate students several distinct and attractive features. The FCJPS is deeply committed to creating and maintaining a program that meets the highest international disciplinary standards; the long-term goal is to eventually develop a Ph.D. program that will garner worldwide attention and recognition.

2. THE FACULTY

Presently, including new hires, there are 12 full-time faculty members consisting of a mix of recent Ph.D's, mid-career and well established senior scholars. Only one retirement is scheduled in the next 7 years and new faculty will be recruited each year over the next 5 years to eventually bring our staff to approximately 28. Thus, our full time faculty complement will both grow and maintain continuity. Core faculty will rotate through graduate course teaching responsibilities, and at present, as per University rules, all faculty are eligible to be members of Graduate Faculty.

As noted earlier in this submission, one of the strengths of the FCJPS is the quality of its faculty. As of this writing, cumulatively, our faculty have published 28 books, 122 peer reviewed journal articles, and 76 book chapters. Faculty are also very active in the writing of grant proposals, and many have won awards for their contributions to teaching, research, and community service.

Faculty have done significant work in a number of areas including, but not limited to, hate crime, youth crime, violent crime, human rights issues, corrections, and evaluation research using a wide variety of methodologies and both quantitative and qualitative analytical techniques. The FCJPS has recently hired four new tenure-track faculty who add additional depth and breadth to the program.

2.1 Current Faculty

Table 2-1 on the following page lists the faculty members involved in the graduate program, and indicates gender and expected retirements in the next seven years. Currently, there are 12 core faculty members involved in the program. Four of these (*) are recent hires (beginning July 2006). It must be noted that since UOIT is a new university, the number of professors involved in the program will increase rapidly in the coming years. The faculty members have not been identified by field as there is not a designated field in the proposed program.

All of the faculty are tenured or tenure track-core faculty members whose graduate involvement is exclusively in the M.A. in Criminology Program.

Table 2-1: Faculty Members				
Faculty Name & Rank[1]	**M/F**	**Ret. Date**	**Home Unit**[2]	**Supervisory Privileges**
Category 1				
Alvi - Professor	M		FCJPS	Full
Baglay – Assistant*	F		FCJPS	Full
Blankenship - Assistant*	F		FCJPS	Full
Cesaroni- Assistant	F		FCJPS	Full
Clow - Assistant	F		FCJPS	Full
Crichlow – Associate	M		FCJPS	Full
Dekeseredy - Professor	M		FCJPS	Full
Dragiewicz – Assistant*	F		FCJPS	Full
Hinch – Professor	M	2013	FCJPS	Full
Olsson – Assistant*	F		FCJPS	Full
Perry – Professor	F		FCJPS	Full
Scott – Associate	F		FCJPS	Full

** New Hires*

All Faculty members in the above list are Category 1: Tenured or tenure-track core faculty members whose graduate involvement is exclusively in the graduate program under review.

- **New faculty requirements and gaps they would be expected to fill**

At the outset, a professor specializing in advanced quantitative methods will need to be hired. As program enrolment grows, it is expected that there will be several new faculty appointments whose expertise and research funding will add significant value to the program.

2.1 External operating research funding - for past seven years by source.

Table 2-2 presents the external research funding that faculty members have received to date since 1998. Since the first faculty started at UOIT in 2003, the funding in table 2-2 for the years 1999 -2003 also represents funding secured by UOIT faculty while at other institutions.

Please note that amongst the funding sources are research funds that have been converted from Swedish Crownes. U.S. dollars however, have been listed separately.

Table 2.2 Operating Research Funding by Source and Year

	Source			
Year[1]	**Granting[1] Councils**	**Government[2]**	**Foundations[3]**	**Others [4]**
1999-00				
2000-01	$235,000.00	$74,000 $588,412.00 USD	$450.00	
2001-02	$35,000.00	$55,000.00		
2002-03	$17,500.00	$10,000.00	$750.00	
2003-04		$5,000.00 $479,833.00 USD	$5,250.00	
2004-05		$57,470.00		$2,000.00
2005-06	$20,000.00	$60,065.00 $4,200.00 USD	$3,750.00	$98,178.00
2006-2007 (to date)	$20,985.00	$144,200		
Totals	$328,485.00	$405,475.00 $1,072,445.00 USD	$10,200.00	$100,178.00

1 *SSRHRC*

2Minnesota Partnership Against Tobacco; Ontario Graduate Scholarship; Ministry of Justice Canada, Youth Policy Branch; Heath Canada; Swiss Government; Canadian Department of Defense; U.S. Department of Justice; British Home office; U.S. Department of Agriculture, Swedish International Development Authority.

3 Crafoord Foundation, Knut och Alice Wallenberg Foundation, Per Westlings Foundation.

4 Swedish International Development Authority, Scientific Society Lund, ,International Child participation, Non-discrimination and Children, Ethics an d Media Projects..

2.2 Graduate supervision

Many members of the Faculty of FCJPS have had the opportunity to teach at the graduate (M.A. and Ph.D.) level. In addition, many have been involved in supervising fourth year honours theses at the undergraduate level. Some of the senior faculty have also been involved as external examiners for M.A. and Ph.D. candidates, and plans are underway to begin a formal mentoring system for junior faculty regarding the contours and responsibilities of the supervisory process. We also plan to create a written set of guidelines for supervising major research papers and theses. These will address, among other issues, the ethics review process, timelines, graduate regulations and the obligations of both student and supervisors.

Table 2.3 lists the completed and current number of thesis supervisions by faculty member. The table shows there is a good balance of senior professors who have successfully graduated students and new professors who have not yet graduated students.

New faculty will continue to be hired at all levels to ensure a healthy balance between full professors, associate professors, and assistant professors. Again, in addition to thesis supervision, it should be noted that many of the faculty at both the junior and senior level have been involved in directed studies, teaching of graduate seminars and supervision of honours theses.

Table 2.3 Completed and Current Numbers of Thesis Supervisions by Faculty Member

	Completed			Current		
Faculty Member	**Master's**	**PhD**	**PDF**	**Master's**	**PhD**	**PDF**
Alvi	3	3	0	0	0	0
Baglay	0	0	0	0	0	0
Blankenship	0	0	0	0	0	0
Cesaroni	0	0	0	0	0	0
Clow	0	0	0	0	0	0
Crichlow	1	0	0	0	0	0
DeKeseredy	14	4	0	0	1	0
Dragiewiez	0	0	0	0	0	0
Hinch	8	0	0	0	0	0
Olsson	0	0	0	0	0	0
Perry	12	0	0	0	0 (1)	0
Scott	4	0	0	0	0	0

2.3 Current teaching assignments

Table 2.4a shows the teaching loads for the 2005/06 academic year. Table 2.4b shows the teaching assignments for the 2004/2005 year and Table 2.4c shows the teaching assignments for the 2003/2004 year. Note that UOIT accepted its first undergraduate students in the 2003/2004 year. Also, the Faculty's four new hires are not included in these tables as their teaching responsibilities do not begin until 2006-2007 and they will

have been teaching at other universities until that time. Each of these new hires is teaching in the areas of law, sociology of law, women's studies and public administration and criminal justice.

Note that all courses in the tables below are 3 credit courses.

TABLE 2.4a Teaching Assignments for 2005/2006

Faculty Member	Rank	Undergraduate	Comments
Alvi	Professor	SSCI 2900 Computing for the Social Sciences SSCI 1000 Introduction to Criminal Justice SSCI 3027 Youth Crime SSCI 4900 Field Work Practicum SSCI 2021 Issues in the Family PHIL 1040 Philosophy: Social & Political Issues	
Cesaroni	Assistant	SSCI 3060 Corrections SSCI 3053 Prosecution & Sentencing SSCI 3050 Policing	
Clow	Assistant	SSCI 2900 Computing for the Social Sciences SSCI 2820 Psychological Explanations of Criminal Behaviour PSYC 1000 Introductory Psychology	
Crichlow	Associate	SSCI 1000 Introduction to Criminal Justice SSCI 2020 Issues in Diversity SSCI 3010 Social Justice & Conflict SSCI 1010 Introduction to Canadian Legal System SSCU 2050 Rights & Freedoms in the Justice System	
DeKeseredy	Professor	SSCI 2810 Sociological Theories of Criminal Behaviour SSCI 2830 Justice Theory & Policy	
Hinch	Professor		Dean, Faculty of Criminology, Justice and Policy Studies
Scott	Associate	SSCI 2820 Psychological Explanations of Criminal Behaviour (2 sections) SSCI 3026 Issues in Organized Crime SSCI 3025 Victimology	
Perry	Professor	SSCI 1000 Introduction to Criminal Justice SSCI 1200 Introduction to Social Policy SSCI 2810 Sociological Theories of Criminal Behaviour SSCU 2050 Rights & Freedoms in the Justice System	

TABLE 2.4b Teaching Assignments for 2004/2005

Faculty Member	Rank	Undergraduate	Comments
Alvi	Professor	SSCI 1000 Introduction to Criminal Justice SOCI 1000 Introductory Sociology PHIL 1040 Philosophy: Social & Political Issues SOC 405[1] SOC 320[1]	
Cesaroni	Assistant	WDW 350Y Young Offenders [2]	
Clow	Assistant	PSYC 1000 Introductory Psychology (2 sections) SSCU 2050 Rights & Freedoms in the Justice System	
Crichlow	Associate	JSTS 3670 Youth Crime JSTS 1600 Criminal Law JSTS 1610 Customs & Immigration Law JSTS 1260 Introduction to Canadian Legal System JSTS 2190 Issues in Diversity	
DeKeseredy	Professor	SSCI 2810 Sociological Theories of Crime SSCI 2830 Justice Theory & Policy	
Hinch	Professor	SSCI 1000 Introduction to Criminal Justice	Dean, Faculty of Criminology, Justice and Policy Studies
Scott	Associate	SSCI 2820 Psychological Explanations of Criminal Behaviour (2 sections) SSCI 1000 Introduction to Criminal Justice	
Perry	Professor	SSCI 1000 Introduction to Criminal Justice SSCI 2810 Sociological Theories of Crime SSCI 2050 Rights and Freedoms in the Justice System SSCI 3025 Victimology	

1 Teaching at University of St Thomas, MN, USA (Course Titles: Criminology, Internship in Criminal Justice)

2 Teaching at the University of Toronto (Course Title: Young Offenders)

TABLE 2.4b Teaching Assignments for 2003/2004

Faculty Member	Rank	Undergraduate	Graduate	Comments
Alvi	Professor	SOC 320[1] SOC 110 SOC 480		
Cesaroni	Assistant	SOCY 511 [2] SOCY 389		
Clow	Assistant	PSYCH 257 E[3] PSYCH 215A PSYCH 020 PSYCH 130A PYSCH 155B		
Crichlow	Associate	JSTS 2190 Issues in Diversity JSTS 1600 Criminal Law JSTS 1610 Customs & Immigration law JSTS 1260 Introduction to Canadian Legal System		
DeKeseredy	Professor	SOC 467a01[4] SOC 201a01	Inner-City Poverty and Crime	
Hinch	Professor	JSTS 1000 Introduction to Criminal Justice		Dean, Faculty of Criminology, Justice and Policy Studies
Scott	Associate	PSYC 1000 Introductory Psychology (2 sections) JSTS 1000 Introduction to Criminal Justice		
Perry	Professor	CRJ 250[5] CRJ 345 CRJ 310	Criminal Justice Policy	

1 Teaching at University of St Thomas, MN, USA (Course Titles: Criminology, Social Problems, Crime and Social Exclusion)

2 Teaching at the Queen's University (Course Titles: Gender and the Law, Children and the Law)

3 Teaching at University of Western Ontario (Course Titles: Introduction to Psychology, The Human Mind, Human Adjustment, Introduction to Personality Theory, Introduction to Sensation and Perception)

4 Teaching at Ohio University (Course Titles: Violence Against Women, Contemporary Social Problems)

5 Teaching at Northern Arizona University (Course Titles: Criminology, Human and Cultural Relations in Criminal Justice, Justice Policy and Process)

2.4 Commitment of faculty members from other graduate programs and/or from other institutions:

Currently, the faculty have sufficient strengths to begin the program; as new faculty are hired, we will become even stronger. Accordingly, we have not yet asked faculty from other institutions or programs to participate in the graduate program. However, we are amenable to this possibility in the future.

