REPORT OF THE ACADEMIC STANDARDS COMMITTEE

Report #W2012–4; May, 2012

In this report the Academic Standards Committee (ASC) brings to Senate its evaluation and recommendation on a number of items.

- the *Certificate in Energy Management and Innovation* from the Chang School
- the *Certificate in Advanced Nursing Leadership and Management* from the Chang School
- the *Certificate in Infrastructure Asset Management and Renewal* from the Chang School
- the *Certificate in Robotics and Embedded Systems* from the Chang School
- the *Certificate in Mining Management* from the Chang School
- the *Bachelor of Science degree program in Biomedical Sciences* from the Faculty of Engineering, Architecture and Science (to be offered by the Faculty of Science)
- the *Bachelor of Commerce degree program in Real Estate Management* from the Ted Rogers School of Management

A. PROPOSAL FOR A CHANG SCHOOL CERTIFICATE IN ENERGY MANAGEMENT AND INNOVATION

1. The Proposal: The Centre for Urban Energy of the Faculty of Engineering and Architectural Science in cooperation with the G. Raymond Chang School of Continuing Education, are proposing to offer a Certificate in Urban Energy, entitled *Energy Management and Innovation*.

2. Rational for the Certificate: Transforming to a "green" economic model has emerged as one of the many challenges facing society in the 21st century. Converting to renewable energy and reducing dependence on fossil fuels is seen as the cornerstone of economic, environmental and industrial sustainability. Renewable energy and the development of the smart grid are regarded as essential to national prosperity, security and maintaining a global competitive advantage. To prepare for, and facilitate this transformation, countries need to invest in developing clean-energy technology and ensure that there is an appropriately trained workforce to lead innovation and drive industry - and vice versa, to lead industry and drive innovation.

Renewable energy and the smart grid are emerging as vital areas of academic and industrial pursuit. Ryerson University and distinguished partners have recently established a Centre for Urban Energy (CUE). It is an institute focused on the discovery, development and commercialization of innovative, practical solutions to urban energy challenges. A great opportunity exists for The Chang School to participate with CUE in developing a program in the field of clean energy management and innovation. The proposed program will provide a distinct and valuable educational option for adult learners.

3. Certificate Goals: In the energy sector, for every two people retiring from the workforce, there is only one joining. This is not sustainable, particularly in a sector that is growing rapidly. Complicating the skills

shortage in the energy sector is the "skills disconnect" between skills-training and skills-needs. The next leaders in this sector will require a balanced understanding of the challenges and emerging solutions in energy science, engineering and technology, energy management, conservation, sustainability and policy and in energy innovation and entrepreneurship.

The goals of the certificate are to deliver this foundation of knowledge in energy, management and innovation to its graduates aspiring to become energy experts and the next leaders in the sector.

4. Target Audience: The target audience for this program includes: individuals seeking to expand their expertise, change or advance their careers and those seeking professional development leading to management and leadership roles in the energy sector. The market for such individuals is large and includes: established private sector companies (large and small), law firms, energy public sector agencies – Ontario Power Authority (OPA), Independent Electricity System Operator (IESO), Ontario Energy Board (OEB), government ministries – and more than 80 provincial utilities. The market also includes energy entrepreneurs seeking to start their own business in this thriving sector.

5. Certificate Structure: The Certificate in Energy Management and Innovation will require the successful completion of six courses, three (3) required, two (2) electives and one (1) Capstone offered through The Chang School:

Required Courses: (single term): Energy Innovation and Entrepreneurship* (39 hours); Fundamentals of Project Management – CKPM202 (39 hours); Renewable Energy and Green Technology – CKES190 (39 hours).

Elective Courses: (single term): Select two (2): Energy Efficiency and Demand Response* (39 hours); Energy and the Public Policy Debate in Canada* (39 hours); Fundamentals of Sustainability I – CKSS100 (39 hours); An Introduction to Smart Grid* (39 hours); Environmental Economics – CECN 510 (39 hours).

Capstone: Current Topics in Energy Management and Innovation* (1) (39 hours)

* = New course.

The optimal flow of the curriculum is described in the flowing chart.

Certificate in Energy Management and Innovation
Structure

Required Course I
Energy Innovation and Entrepreneurship* (39 hours)

Required Course I
CKPM 202 Fundamentals of Project Management
(39 hours)

Required Course I
CKES 190 Renewable Energy and Green Technology
(39 hours)

Elective Courses
Students choose two of the following courses:

Energy Efficiency and Demand Response* (39 hours)
Energy and the Public Policy Debate in Canada* (39 hours)
Fundamentals of Sustainability I – CKSS100 (39 hours)
An Introduction to Smart Grid* (39 hours)
Environmental Economics – CECN 510 (39 hours)

Capstone Course
Current Topics in Energy Management and Innovation*
(39 hours)

*New course

It is recommended that the 5 required courses be taken before the Capstone course although the Capstone course may be taken in conjunction with the fifth course of the Certificate.

6. Certificate Learning Outcomes: The learning outcomes from the Certificate in Energy Management and Innovation will include:

- A professional with an in-depth grasp of the technical and non-technical issues that impact energy generation, transmission (transport), distribution and consumption.
- A professional with enriched knowledge of: innovation and innovation literacy, entrepreneurship, project management and innovation management.
- A professional with comparative analytical acuity with respect to renewables.
- A professional with applicable knowledge