3. PHYSICAL AND FINANCIAL RESOURCES

3.1 Library Resources

The goal of the UOIT Library is to enrich the research, teaching, study, and conversation of the University by providing exceptional library and information services and facilities to support all academic programs.

The construction of a new, state-of-the-art library for the University of Ontario Institute of Technology was completed in the fall of 2004. Designed by internationally renowned Diamond and Schmitt Architects Incorporated, the 73,000-square-foot library serves students, faculty, and staff. The four-storey, $20.7-million library houses individual and collaborative learning spaces, research workstations, electronic classrooms, a round pavilion with a reading room and periodicals collection, and other facilities. It offers a variety of learning spaces to suit individual learning styles and user needs. Its design also allows for future enlargement, up to double the original size.

Digital resources and complementary print collections are provided for students in both a physical and virtual environment. Librarians are available to provide students with the skills to navigate effectively through the information environment.

In addition to interlibrary loans, students will also have access to the resources available at the largest academic library in Canada, the University of Toronto Libraries, through a partnership program.

A more detailed description of the library resources is provided as Appendix A: Library Resources.

3.2 Laboratory facilities

There are no specific laboratory facilities required for this program.

3.3 Computer Facilities

There are no specific computer requirements for this program. Desktop computers are available for use by graduate students in the library and the learning commons. Classrooms and learning spaces at the campus are fully networked and feature full multimedia support. The latest wireless technology is available in all main public areas of the campus. Offices and research spaces are also wired for access to UOIT's network.

3.4 Space

In addition to classroom and seminar spaces, the proposed program will require additional office space as new faculty members are hired and desk space for graduate students. Because the graduate students will also be teaching assistants, they will be able to use work spaces that are currently assigned to teaching assistants hired on a contractual basis.

3.5 Financial support of graduate students

As this is a new program, we have no history of funding graduate students. However, all students offered admission to the M.A. program in the Faculty of Criminology, Justice and Policy Studies should be able to complete the program irrespective of their financial status. It is expected that the average support for M.A. students in this program will be approximately $10,000 per year with funding coming from a variety of sources, including:

- External Awards – These include SSSHRC graduate awards and OGS M.A. scholarships.
- Teaching Assistantships – M.A. students will be eligible to earn up to approximately $10,000 per year through teaching assistantships.
- Research Assistantships – Additional support emanating from the research grants of individual faculty supervisors will be available to students.
- Work-Study and Other Forms of Employment-Based Learning.
- Provincial Loan Programs.

It is expected that the majority of funding for M.A. students will come from Research Assistantships and Teaching Assistantships. Normally, funding will not be provided to part-time students.

Financial Counselling

The University and its student support services shall make financial counselling available to students.

4. PROGRAM REGULATIONS AND COURSES

4.1 The intellectual development and the educational experience of the student

The graduate school experience should be characterized by advanced systematic study in a supportive environment to achieve in-depth knowledge and understanding of a discipline. Accordingly, with respect to the M.A. in Criminology, our aims are to ensure that:

- Graduate students develop advanced critical thinking, research, and analytical skills.
- Graduate students also develop in-depth substantive knowledge of the central theoretical debates and methodological techniques within criminology.
- The graduate program offers a stimulating and supportive environment for students.

To foster these outcomes, students will be closely mentored by a group of fully committed faculty offering a high quality, rigorous curriculum focusing on a core set of competencies in theory, research methodology and the substantive area of inequality and crime. In addition, graduate students will be able to choose from a wide range of additional topics courses to round out their education.

Too often, graduate students complain in retrospect that their experiences in graduate school were lonely and alienating, or that faculty were disinterested in their progress. Through appropriate mentoring which includes conscientious advising, prompt feedback, orientation to the graduate program (via the Professional Seminar), clear statements of expectations, annual evaluations of progress, departmental seminars, and opportunities for students to attend conferences and colloquia, our program will ensure that M.A. students gain maximum quality contact time with faculty and the discipline and that their experiences will be substantial and enriching. The graduate research and educational opportunities provided in the program are designed to foster the highest quality of student intellectual development.

To further enhance the quality of graduate student's experiences, in addition to setting high academic standards, faculty will ensure that they are up-to-date in their specializations and that they are diligent in their research, grantsmanship, teaching and service work. The faculty members of the Master's program have a strong demonstrated commitment to pursuing scholarly activities at levels approved by international peers in their respective areas of specialization. The University is also committed to hiring new professors with proven track records in research who will augment and complement the present membership. The supervision of graduate students is an item of high priority for all members of the graduate program and the University as a whole. To further ensure the quality of supervision of the graduate students in this program, guidelines on good supervisory practice will be enacted. Preparation of these guidelines is currently being coordinated by the UOIT Office of Graduate Studies.

UOIT is committed to excellence in both research and teaching. In addition to mandatory orientation and training seminars for teaching assistants, the University offers

opportunities for interested graduate students to participate in teaching and instructional development seminars.

During the course of the program, students will have opportunities to attend featured presentations by the core faculty and their peers, as well as from invited speakers from outside the program and University. Guest speakers will expose students to lines of research outside of the local expertise; this will stimulate discussions and will have the potential of generating new ideas, results and collaborations.

The ability to communicate one's ideas effectively is an essential ingredient in any successful career. For this reason, the program places a strong emphasis on the development of both oral and written communication skills. The quality and clarity of writing are assessed in the evaluation of all written assignments, most notably the thesis and the major project. In addition to the requirements of their coursework, graduate students will hone their presentation skills through their roles as teaching assistants for undergraduate courses and, where appropriate, as presenters at local conferences. This will strengthen their ability to adjust content and presentation style to meet the needs of various audiences. Furthermore, for the thesis students, the quality of the oral presentation at the thesis defence will be assessed.

An important part of the graduate experience is an introduction to the wider community of researchers who are participating in similar research. Students in the program will be familiarized with the research of core faculty through the Professional Seminar course; however, students will also be encouraged to attend conferences and seminars at neighbouring universities or facilities where relevant research is presented. It will be communicated to the students that participation in these events, conferences, workshops and seminars is an essential part of their graduate training and lifelong learning.

All graduate students will have access to the faculty lounge. This provides a central meeting point for students and faculty members to get to know one another and to engage in discussions of mutual interest. This also provides opportunities for students to meet academics and other graduate students from outside their discipline. In addition to formal orientation sessions, other social activities will be arranged periodically to provide additional opportunities for students to interact with graduate students from their own and other programs.

Carefully designed curricula, rigorous and clearly defined expectations, mentoring by high quality faculty members, and exposure to a wide range of experts within and outside their immediate profession will surely support the intellectual development of students in the proposed M.A. program. Additional strategies which encourage graduate students to develop and interact within a supportive community of peers will also enhance their educational experience at UOIT.

4.2 Program Regulations

Degree requirements

The table below summarizes the degree requirements for the M.A. program.

Degree Requirements for Thesis and Non-thesis M.A. in Criminology, UOIT			
Thesis-Based Degree Requirements	Credits	*Non-thesis* Based Degree Requirements	Credits
Required Core Courses:		**Required Core Courses:**	
Advanced Quantitative Methods	3	Advanced Quantitative Methods	3
Advanced Methods in Qualitative Research	3	Advanced Methods in Qualitative Research	3
Criminological Theory	3	Criminological Theory	3
Graduate Seminar in Inequality and Crime	3	Graduate Seminar in Inequality and Crime	3
Professional Seminar	3	Professional Seminar	3
Thesis	9	**Major Paper**	6
Substantive Courses Options:	Maximum of one 3-credit course	**Substantive Courses Options:**	Maximum of two 3-credit courses in any combination
1 of: Reading Course or Special Topics in Criminology		Reading Course (Max. of 1)	
		Special Topics Criminology (Max. of 2)	
TOTAL	27 credits	**TOTAL**	27 credits

Sequence of courses

THESIS OPTION	**NON-THESIS OPTION**
Term 1 Advanced Quantitative Methods Criminological Theory Professional Seminar	Term 1 Advanced Quantitative Methods Criminological Theory Professional Seminar
Term 2 Advanced Methods in Qualitative Research Graduate Seminar in Inequality and Crime Thesis	Term 2 Advanced Methods in Qualitative Research Graduate Seminar in Inequality and Crime Major Paper
Term 3 Reading course or Special Topics in Criminology Elective Thesis	Term 3 Reading course Special Topics in Criminology Elective Major Paper
Term 4 Thesis	Term 4 Major Paper

The courses have been designed and sequenced in this fashion to ensure that students have close contact with members of the faculty in the first year so positive mentoring relationships can be established. In the first year, students need this additional support to meet the rigorous and intense demands of graduate level study. The mandated courses provide a solid foundation of classical and contemporary theory, an understanding of advanced research methodologies and ways in which they may be applied and exposure to a wide range of substantive professional issues and research options. Special interests which have arisen from the content of the mandatory courses can be explored further in the Special Topics in Criminology electives or Reading Course in the latter half of the program. This structure provides the tools students need to work under the 'guidance' of faculty, but with greater independence and confidence, as they proceed with their major paper or thesis in the second half of the program.

Admission

The minimum admission requirements for the MA program is completion of an undergraduate honours degree in the social sciences from an accredited social science program at a Canadian university, or its equivalent, with a minimum of a B (75%) average in the last two years. Normally, applicants will be expected to have graduated with a social science degree which has provided students with a sound understanding of social science methodologies and a basic understanding of criminological theories.

Applicants will be required to submit a portfolio consisting of:

1. A completed application form
2. A personal profile
3. A Curriculum Vitae
4. An official transcript of grades attained in an undergraduate program.
5. Two letters of reference (one academic and one personal/work related reference)
6. A sample of writing from a previously taken undergraduate course.

The policies and procedures governing Graduate Studies at UOIT are currently under review. The most current draft of General Policies and Procedures for Graduate Studies at UOIT is provided as Appendix B in this submission.

Progress reports

Students will submit a progress report consisting of a summary of what they have accomplished that year and their objectives for the following year to the Faculty Graduate Program Director after the first year of registration in the program, and once a year after that. Students will be permitted to continue their program only if they submit a report deemed to be satisfactory.

Thesis evaluation procedures

Within six months of starting an M.A. program, a supervisory committee for the student must be formed. The supervisory committee for a M.A. student will consist of the student's supervisor or supervisors plus two faculty members from UOIT. The Faculty Graduate Program Director will be an ex officio member of all supervisory committees.

The supervisory committee may be chaired by a member of the committee other than the student's supervisor. The supervisory committee is responsible for monitoring and evaluating the student's progress through their program. All M.A. students choosing the thesis option must successfully defend their thesis in front of an examination committee. The examination committee for an M.A. student will be comprised of the student's supervisory committee plus an external examiner who may or may not be a faculty member of UOIT. All external examiners must be approved by the Dean of Graduate Studies.

Language Requirements

All applicants are required to give evidence of their oral and written proficiency in English. This requirement can be satisfied with one of the following criteria:

i) The student's mother tongue or first language is English

ii) The student has studied full-time for at least three years (or equivalent in part-time studies) in a secondary school or university where the language of instruction and examination was English; or

iii) The student has achieved the required proficiency on one of the tests in English language acceptable to the University of Ontario Institute of Technology (see below)

Recommended Scores - English Language Proficiency Tests

- *(higher scores may be required)*
- *TOEFL (computer based) 220*
- *TOEFL (paper based) 560*
- *IELTS 7*
- *MELAB 85*
- *CAEL 60*

Residence Requirements

At least half of a graduate student's courses must be from among the University of Ontario Institute of Technology course offerings in order to meet the residency requirements for graduation.

The minimum time allowed for full-time students to complete a Master's program is one year. The maximum time allowed for completion of a Master's degree is five years on a part time basis.

Distance delivery

The M.A. in Criminology will not be offered as a distance program.

4.3 Part-time studies

At this time, this program will only be available to registered full-time students. We do expect, at some point in the future, to specifically recruit students interested in part-time study. The Office of Graduate Studies will design relevant policies and practices to support the specific needs of these learners.

4.4 Total graduate courses listed and level

Table 7 - Courses to be Offered to Graduate Students

Course	Current Faculty Member(s) Qualified to Teach Course	Proposed Start 2007-2008
Advanced Quantitative Methods	Faculty to be hired	Fall 2007
Professional Seminar	Alvi, DeKeseredy, Perry, Faculty to be hired	Fall 2007
Criminological Theory	Alvi, DeKeseredy, Perry, Scott	Fall 2007
Graduate Seminar in Inequality and Crime	Alvi, DeKeseredy, Perry, Scott	Winter 2008
Advanced Methods in Qualitative Research	Scott, Alvi, Dragiewicz, Perry, Olsson	Winter 2008
Reading Course	All current faculty (and faculty to be hired) who hold Ph.D., have demonstrated specialty in specific area and have been approved by graduate committee to teach course	Fall 2008
Special Topics	All current faculty (and faculty to be hired) who hold Ph.D., have demonstrated specialty in specific area and have been approved by graduate committee to teach course	Fall 2008
Major Paper in Criminology	All current faculty	Fall 2008 and Winter 2009
M.A. Thesis in Criminology	DeKeseredy, Scott, Hinch, Alvi, Perry, Faculty to be hired	Fall 2008 and Winter 2009

Graduate Course Outlines

It should be noted that all courses in the proposed program are graduate level courses. Combined courses in which both graduate and undergraduate students would enrol will not be offered.

Course Title: Advanced Quantitative Methods

Year and Semester: Fall 2007

Course /subject description:

The objective of this course is to familiarize the student with the principles of advanced statistical analytical techniques and strategies as applied to criminology and criminal justice. Topics may include, but are not limited to, simple, multiple, and logistic, regression analysis, ANCOVA, MANCOVA, and factor analysis.

Method(s) of instruction:

This course will be taught in seminar format.

Content outline by topic:

Week	Content Topic
1	Introduction
2	Simple Regression
3	Multiple Regression
4	Logistic regression
5	Logistic regression
6	Analysis of Variance (ANOVA)
7	Analysis of Co-Variance (ANCOVA)
8	Analysis of M Variance (MANCOVA)
9	Factor Analysis
10	Factor Analysis
11	Student Presentations
12	Student Presentations
13	Summary

Length in contact hours: Three hours weekly for 13 weeks.

Method(s) and frequency of evaluation of student performance:

Students will be evaluated 5 times: Using existing data sets (such as those available through Statistics Canada's Data Liberation Initiative, or faculty research projects), students will work through four projects designed to enhance their understanding of and capabilities with a range of quantitative techniques. Students will also be required to make a final presentation on a criminological problem using a quantitative technique(s) of their choice.

Project 1 (20%)
Project 2 (20%)
Project 3 (20%)
Project 4 (20%)
Presentation (20%)

Advanced Quantitative Methods continued…

Resources to be purchased/provided by students:

Textbooks
Any other resources to be determined by the faculty member hired to teach the course.

Textbook requirements:

Tabachnick , B. & Fidell, L. (2001). *Using multivariate statistics.* 4th ed. Toronto, ON: Allyn and Bacon.

Learning Outcomes:

Students who successfully complete the course will demonstrate the ability to:

- Apply a variety of advanced statistical methods
- Design projects using advanced statistical methods
- Analyze data using advanced statistical methods
- Evaluate various advanced statistical methods for utility
- Display advanced and efficient skills in applications of SPSS (Statistical Package for the Social Sciences)
- Research, design and present statistical papers using advanced analysis and presentation of statistical information
- Develop preparation and presentation skills to explain complex statistical applications grounded in research to a knowledgeable audience.

Information about Course Designer/ Developer:

Course designed by Dr. Hannah Scott, Associate Professor.

List faculty eligible to teach the course and/or statement of "faculty to be hired":

Faculty to be hired

If method of instruction includes on-line delivery what percentage of course content will be offered on-line. None

Faculty Qualifications to teach/supervise the course:

Faculty member must hold a Ph.D. in Social Sciences related discipline and knowledge and training in advanced statistical methods.

Classroom requirements: Seminar room

Equipment requirements: Standard classroom delivery technology available at UOIT

Course Title: Criminological Theory

Year and Semester: Fall 2007

Course /subject description:

This seminar provides students with an in-depth overview of major criminological theories of the past and present. Emphasis is given to the pre-theoretical assumptions of each theory, its major contributions in criminology, key empirical findings generated by the theory, and historical and contemporary debates around each theory. In addition, students will be encouraged to examine new extensions of present paradigmatic theoretical structures.

Method(s) of instruction:

This course is in seminar format. Each week one student will choose two theorists whose work falls within the topic areas for that week. Students will lead the seminar by making a brief presentation based on a reading of the work. The presentation and discussion to follow should address the contributions of the work to criminological literature, the relationship of the work to other perspectives in criminology, and the theoretical strengths and limitations of the work.

Content outline by topic:

Week	Content Topic
1	Introduction to the course: Lecture: Historical Foundations of Criminology
2	The Classical School
3	The Positivist School
4	Rational Choice, Routine Activities and Deterrence
5	Social Disorganization and Cultural Transmission
6	Subcultural Theories
7	Labelling Theories
8	Control Theories
9	Differential Association and Social Learning Theories
10	Strain and Anomie Theories
11	Feminist Theories
12	Critical Criminology
13	Integrated Theories: Summary

Length in contact hours: Three hours weekly for 13 weeks

Criminological Theory continued…

Method(s) and frequency of evaluation of student performance:

Students will be evaluated four times in this course:

Two Presentations (15% each)	Each student will make two presentations on two different topics to lead seminar discussion for the week.
First Paper (20%)	A paper evaluating and critiquing a journal article on a specific criminological theory. Approximately 10 pages in length.
Final Paper Prospectus (15%)	A detailed document outlining the student's plans for the final research paper, including the goals of the paper and a synopsis of key arguments to be made. Approximately 5 pages in length.
Final Research Paper (35%)	A major paper on any of the topics discussed in the seminar. Approximately 25 pages in length.

Resources to be purchased/provided by students:

Textbooks and course pack
Any other resources to be determined by the faculty member hired to teach the course

Textbook requirements:

Williams, F. P. III, & McShane, M. D. (2004). *Criminological theory*. 4th ed. Upper Saddle River, NJ: Prentice Hall.

Downes, D, & Rock, P. (200xx) *Understanding Deviance.* 4th ed.

Other reading requirements:

A course pack of journal articles will be available in the bookstore or online through existing library resources.

Learning Outcomes:

Students who successfully complete the course have reliably demonstrated the ability to:

- Develop an in-depth understanding of the strengths and limitations of classical and contemporary criminological theories.
- Understand the context in which current ideas are forming in Criminology.
- Think critically about historical and emerging issues in light of theoretical explanations.
- Write an in-depth paper in criminology which illustrates advanced knowledge and skill required at a graduate level.
- Use specialized knowledge and professional communication skills to explain complex theoretical ideas to a knowledgeable audience.

Criminological Theory continued…

Information about Course Designer/ Developer(s):

Course designed by faculty eligible to teach this course:
Dr. Shahid Alvi, Professor.
Dr. Walter DeKeseredy, Professor
Dr. Barbara Perry, Professor.
Dr. Hannah Scott, Associate Professor

List faculty eligible to teach the course and/or statement of "faculty to be hired":

Dr. Shahid Alvi, Professor.
Dr. Walter DeKeseredy, Professor
Dr. Barbara Perry, Professor.
Dr. Hannah Scott, Associate Professor

If method of instruction includes on-line delivery what percentage of course content will be offered on-line. None

Faculty Qualifications to teach/supervise the course:

Faculty member must have a Ph.D. and hold an interest in Criminological Theory.

Classroom requirements: Seminar room

Equipment requirements: Standard classroom delivery technology available at UOIT

Course Title: Professional Seminar

Year and Semester: Fall 2007

Course /subject description:

This is a professional development seminar. This course has several objectives. First, this course is designed to provide all graduate students with an understanding of basic research issues in the areas of crime, law and justice. Second, students will be introduced to the faculty members of the Faculty of Social Science and their current research agendas. Third, students will also be given knowledge and skills to aid them with completing their graduate degree, and finding post graduate employment or other university programs to continue their education. Thus, each week this course will provide an in-depth discussion of current research, professional skill development, and/or learning about current issues in setting goals both within the program and post completion. This course is mandatory for all students, and is graded on a satisfactory/unsatisfactory evaluation scale. This course provides students with the opportunity to prepare a proposal for their major research paper/thesis under close supervision. Students will share proposals with each other and will provide commentary and feedback on each other's work.

Method(s) of instruction:

This course will be taught in seminar format. Throughout the course, various faculty members or guest speakers will be invited to talk about their current research interests and projects, and to discuss their own experiences in relation to the topic of the week. Students will be responsible for reading materials provided by the instructor or faculty in addition to appropriate readings from the textbooks. All students are expected to participate in discussions emanating from the readings and lectures.

Content outline by topic:

Week	Content Topic
1	Introduction
2	How to ask good questions
3	The writing process I
4	The writing process II
5	Effective presentations
6	Issues in classroom teaching
7	Effective report writing
8	Writing research proposals
9	How to publish
10	Applying for research grants/writing research proposals
11	Finding employment
12	Applying to Doctoral programs and scholarships
13	Wrap up

Length in contact hours: Three hours weekly for 13 weeks

Professional Seminar continued…

Method(s) and frequency of evaluation of student performance:

Students will be provided written and verbal feedback from both the instructor and other students on their major paper/thesis proposal and on their seminar presentation. This is a pass/fail course.

Resources to be purchased/provided by students:

Textbooks
Any other resources to be determined by the faculty member hired to teach the course.

Textbook requirements:

Becker, Howard S. (1986). Writing for Social Scientists: *How to Start and Finish Your Thesis, Book, or Article*. Chicago: University of Chicago Press.

Becker, Howard S. (1998). Tricks of the Trade: *How to Think about Your Research While You're Doing It*. Chicago: University of Chicago Press.

Portner, H. (2005). *Workshops that really work : The ABC's of designing and delivering sensational presentations*. Thousand Oaks, CA: Sage

Learning Outcomes:

Students who successfully complete the course will demonstrate the ability to:

- Meet professors currently conducting research.
- Understand some of the current research and issues in the area of Criminology and Justice.
- Become familiar with writing requirements within the graduate program.
- Develop a sound understanding of the basic ground rules for effective communication of ideas through various formats.
- Design and deliver effective presentations on areas of interest.
- Understand the different ways of communicating information and how to master them.
- Receive guidance and begin the planning process for potential goals post program completion.

Information about Course Designer/ Developer(s):

Course designed by:
Shahid Alvi, Professor.
Walter DeKeseredy, Professor.
Hannah Scott, Associate Professor.

Professional Seminar continued…

List faculty eligible to teach the course and/or statement of "faculty to be hired":

- Dr. Shahid Alvi
- Dr. Walter DeKeseredy
- Dr. Barbara Perry
- Faculty to be hired

If method of instruction includes on-line delivery what percentage of course content will be offered on-line. None

Faculty Qualifications to teach/supervise the course:

Faculty must hold a Ph.D. and be approved by the Faculty to teach graduate level courses.

Classroom requirements: Seminar room

Equipment requirements: Standard classroom delivery technology available at UOIT

Course Title: Advanced Methods in Qualitative Research

Year and Semester: Winter 2008

Course /subject description:

The objective of this course is to familiarize the student with the principles of qualitative research. This course will not assume prior knowledge of qualitative methods other than basic introduction to methods in a general undergraduate methods course. Students will be exposed to a variety of qualitative methods including, but not limited to, issues of overt and covert research, comparing and contrasting qualitative and quantitative methods, content analysis, participant observation, and historical comparative methods. Students will also learn how to use these methods with quantitative methods.

Method(s) of instruction:

This course will be taught in seminar format.

Content outline by topic:

Week	Content Topic
1	Introduction
2	Qualitative Methods: Obtrusive vs. unobtrusive methods
3	Covert vs. overt methods
4	Participant observation
5	Interviewing techniques
6	Qualitative methods in survey design
7	Content Analyses
8	Historical comparative Analyses
9	Organizing your data: Folder methods, qualitative research packages, importance of theoretical framework.
10	Ethnography
11	Archival and historical analysis
12	Triangulation in project methodology
13	Summary

Length in contact hours: Three hours weekly for 13 weeks

Advanced Methods in Qualitative Research continued…

Method(s) and frequency of evaluation of student performance:

Students will be evaluated three times in this course:

Participation (30%)	Students are expected to lead weekly discussions based on readings for that week.
Research Proposal (30%)	Since the course is designed provide students with the skills necessary to conduct a qualitative research project relevant to criminology, each student will prepare a formal research proposal addressing a proposed research question, the rationale/motivation for this question, a brief literature review, and an overview of the proposed methodology. Approximately 20 pages in length.
Research Paper (40%)	A major paper on any of the topics discussed in the seminar. Approximately 25 pages in length.

Resources to be purchased/provided by students:

Textbooks
Any other resources to be determined by the faculty member hired to teach the course

Textbook requirements:

Patton, M. Q. (2001) *Qualitative research and evaluation methods*, 3rd Ed. Thousand Oaks, CA: Sage.

Wolcott, H. F. (2001) *Writing up qualitative research*, 2nd. Ed. Thousand Oaks, CA: Sage

Miller, J. M. & Tewksbury, R. (2001) *Extreme methods*. Toronto, ON: Allyn and Bacon

Learning Outcomes:

Students who successfully complete the course will demonstrate:

- An in-depth understanding of modern qualitative methods.
- The ability to apply qualitative methods and to analyze qualitative data.
- The ability to apply these methods in various types of projects.
- The ability to design research projects using qualitative methods.
- An understanding of how to combine qualitative and quantitative methods in single projects.

Information about Course Designer/ Developer(s):

Course designed by:
Dr. Hannah Scott, Associate Professor.
Dr. Shahid Alvi, Professor.

Advanced Methods in Qualitative Research continued…

List faculty eligible to teach the course and/or statement of "faculty to be hired"

Dr. Hannah Scott
Dr. Shahid Alvi
Dr. Molly Dragiewicz
Dr. Barbara Perry
Dr. Patrik Olsson

If method of instruction includes on-line delivery what percentage of course content will be offered on-line. None

Faculty Qualifications to teach/supervise the course:

Faculty must have a Ph.D. in a Social Science related field, and have working and academic knowledge of qualitative research methods.

Classroom requirements: Seminar room

Equipment requirements: Standard classroom delivery technology available at UOIT

Course Title: Graduate Seminar in Inequality and Crime

Year and Semester: Winter 2008

Course /subject description:

The main objective of this course is to provide an in-depth, critical overview of several new directions in criminological theory and research in the areas of inequality and crime. Students will explore the interplay of race/ethnicity, social class and gender in relation to crime and its control, and will be challenged to critically evaluate some of the major explanations offered for these relationships. Special attention will be devoted to left realist and feminist contributions to a sociological understanding of North American inner-city crime and to sociological work on the relationship between masculinities and crime in various social settings.

Method(s) of instruction:

This course is in seminar format. Students will be expected to do required readings and to make presentations each week summarizing the readings.

Content outline by topic:

Week	Content Topic
1	Introduction to Issues surrounding Inequality and Crime and the problem of causal inference
2	Poverty and Joblessness in Urban North America (Part 1 and Part 2)
3	Poverty, Joblessness and Crime (Part 1, Part 2)
4	Race, ethnicity and Crime
5	Race, ethnicity, culture and Crime
6	Gender and Crime (Part 1, Part 2)
7	Masculinities and Crime (Part 1, Part 2)
8	Poverty, Crime and Social Control (Part 1)
9	Poverty, Crime and Social Control (Part 2)
10	Policy Issues
11	Student Paper Presentations
12	Student Paper Presentations
13	Student Paper Presentations

Length in contact hours: Three hours weekly for 13 weeks

Graduate Seminar in Inequality and Crime continued…

Method(s) and frequency of evaluation of student performance:

Students will be evaluated in four ways:

Seminar Participation: (25%)	Students will be expected to participate fully in the seminar.
Research Paper Proposal (20%)	A detailed document outlining the student's plans for the final research paper, including the goals of the paper and a synopsis of key arguments to be made. Approximately 5 pages in length.
Presentation of Research Paper to class (15%)	Students will make a presentation of the central arguments of their major research paper. Discussion and feedback from seminar participants will be used to make revisions to the research paper.
Research Paper (40%)	A major paper on any of the topics discussed in the seminar. Approximately 25 pages in length.

Resources to be purchased/provided by students:

Textbooks and monographs.

Representative Textbooks:

Chesney-Lind. M. (2003). *The female offender: Girls, women, and crime*. 2nd ed. Thousand Oaks, CA: Sage.

Morash, M. (2006). *Understanding Gender, Crime, and Justice*. Thousand Oaks, CA: Sage.

Gabbidon, S.L., & Taylor Greene, H. (2005). *Race, Crime, and Justice: A Reader*. New York: Routledge.

Messerschmidt, J.W. (1993). Masculinities and crime: Critique and reconceptualization. Lanham, MD: Roman & Littlefield.

Young, J. (1999). *The exclusive society*. London: Sage.

Hagan, J., & Peterson, R. (1995). *Crime and Inequality.* Stanford University Press.

Other reading requirements:

A course pack of journal articles will be available in the bookstore or online through existing library resources.

Graduate Seminar in Inequality and Crime continued…

Learning Outcomes:

Students who successfully complete the course will demonstrate the ability to:

- Identify major substantive issues surrounding inequality and crime.
- Grasp the complexities of the intersection of race, gender, and social class vis a vis crime in the social world.
- Think critically about the interplay between gender, race, and social class and the criminal justice system.
- Understand the role of social identity in the perpetuation of inequality.
- Think critically and develop advanced and nuanced knowledge of theoretical explanations of race, gender and social class.
- Write an in-depth paper on a relevant issue which illustrates advanced knowledge and skill required at a graduate level
- Use advanced knowledge and professional communication skills in presenting ideas around the intersection of crime, race, gender and social class to a knowledgeable audience.

Information about Course Designer/ Developer(s):

Course designed by:
Dr. Shahid Alvi, Professor
Dr. Hannah Scott, Associate Professor
Dr. Walter DeKeseredy, Professor
Dr. Barbara Perry, Professor

List faculty eligible to teach the course and/or statement of "faculty to be hired"

- Dr. Walter DeKeseredy
- Dr. Shahid Alvi
- Dr. Barbara Perry

If method of instruction includes on-line delivery what percentage of course content will be offered on-line. None

Faculty Qualifications to teach/supervise the course:

Dr. Alvi, Dr. Perry, and Dr. DeKeseredy have published several books and articles in this area.

Classroom requirements: Seminar room

Equipment requirements: Standard classroom delivery technology available at UOIT

Course Title: Special Topics in Criminology

Year and Semester: Fall 2008

Course /subject description:

The purpose of these Special topics courses is to allow students to delve deeper into more substantive areas that they are interested in. The content of each course will vary with instructor interests and current research specializations and projects. Special Topics Courses may be offered either inside the Faculty, or may be taken outside the Faculty with the Approval of the Graduate Committee of the Faculty. These graduate courses will explore a selection of research topics in criminology via thorough and critical reviews of current literature. Courses are expected to offer highly specialized substantive knowledge on topics in Criminology.

Method(s) of instruction:

Various, depending on instructor.

Content outline by topic:

Various, depending on instructor.

Examples of Special Topics include, but are not limited to:

- Special Topics: White Collar and Organized Crime
- Special Topics: Hate Crime
- Special Topics: Woman Abuse
- Special Topics: Women and Crime
- Special Topics: Advanced Studies in Homicide
- Special Topics: Advanced Issues in Juvenile Justice
- Special Topics: Advanced Issues in Corrections
- Special Topics: Advanced Issues in Policing
- Special Topics: Human Rights and Justice

Length in contact hours:

Variable, depending on instructor.

Method(s) and frequency of evaluation of student performance:

Variable, depending on instructor.

Resources to be purchased/provided by students:

Various, depending on course requirements set out by instructor.

Textbook requirements:

Various, depending on course requirements set out by instructor.

Special Topics in Criminology continued…

Learning Outcomes:

Learning outcomes will be specific to the course and the instructor teaching the Special Topics. However, students in each course will be expected to reach the following objectives:

- Conduct in-depth research on substantive issues in criminology at an advanced level
- Critically examine the current state of knowledge of research in specific issues in criminology
- Synthesize current research, present it in a comprehensible manner, and suggest future research avenues.

Information about Course Designer/ Developer(s):

Course designed by:
Dr. Shahid Alvi, Professor.
Dr. Hannah Scott, Associate Professor.

List faculty eligible to teach the course and/or statement of "faculty to be hired":

- All current faculty members who hold a Ph.D. who hold a demonstrated specialty in a specific area and have been approved by the graduate committee to teach a Special Topics Course in this area.
- Faculty to be hired who hold a Ph.D. who hold a demonstrated specialty in a specific area and have been approved by the graduate committee to teach a Special Topics Course in this area.

If method of instruction includes on-line delivery what percentage of course content will be offered on-line. None

Faculty Qualifications to teach/supervise the course:

Must currently hold a Ph.D. and be approved to teach a course at the graduate level by the Faculty.

Classroom requirements: Seminar room

Equipment requirements: Standard classroom delivery technology available at UOIT

Course Title: Reading Course

Year and Semester: Fall 2008

Course /subject description:

Students are required to do a series of readings in a particular area of criminology and write an advanced level literature review. Students will be required to summarize relevant literature on a topic around a clearly stated research question of some significance. They will be required to provide a critical appraisal of the strengths, limitations, gaps in knowledge, inconsistencies and conflicting viewpoints associated with the literature, and to write their own interpretation of the contribution and implications of the literature to the research question at hand.

Method(s) of instruction:

This is an independent study course to be taught in consultation with a professor.

Content outline by topic:

To be decided in consultation between the professor and the student.

Length in contact hours

Variable

Method(s) and frequency of evaluation of student performance:

Variable.

Resources to be purchased/provided by students:

Variable. Students may be required to obtain library material to complete the reading course.

Textbook requirements:

Variable: Professors may assign or recommend texts and other resources to guide student in the reading course.

Learning Outcomes:

Students who successfully complete the course will demonstrate the ability to:

- Identify appropriate questions to be addressed in a literature review.
- Focus attention on and demonstrate advanced knowledge of a specialized area in criminology.
- Organize, construct and present an in-depth literature review on a particular subject in criminology.
- Identify patterns, trends and seminal studies within a body of literature

Reading Course continued…

Information about Course Designer/ Developer(s):

Course designed by:
Dr. Hannah Scott, Associate Professor
Dr. Shahid Alvi, Professor

Reading Course continued…

List faculty eligible to teach the course and/or statement of "faculty to be hired":

- All current members in the Faculty.
- Faculty to be hired who hold a Ph.D.

If method of instruction includes on-line delivery what percentage of course content will be offered on-line. None

Faculty Qualifications to teach/supervise the course:

Faculty must hold a Ph.D. and be approved by the Faculty. to teach graduate level courses.

Classroom requirements:

Faculty may require a seminar classroom if there are sufficiently large numbers of students approved in a single semester who wish to take a reading course with a specific professor.

Equipment requirements: Standard computer and desktop technology available at UOIT

Course Title: Major Paper in Criminology (non-thesis option)

Year and Semester: Fall 2008 and Winter 2009

Course /subject description:

This course is designed to allow students to combine the knowledge garnered from graduate level courses and apply them to a project resulting in a major paper. The paper will develop all of the analytical and intellectual skills of a thesis, but is shorter in length. Normally, the paper should be approximately 50 pages long. The paper should be concerned with discussing a meaningful question within criminology and may require some empirical research, a critical review of the literature or a critical analysis of a theoretical problem.

Students will complete this requirement under the supervision of a professor.

Method(s) of instruction:

This is an independent study course requirement, under the supervision with a professor. Contact time will vary depending on the nature of the project. Students meet with professor regularly for updates and discussion of progress.

Content outline by topic:

Content will vary according on student interest. Students will be required to regularly meet with their faculty advisor, submit regular progress reports including a project proposal, and to hand in drafts of the paper as required.

Length in contact hours:

Variable

Method(s) and frequency of evaluation of student performance:

Students will be evaluated one time in this course:

Paper Completion (100%)

Resources to be purchased/provided by students:

Variable: Students may be required to acquire library materials to complete the project.

Textbook requirements:

Variable: Supervisor may require students to purchase books related to the student's research topic.

Learning Outcomes Students who successfully complete the course have reliably demonstrated the ability to:

- Complete a project using knowledge gained from courses in the program.
- Outcomes will vary depending on the nature of the project.
- Outcomes will be decided by supervising professor in consultation with the student.

Major Paper in Criminology (non-thesis option) continued…

Information about Course Designer/ Developer(s):

Course designed by:
Dr. Shahid Alvi, Professor
Dr. Hannah Scott, Associate Professor

List faculty eligible to teach the course and/or statement of "faculty to be hired":

- All current faculty are eligible to teach this project course
- Faculty to be hired with Ph.D. are also eligible to teach this project course

If method of instruction includes on-line delivery what percentage of course content will be offered on-line. None

Faculty Qualifications to teach/supervise the course:

Faculty must have a Ph.D.

Classroom requirements:

- Consultations take place with faculty in office space.
- Seminar space may be needed if professor has several students wishing to write a major paper with a professor in a specific semester.

Equipment requirements: Standard computer and desktop technology available at UOIT

Course Title: M.A. Thesis in Criminology

Year and Semester: Fall 2008 and Winter 2009

Course /subject description:

The M.A. thesis is designed to allow the student to combine the knowledge garnered from graduate level courses and to develop them into a thesis. The potential thesis topic is to be selected and approved in consultation with the candidate's Supervisor and Advisory Committee. A formal thesis proposal must be submitted to and approved by the Advisory Committee. Normally, the thesis will be approximately 50 to 100 pages in length. Once the thesis has been completed, students will undergo an oral examination to defend their thesis.

Method(s) of instruction:

This is an independent study course requirement, under the supervision of a professor in the Faculty of Criminology, Justice and Policy Studies, and an advisory committee of at least one other faculty member. Contact time will vary depending on the nature of the project. Students meet with professors regularly for updates and discussion of progress.

Content outline by topic:

Variable.

Length in contact hours:

Variable

Method(s) and frequency of evaluation of student performance:

Students will be evaluated upon satisfactory completion of a thesis document. This part of the degree requires students to complete a thesis in 6 credit hours. Students will receive a one time grade for the thesis of either satisfactory or unsatisfactory.

Resources to be purchased/provided by students:

Variable: Students may be required to acquire library materials to complete the project.

Textbook requirements:

Variable: Supervisor may require students to purchase a textbook as a guide to complete project.

Learning Outcomes:

Students who successfully complete the course will demonstrate the ability to:

- Complete a major research project using knowledge and skills gained from courses in the program.
- Understand and explain the essential facts, concepts, principles, and theories relating to their research topic.
- Effectively use advanced tools to conduct research.
- Critically evaluate advanced information and knowledge and their implications.
- Understand, explain, and solve problems using quantitative and/or qualitative methods.
- Prepare and present, orally and in writing, to peers and experts, a systematic report on a significant research topic.

M.A. Thesis in Criminology continued…

Information about Course Designer/ Developer(s):

Course designed by:
Dr. Shahid Alvi, Professor
Dr. Walter DeKeseredy, Professor
Dr. Hannah Scott, Associate Professor

List faculty eligible to teach the course and/or statement of "faculty to be hired":

- Dr. Walter DeKeseredy
- Dr. Hannah Scott
- Dr. Ronald Hinch
- Dr. Shahid Alvi
- Dr. Barbara Perry
- Faculty to be hired

If method of instruction includes on-line delivery what percentage of course content will be offered on-line. None

Faculty Qualifications to teach/supervise the course:

- Faculty must have a Ph.D. and have previous experience as an advisor,
- Have demonstrated specialized experience in researching in a specialized area of expertise of interest to the student.
- Faculty must also hold tenure at the university.

Classroom requirements: None

Equipment requirements: Standard computer and desktop technology available at UOIT

4.5 Collateral and supporting departments:

The administrative, faculty and support staffing needs of the M.A. in Criminology Program can be met by personnel within the Faculty, Criminology, Justice and Policy Studies. The Office of Graduate Studies will provide leadership and administrative support in the development and implementation of all graduate programs at UOIT.

5. OUTCOMES

5.1 Enrolment and graduations

As this is an application for a new program, sections 5.1 to 5.3 are not applicable.

5.4 Projected graduate intake and enrolments

Table 5.1 below provides projected graduate enrolments in the MA program for the next seven years. These estimates are based on current expressions of interest from potential graduate students.

Table 5.1

PROJECTED INTAKE AND ENROLMENTS for the MA program in Criminology					
YEAR	**FULL-TIME**		**PART-TIME**		**TOTAL ENROLMENT**
	Intake	**Enrolments**	**Intake**	**Enrolments**	**MA**
	MA	**MA**	**MA**	**MA**	
2006-07					
2007-08	**10-15** (Domestic = 9-13) (International 1-2)	**10-15** (Domestic = 9-13) (International 1-2)	**2**	**2**	**12 – 17**
2008-09	**10-15** (Domestic = 9-13) (International 1-2)	Intake: 10-15 Return: 9-13 **Total: 19-28** (Domestic = 17-25) (International 2-3)	**2**	Intake 2 Return 2 **Total 4**	**23-28**

2009-10	**11 - 16**	Intake: 11-16 Return: 9-13 **Total: 20-29** (Domestic = 17-25) (International 2-3)	**2**	Intake 2 Return 3 **Total 5**	**25 – 34**
2010-11	**11 - 16**	Intake: 11-16 Return: 10-14 **Total: 21-30** (Domestic = 19-27) (International 2-3)	**2**	Intake 2 Return 4 **Total 6**	**27-36**
2011-12	**12 - 18**	Intake: 12-18 Return: 10-14 **Total: 21-32** (Domestic = 19-29) (International 2-3)	**2**	Intake 2 Return 4 **6**	**27 – 36**
2012-13	**12 - 18**	Intake: 12-18 Return: 10-14 **Total: 22-32** (Domestic = 19-29) (International 2-3	**2**	Intake 2 Return 4 **Total 6**	**28 – 38**

These projections include low and high estimates. For example, in the first year our low estimate is that 10 students will enter the program on a full time basis, and that 2 students will enter on a part time basis. At the high end we estimate that up to 15 students will enter the program in year one. We do not estimate significant demand for the program on a part time basis. The numbers in the Intake column show the number of new students expected to enter the program each year. The numbers in the Enrolments column indicate the total number of first and second year students in the program each year allowing for dropout rates (10% per years) and completion rates (after two years for Full time students and four years for Part Time students). Enrolments will reach a steady state by 2011-12.

Appendix A: Library Resources

LIBRARY SUBMISSION TO ONTARIO COUNCIL OF GRADUATE STUDIES (OCGS)

FOR THE MASTER OF ARTS IN CRIMINOLOGY

Compiled by: Carol Mittlestead, B.A. (Hon), M.L.S., Acting University Librarian/Associate Librarian

With respect to the University of Ontario Institute of Technology's Master of Arts in Criminology offered within the Faculty of Criminology, Justice and Policy Studies, the following section discusses the Library in relation to the collection; the accessibility of resources and services; and research support, staffing, and partnerships. The collection is defined as including both the traditional paper book or periodical, and the more non-traditional –but increasingly common-electronic index, book or journal database; librarian recommended web sites, various research data sets; and UOIT's institutional repository (D-Space). Accessibility addresses the physical presence of the Library, onsite reference assistance, the Library web page www.uoit.ca/library as a 24/7 portal, and interlibrary loan and document delivery. Research support, staffing, and partnerships emphasize the Library's role in teaching students, liaising with faculty, and connecting with government and corporate agencies.

Collections:

It is understood that the Library's acquisition plan must be based on evolving pedagogical needs as determined by the academic schools. In close liaison with the Deans and Professors, subject specialist Librarians will define collection development strategies for the ongoing curriculum-based purchase of resources as well as for the evaluation and review of existing material.

Books:

The Library offers a small but comprehensive collection. At present, there are approximately 73,000 volumes on the shelves. In August 2004, the Library took possession of its new building (described below) and this additional space will allow for the relatively quick expansion of the collection to 160,000 texts. It is estimated that approximately 20,000 of these volumes are directly applicable to topics such as criminological theory, corporate and political responsibility, law enforcement, poverty and income distribution, and ethnicity and gender inequality. The Library acknowledges the interdisciplinary approach of this Masters program in that it embraces the contributions of sociology, psychology, political science, cultural studies, critical race theory and legal studies. Some of the Library's science resources will also prove valuable given the recent creation of the UOIT Observatory on Sustainable Cities and Urban Communities. Please note that government and public policy documents are integrated into the regular reference and circulating collections.

The Library recognizes the uniqueness of the UOIT Criminology proposal in having students take a separate course in both quantitative and qualitative methods, rather than a combined course as offered by other institutions. This emphasis on research

techniques has already been wisely established at the undergraduate level, and the Library has purchased the entire Sage Publications quantitative and qualitative methods series along with several other similar titles from various vendors. Even further additions will be made.

More specialized and academically focused books are being bought in preparation for year four of UOIT's operation and for graduate programs. This includes texts that address the drafting of research proposals, grant writing, public speaking and presentation techniques, professional and technical communications including abstracting, and university teaching. The Library's goal is to increase its holdings by 2,000 to 3,000 volumes per year for several successive years with a current projected cost of $400,000. to $450,000. per annum. Books are selected primarily (Faculty suggestions are most welcome) by Subject Specialist Librarians both directly from noteworthy academic publishers (e.g. Wiley, Sage, Elsevier, Oxford University Press, Addison-Wesley, Kluwer, Springer-Verlag, Pearson Prentice Hall) and from Blackwell's Book Services, an arrangement that allows for the simultaneous purchase of titles from a wide array of vendors.

The M.A. in Criminology program can also benefit from the Library's extensive collection of statutes and case law. Especially since many series extend back to the early 1900s (Library's Special Collection Room), background documentation for various in depth research topics can be provided. As well, the Library subscribes to numerous loose-leaf services (e.g. *Youth Criminal Justice Act Manual, Cohabitation: the Law in Canada, The Ontario Family Law Act Manual, Canadian Environmental Law Guide)*; updates are received regularly keeping interested individuals abreast of new developments within the law. Online legal resources are discussed below.

With over 15,000 titles (not included in the total above), e-books are an integral part of the UOIT library collection. Currently, NetLibrary is the database most likely to interest Criminology students and faculty. Especially given UOIT's commitment to the laptop university concept, the Library's e-book collection is destined to grow.

Periodicals:

In addition to the indexing and abstracting that the Library provides for thousands of periodicals (journals, magazines, newspapers) through its electronic databases, 30,000 of these titles are available in full text electronically and 350 in paper. While the M.A. in Criminology program does indeed have an interdisciplinary focus, it is relevant that approximately 7,000 of these full text titles are categorized under the heading of Social Sciences. Periodicals are available as traditional paper subscriptions, single electronic titles or as one of several titles within an electronic database.

In addition to numerous other social science journals, the Library consequently offers access to full text journals such as *Critical Criminology; Feminist Criminology; Journal of Quantitative Criminology; Aggression and Violent Behavior; Theoretical Criminology; Crime, Media, Culture: an International Journal;* and *Criminology and Public Policy.*

UOIT library journal databases believed to support this graduate program are categorized and then listed alphabetically below. While far from exhaustive, an attempt has been made to identify databases that may be accessed for interdisciplinary

research. Please see the UOIT library web page www.uoit.ca/library for a complete listing of periodical databases.

Extremely Relevant:

Academic Search Premier (Ebsco) - multidisciplinary
Criminal Justice Abstracts (Sage)
Criminal Justice Periodicals (Proquest)
Criminology: A Sage Full-Text Collection
E-Journals @ Scholars Portal / Scholars Portal – multidisciplinary - (e.g. Springer, Kluwer, Cambridge, Sage, Wiley, Elsevier - see description below)
Social Science Citation Index (ISI Web of Science)
Sociology: A Sage Full-Text Collection
Violence and Abuse Abstracts (Sage)

Very Relevant:

Criminal Source/Law Source (Westlaw/e-Carswell) – Full text Canadian criminal case law, criminal and related legislation, law reports and digests, annotated criminal codes (Tremeer's and Crankshaw's) and e-book selections
Lexis Nexis – Commonwealth, American and some other international legal research materials

Relevant - sample databases for interdisciplinary research (see note above):

Business Source Complete (Ebsco)
CCOHS – Canadian Centre for Occupational Health & Safety
Communication and Mass Media Complete (Ebsco)
EconLit (American Economic Association)
Family Studies Abstracts (Sage)
Health Science: A Sage Full- Text Collection
Political Science: A Sage Full-Text Collection
Proquest Science Journals
PsycArticles and PsycInfo (American Psychological Association)
Urban Studies and Planning: A Sage Full-Text Collection

Canada's Heritage, Canadian Newsstand, Factiva, Lexis Nexis, Regional Business News – databases offering full-text local, national and international newspapers

Following approval of the Master of Arts in Criminology program and review of course outlines, the Library will investigate subscriptions to databases such as Contemporary Women's Issues (Responsive Database Services, Inc.) and Gender Studies (National Information Services) so as to provide further support for research categorized under the Program heading of "Inequality and Crime".

Please note that there are several ways to access electronic journals. UOIT is a member of both OCUL (Ontario Council of University Libraries) and CRKN (Canadian Research Knowledge Network) - the provincial and national university library consortia, respectively, that provide for the effective group purchase and distribution of electronic resources. Scholars Portal and E-Journals at Scholars Portal are OCUL platforms that allow an individual to access a number of databases simultaneously. The UOIT Library

also provides Faculty and subject guides highlighting pertinent indexes and databases, a searchable alphabetical list of all indexes and databases, a searchable alphabetically list of all periodical (journal, magazine and newspaper) titles, and a citation locator that checks for either journal or article availability. Further, cross-referencing amongst databases is provided by a federated search engine or linking software called "Find It @ UOIT". If a patron is searching one database, but the article is available in another, he/she will be redirected to this resource. If the article is not available at UOIT, the option to request an ILL (Interlibrary loan) is displayed.

The Library also hosts Refworks, a software tool that allows for citations to be "harvested" from various periodical databases or imported directly so bibliographies can be easily prepared. The user selects the appropriate bibliographic format (e.g. MLA, APA) and Refworks applies it to the references that have been accumulated. The complementary component is Refshare; it allows for bibliographies to be shared amongst colleagues and/or to be used as electronic reserve listings. Students are directed to an article by their professor and simply authenticate into the Library system.

Following the mandate of the UOIT as a laptop university with "round the clock" accessibility to resources, whenever possible, the Library will purchase significant holdings to a journal in electronic format. It is, however, realized that paper copies may sometimes be essential, and must be purchased accordingly.

Internet:

While the prevalence and importance of the Internet is recognized, it is also realized that not all information on the Internet is of equal value and/or prominence, and that not all people have equal search skills. The Library, therefore, strives to make staff and students aware of quality web sites appropriate to their Program. Listings of recommended web sites are part of the Library Faculty Guides that are prepared with each UOIT program in mind. Posted on the Library web site www.uoit.ca/library, these Faculty Guides are discussed in detail under "Accessibility". For example, relevant sites include: Canadian Criminal Justice Association, Canadian Centre for Justice Statistics, National Clearinghouse on Family Violence, Canadian Human Rights Commission and the Nathanson Centre for the Study of Organized Crime and Corruption.

Research Data:

The Library currently has subscriptions to E-Stat and the Data Liberation Initiative (DLI). A subscription to the Inter-University Consortium for Political and Social Research (ICPSR) is being investigated and should be successfully negotiated and activated by October. E-Stat is Statistics Canada's educational database including census data and CANSIM (Canadian Socio-economic Management System), and while its primary audience is undergraduates looking for "pre packaged" graphs, tables and news releases, the graduate student may also on occasion find this "ready to use" data valuable. The DLI is an expansive collection of detailed statistical datasets accumulated and maintained by Statistics Canada and offered through the IDLS (Internet Data Library System) hosted by the University of Western Ontario's Social Science Computing Laboratory. Data can be downloaded and manipulated in response to research queries. Similarly, the ICPSR is an international archive of social science data for research and instruction that is maintained at the University of Michigan.

Institutional Repository:
The Library has already acquired the necessary server and is planning to launch its own D-Space within the next few months. This is an open archive initiative (OAI) developed by the Massachusetts Institute of Technology (MIT) that allows for the capturing, storing, indexing, preserving and distribution of digital research material. Faculty members are invited to post their research findings and papers in this institutional repository thus encouraging collaboration amongst colleagues. The posting of post-graduate thesis papers is also a possibility.

Accessibility:

The Building:

A new state-of-the-art, 73,000 square foot Library was opened in August 2004. The intent of the design is to create a print/electronic library that accommodates new and emerging technologies without sacrificing the personal warmth of a traditional library. The building offers various types of study and activity spaces to accommodate different learning styles and user needs. These spaces include:

- Quiet public study spaces as well as a formal Reading Room, all within a "wireless" environment
- Collaborative learning spaces for groups of various sizes
- Common spaces and public service research workstations that facilitate intellectual interaction and engagement
- Electronic classrooms for regular ongoing educational sessions on library resources and research strategies
- Attractive and appealing display areas for art and library exhibitions
- Special needs adaptive technology equipment

Staff, students and faculty have welcomed this new building with its seating for over 500 patrons and 150 public access workstations with Internet access. The grand opening was October 29, 2004.

On Campus Reference Assistance:

Reference services are provided by professional librarians for 68 hours of the 89 hours per week that the Library is physically open or 76.5% of the time. Librarians liaise with professors so classes specific to student research topics can be offered. Both staff and students are also welcome to make individual or small group appointments with Librarians.

Library Web Page:

The Library web page is available at www.uoit.ca/library and is accessible 24 hours a day, seven days a week. Both a general Library e-mail address and a Reference Desk e-mail are provided as well as telephone information so individuals can leave messages at any time. In collaboration with other Ontario University Libraries, the Library is also currently investigating a web-based service such as the Virtual Reference Desk (www.lssi.com) that uses chat software to deliver reference service to users regardless of time and location. The Librarian can "push" pages to patrons so they can literally see both the steps involved and the results achieved with a given search. Consequently, this

technology promises to be more effective than e-mail and telephone. Beginning with limited hours and an after-hours e-mail default, the ultimate goal is to make virtual reference a "round the clock" service.

General reference assistance is provided through Library web page sections that explain topics such as computer search techniques, article searching, Internet evaluation, and bibliographic citation. Amongst the services outlined are circulation procedures, reserves, and interlibrary loan. What makes the UOIT Library web page truly unique is its Faculty Guides. Prepared with each program in mind for a particular Faculty, every Guide outlines and links to pertinent Electronic Databases and Indexes; provides sample listings with links to relevant journals along with subject headings for further investigation; highlights the Catalogue with suggestions from the Reference collection; describes and links to the most appropriate E-book databases; and offers Recommended Web Sites. These Guides are indeed resource portals. As UOIT's Faculties are becoming more and more diverse, Subject Guides are also being launched. These are of particular assistance to students taking electives from areas outside their discipline.

Interlibrary Loan and Document Delivery:

As UOIT is still in its developmental stages, Interlibrary Loan is currently available free of charge to students, staff and faculty. Individuals have the option of making their requests online or in person. RACER (rapid access to collections by electronic requesting) is a VDX (Virtual Document Exchange) interlibrary loan system implemented in OCUL member libraries. Searches are performed throughout all Ontario university libraries and CISTI (Canada Institute for Scientific and Technical Information). As part of OCUL and the IUTS (Inter University Transit System), the Library now receives book loans in a very reasonable amount of time, and Ariel, an electronic transmission system for periodical articles, allows journal requests to be filled within a few days

Faculty and students from UOIT may also visit any of Canada's university libraries and may borrow books (Reciprocal Borrowing Agreement) directly from them upon presentation of their UOIT photo identification card. Materials may be returned directly to the lending library or may be left at the UOIT Library where they will be returned to the appropriate lending library.

Since a graduate program is being discussed here, the borrowing restrictions that the University of Toronto Libraries have on undergraduates are obviously not applicable.

Research Support, Staffing and Partnerships:

The following strategies are established and/or being developed:

1. As described above, the Library as part of a newly formed institution (June 2002) has already made significant progress in terms of collection development, instruction and resource accessibility. Continued efforts will be made to improve and expand information services. As professors arrive on the UOIT campus, librarians are meeting with them to identify their teaching and research objectives.

2. A professionally qualified librarian (M.L.S.) dedicated to the social sciences joined the UOIT Library staff in February 2005. Given the anticipated appearance and evolution of

more UOIT graduate programs, the hiring of a Graduate Studies Librarian will occur within the next two years.

3. The importance of liaising with the UOIT Centre for Academic Excellence and Innovation (CAEI), a facility where faculty are introduced and mentored in the use of instructional technology such as computerized teaching packages, presentation software, web development, and distance learning delivery is recognized. This would ensure that the Library's resources, in digital format, are included amongst the links for courses developed within the Faculty. A link to the Library Web Page Faculty Guides from each student's "My WebCT" template is planned.

4. The Library will connect to national and global resources that both enhance student employment opportunities and that support high levels of applied scholarly research.

The Library is indeed preparing for the University of Ontario Institute of Technology's initial graduate degree offerings, and lends its support to the resource and research needs of both faculty and students.

Appendix B: General Policies and Procedures for Graduate Studies

Note: Most recent version of draft to be inserted at time of submission to OCGS

Appendix C: Additional Information

1. Degree-Level Summary
2. Resource Renewal and Upgrading
3. Program Design and Credential Recognition
4. Applicant Acknowledgement and Agreement

1. Degree-Level Summary

UOIT is committed to providing high quality, challenging graduate programs which clearly meet and/or exceed the standards required for master's degrees. The design of the M.A. in Criminology has been guided by benchmarks described in the *Postsecondary Education Quality Assessment Board Handbook for Applicants.* The proposed M.A. program is designed to build upon the knowledge and skills of well qualified applicants from relevant undergraduate programs.

The Faculty of Criminology, Justice and Policy Studies intends to provide its graduate students with a rigorous education and to instil in them the skills, attitudes, values, and vision that will prepare them for a lifetime of continued research, learning and leadership in their chosen careers.

The primary objectives of the program are to provide students with in-depth and broad understanding of contemporary criminological issues and debates, critical thinking and practical skills necessary to conduct criminological research in the public and private sectors and preparation for the job market or advanced study in Criminology and related disciplines.

In keeping with its mission and values, UOIT aims to provide its graduate students with programs of advanced study and research that are rigorous, challenging, innovative and responsive to the needs of both students and employers. UOIT has made every effort to provide highly qualified and experienced faculty and state-of-the-art learning facilities and resources to support this commitment.

The courses in the Criminology Program have been designed to give students in-depth understanding of historical and contemporary criminological issues and debates, a strong foundation in quantitative and qualitative research methodologies, opportunities for advanced development of generic skills such as communication and teamwork, and intensive involvement in the scholarly activities of research, seminars, and presentations. Throughout the curriculum, learning activities are planned and student progress monitored to ensure that professional guidelines and ethical responsibilities relevant to the areas of study and research are modelled, developed, and evaluated.

The courses have been designed and sequenced to ensure that students have close contact with members of the faculty in the first year so positive mentoring relationships can be established and students have additional support to meet the rigorous demands of graduate level study. Four mandated courses provide a solid foundation of classical and contemporary theory, an understanding of advanced research methodologies and ways in which they may be applied and exposure to a wide range of substantive professional issues and research options. Special interests which have arisen from the content of the mandatory courses can be explored further in the Special Topics electives or Reading Course in the latter half of the program. This structure provides the tools students need to work under the 'guidance' of faculty, but with greater independence and confidence as they proceed with their major paper or thesis in the second half of the program.

The proposed program will be delivered by highly qualified and experienced faculty with solid research and publication records. The team will deliver the program in interesting

and challenging ways to ensure that students acquire a critical awareness of current problems and/or new insights which are at, or informed by, the forefront of their academic discipline, field of study, or area of professional practice. Graduate students participating in this program will interact with peers and faculty with a variety of research interests; this will further enrich their learning experiences.

The program's learning objectives will be achieved through coursework, guest presentations, focused research training and the completion of a major research paper or thesis. Course assignments will include written reports, oral presentations, critical analyses of professional literature and research.

Relevant Knowledge and Understanding

The M.A. program will provide students with a solid foundation of advanced knowledge in criminological theory, sophisticated research methodologies, complex quantitative and qualitative applications, and contemporary substantive issues in criminology.

Through thorough and critical reviews of relevant literature and participation in seminars, workshops and conferences, students will explore relevant trends and problems in criminology that are at the forefront of current practice and research.

The Special Topics elective and Reading courses enable students to engage in more in-depth study of areas in which they have a particular interest and to develop deeper understanding of particular issues or problems.

The Faculty's experienced professors and selected guest speakers will expose students to diverse issues, research interests and practices; this will encourage students to be open to new insights and approaches as they undertake assignments and projects and explore a range of possible solutions to professional problems.

To meet the requirements of the program, students will be expected to understand and use discipline-specific terminology and to demonstrate competent use of quantitative and qualitative research applications.

Application

In addition to acquiring essential theory, graduate students will be exposed to a broad spectrum of analytical techniques and strategies which can be used to obtain and analyze data and to formulate potential solutions to problems in areas of criminology and criminal justice.

Under the guidance of a faculty expert, graduate students will apply the concepts, principles and techniques they have learned to the investigation of a specific research problem. As they work through their theses or major research papers, they will be called upon to demonstrate their advanced understanding of relevant theory and research related to a specialized field or area of study, their use of appropriate methods of analysis to identify and evaluate a range of options and their skills in the conduct of research and management of projects.

Cognitive Skills

Problem solving, critical analysis, and synthesis are cognitive skills essential to advanced study and success in any discipline. Graduate students in the proposed program will be actively engaged in these processes throughout the program. Many opportunities will be provided for them to refine these cognitive skills, including: collaborative and independent learning activities; oral and written critiques of theory and research; debates and discussions; and oral presentations that require justification of ideas and decisions. Activities and assignments will strengthen students' abilities to critically analyze complex information they see, hear and read, to identify assumptions and implicit values, to gather appropriate data to inform and guide decision-making, to propose new ideas and interpretations, to create and assess a range of solutions, to predict risks and to evaluate methodologies and outcomes. Certain activities will require students to work in groups; this will expose them to a variety of perspectives and require them to listen, assess and incorporate the ideas of others into the problem solving process. Collaborative activities and participation in seminars will enable them to pose questions, devise and sustain arguments, and, most importantly, to be active participants in the learning process. While engaged in such interactive processes, they will learn from and contribute to the learning of others.

The thesis or major research paper will provide students skills needed for research in the discipline. It will familiarize them with current issues and problems that this area of research may target. The students' independent research activities will hone their skills in the use of established tools and techniques of research and inquiry, data interpretation and the analysis of results.

In several courses, students will be required to present, to an audience of faculty and peers, an overview of their research, including background, methodology, results and interpretation. Students in the audience will be expected to analyze and challenge what they hear; the presenters will be expected to present articulate and convincing responses. They will be expected to give, receive and use constructive feedback.

Analytical skills will be refined as students gather the data they need to determine which methods are most appropriate for solving specific problems and, on the basis of their results, modify those methods to achieve better outcomes.

Lifelong Learning

Students will develop skills necessary for clear communication and responsible teamwork and acquire professional attitudes and ethics, preparing them for modern work environments and encouraging them to engage in the pursuit of lifelong learning.

Stimulating seminars and colloquia, presentations by professionals from public and private organizations and intensive research activities will expose students to the complexities and challenges of advanced study. Graduates must be prepared to work in complex and unpredictable environments, in different types of organizations and with a wide range of colleagues and clients. The program will support students as they develop positive attitudes and pro-active strategies to manage professional challenges such as change and ambiguity. Through their involvement in this program, students will become aware of the value of diverse interpretations, methods, and disciplines in approaching

and solving research problems.

Students will learn how to engage in advanced research by using print and electronic publications, including scholarly journals, books, and research websites for the most up-to-date information. They will recognize the need for independent and ongoing learning to maintain currency in their field and to further develop their professional skills. Graduates will have the advanced knowledge base and skill set needed to undertake further education to support and advance their careers.

Transferable Skills

The curriculum has been designed to emphasize the development of qualities and transferable skills which will contribute to the students' continued success as independent learners and as team members. Beginning with the Professional Seminar and continuing throughout the program, graduate students will be involved in a variety of tasks that involve the demonstration of effective communication skills using oral, written, graphic and electronic formats. They will be expected to share information in ways which are suitable for both lay and specialist audiences. Students will participate in group activities and hone their skills as both team members and leaders. The demanding workload will require students to organize their time and manage their projects efficiently in order to meet clearly defined standards of performance and expected deadlines.

UOIT is confident that the proposed program is sufficiently comprehensive and rigorous to meet the standards of a master’s level graduate degree program. It aims to develop in students the advanced knowledge base, enhanced technical, cognitive, and interpersonal skills as well as the positive attitudes that will enable them to experience personal, academic, and professional success during their graduate studies at UOIT and beyond.

2. Resource Renewal and Upgrading

Library Renewal and Upgrading

For library renewal and upgrading, refer to Appendix A: Library Resources.

Computers and Computer Access

The Technical Services department at Durham College and the University of Ontario Institute of Technology is organized into two main groups: Technical Services and Technical Operations.

Technical Services has overall responsibility for the design, planning and operation of the technical infrastructure for all campus locations. This includes the extensive wired and wireless network, data centre operations, and desktop computer labs to ensure they meet the current and future needs of both institutions. More specifically, the department's responsibilities involve Intel and Unix server planning, Internet access, IT security, and virtual private network services, which allow authorized staff to have remote access to the main network via the Internet. Additional services include the IT Support Desk, software & hardware planning and acquisition, academic support, data backup and recovery, desktop lab support.

Technical Operations manage network and data centre operations at all Durham College and UOIT campus locations. They incorporate department programs and projects into the campus IT infrastructure and work to ensure the system is robust, secure, and has the necessary capacity to expand. Technical Operations develops high-level system plans for approval by senior management, researches new technologies and standards, and manages third-party vendors and service-level agreements.

Classrooms and Physical Facilities

Capital plans are in place to develop two phases of building. Initial construction occurred on 115 acres immediately adjacent to Durham College. UOIT has purchased 385 acres to the north of this area to accommodate future growth.

The first University building, which was ready for occupancy in September 2003, contains classrooms, laboratories, and academic and staff offices. A 300-bed residence was also ready for the first class of UOIT students in September 2003.

The second phase of construction included one additional (200-bed) residence building, two additional academic buildings and a new library shared by UOIT and Durham College. This phase was completed in September 2004.

The initial core facilities for teaching and research at UOIT are housed in the three academic buildings. Together with the new campus library, these buildings overlook a campus commons.

A key characteristic of each academic building is the provision of generous study and lounge spaces. These are complemented by a faculty lounge, Council room, small

meeting rooms and student club offices. The lounge and study spaces are concentrated around a central skylit atrium which provides a point of orientation, gathering and connection for students and faculty. The buildings are designed to be highly flexible, adaptable to programs and teaching configurations yet unknown. Wired and wireless connections are provided through all dedicated and informal teaching spaces.

The new University library has been designed as the intellectual and social commons for this 21st century university. In particular, the library has two points of focus: the provision of access to electronic collections and resources and work and study space for 750 students. While the library will house a print collection of about 125,000 volume equivalents, with an emphasis on reference materials, it is in the provision of access through wired and wireless connection to electronic collections that the library will be distinguished. The building is designed on three floors with the connectivity and staff resources to fulfill this mission. Much attention has been devoted to the quality and variety of student space. Large study halls overlook the landscape commons and provide a variety of table, carrel and soft lounge seating. Many enclosed rooms are also provided for group study, seminar discussion and quiet work activities.

Construction of a new engineering building was started in early 2005. It is scheduled for completion for September 2006.

Laboratories and Equipment

Naturally, the Faculty of Criminology, Justice and Policy Studies does not have the same need for designated laboratories or highly specialized equipment as programs in the Science and Engineering Faculties.

Faculty members will typically submit requests for capital equipment and instructional materials to their Dean one year in advance of the time in which it will be required. Such requests will be considered annually as part of the normal budgeting process for each Faculty and the University as a whole.

A Teaching Equipment Fund will be established to provide funds for laboratory and equipment purchases and renewals.

In addition, funds will be sought from donations to upgrade laboratories and equipment. It is the mandate of UOIT's Advancement Office to provide a permanent source of funds to enable the University to respond to new and growing needs that fall beyond its normal budgeting capability and to afford donors an opportunity to support UOIT in its strategic drive for growth, excellence and innovation.

In addition, certain specialized equipment may be purchased for use by faculty and graduate students through research grants awarded to individual faculty members.

3. Program Design and Credential Recognition

UOIT is committed to providing high quality, challenging graduate programs which clearly meet and/or exceed the standards required for master's degrees. The design of the M.A. in Criminology has been guided by benchmarks described in the *Postsecondary Education Quality Assessment Board Handbook for Applicants.*
(Program Degree Level, Benchmark 1, Handbook – Public, 7.1)

The M.A. is a research-oriented master's degree, designed to build upon the knowledge and skills of well qualified applicants from relevant undergraduate programs.

Research was conducted to compare the breadth and rigour of the elements of this proposed graduate program to similar programs in Ontario and elsewhere. An overview of program comparisons is provided in Section 1.1.

Upon successful completion of the program, UOIT students will have achieved the degree level standard for the Master of Arts Degree. It is understood that applications by graduates of the Criminology Program for further post-graduate study will be considered on a case-by-case basis by the admitting university.

Consultation

Academic details of the proposed program were submitted to UOIT's Curriculum and Program Review Committee for examination on May 31, 2006. The proposal was then referred to the University's Academic Council and approved by that administrative body on June ___, 2006. These advisory and decision-making bodies supported the design of the Master of Arts degree in Criminology and authorized the submission of this Appraisal Brief to OCGS and PEQAB.

As part of the program development process, several prominent academics were asked to review and comment on the proposed program. Letters of support from the following are provided on the following pages:

Tom Melymuk, City of Pickering
Dr. Lorraine Malcoe, University of New Mexico
Dr. Martin D. Schwartz, Ohio University
Jack McGinnis, Manager, RDC Group

Note: Letters to be added here

4. Applicant Acknowledgement and Agreement

The Applicant Acknowledgement and Agreement form, signed by the Provost of the University, is included on the pages that follow.

Note: Signed form to be inserted here following Academic Council approval.

VOLUME II:

Curricula Vitae – Faculty Members

Alvi, Shahid
Baglay, Sasha
Blankenship, Susan
Cesaroni, Carla
Clow, Kimberley
Crichlow, Wesley
DeKeseredy, Walter
Dragiewicz, Molly
Hinch, Ron
Olsson, Patrick
Perry, Barbara
Scott, Hannah

VOLUME III:

Curricula Vitae – Prospective Consultants

Burtch, Brian
Michalowski, Raymond
Renzetti, Claire
Sacco, Vincent
Walker, Jeffery

Revenue and Expenses (Business Plan)

The table indicates the total expected revenues for the years 2007/08 to 2012/13. These estimates are based on the enrolment projections found in the columns labelled New Enrolment and Total Enrolment. Based on the estimated enrolments, the estimated revenues are given a range each year from a low based on a low enrolment estimate to a high based on the high enrolment estimate. The estimates are based on the BIU and Tuition numbers shown at the bottom of the table.

ENROLMENT PROJECTIONS AND REVENUE PROJECTIONS for MA Program in Criminology

YEAR	NEW ENROLMENT				TOTAL ENROLMENT				NEW FULL TIME FACULTY EQUIVALENTS REQUIRED	GRANT REVENUE (Domestic Students Only)		TUITION REVENUE (Domestic Plus International Students)			TOTAL REVENUE
	FULL TIME	PART TIME	DOM	INT	FULL TIME	PART TIME	DOM	INT		FULL TIME	PART TIME	DOM FULL TIME	DOM PART TIME	INT	
2007/08	10-15	2	(9-13)	(1-2)	10-15	2	9-13	1-2	1	$ 89,829 * To $ 129,753	$ 5,988	$ 48,600 To $ 70,200	$ 5,400	$ 17,000 To $ 34,000	$ 166,817 To $ 245,341
2008/09	10-15	2	(9-13)	(1-2)	19-28	4	17-25	4	.5	$ 169,677 To $ 249,525	$ 11,976	$ 91,800 To $ 135,000	$ 10,800	$ 34,000 To $51,000	$ 318,253 To $ 458,301
2009/10	11-16	2-3	(11-16)	(2-3)	20-29	6-7	17-25	2-3	-	$ 169,677 To $249,525	$ 17,964 To $ 20,959	$ 91,800 To $ 135,000	$ 16,200 To $ 18,900	$ 34,000 To $ 51,000	$ 329,641 To $ 475,384
2010/11	12-18	3-4	(19-27)	(2-3)	21-30	8-10	19-27	2-3	-	$ 189,639 To $ 269,487	$23,952 To $29,940	$102,600 To $ 145,800	$ 21,600 to $27,000	$ 34,000 To $ 51,000	$ 371,791 To $ 523,227
2011/12	12-18	3-4	(19-29)	(3-4)	21-32	10-13	19-29	3-4	-	$ 189,639 To $ 289,449	$ 29,940 To $ 38,922	$ 102,600 To $ 156,600	$ 27,000 To $ 35,100	$ 51,000 To $ 68,000	$ 400,179 To $ 588,071
2012	12-18	3-4	(19-29)	(3-4)	21-32	10-13	19-29	3-4	-	$ 189,639	$ 29,940	$ 102,600	$ 27,000	$ 51,000	$ 400,179

/13										To $ 289,449	To $ 38,922	To $ 156,600	To $ 35,100	To $ 68,000	To $ 588,071

Assumptions:
Tuition Rates:
Full time = $ 5.400
Part Time = $ 2,700
Grant Income: (Domestic Students Only)
Full time Student = $ 9,981
Part Time = $ 2,994
Attrition Rates: Generally assumes a 90% return rate from entry to second year.
Graduation assumption is that full time student will graduate after 6 semester in the program while part time students will take 12 semesters.
After year two the column for New Faculty Required is blank because no new faculty are required in those years to staff the courses in the program.

* multiply by 9

Because the program requires only 6 course sections to be taught on an annual basis, the cost of staffing requires the equivalent of just 1.5 full time faculty (at an average salary of $ 90,000 for a full time faculty member, plus 18.5% for benefits) in addition to the faculty required to deliver the undergraduate program in Criminology and Justice. The Table shows the expected faculty expenditures from 2007/08 to 2012/13. Note that we do not anticipate funding graduate students from the revenues generated from this program. Graduate students will be funding from TA funds and from Research Grants.

Projected Revenues and Estimated Expenses						
	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Total Revenue	$ 167,417 To $ 245,341	$ 318,253 To $ 473,101	$ 329,641 To $ 475,384	$ 371,791 To $ 523,227	$ 400,179 To $ 588,071	$ 400,179 To $ 588,071
Salaries (Includes benefits)	$ 106,650	$ 159,975	$ 159,975	$ 159,975	$ 159,975	$ 159,975
Difference Between Revenue and Expenses	$ 60,767 To $ 138,691	$ 158,278 To 313,123	$ 169,816 To $ 315,409	$ 211,816 To $ 363,252	$ 140,204 To $ 428,096	$ 140,204 To $ 428,096

Assumptions:

In year one, only 1 FTFE is required. In subsequent years 1.5 FTFE are required.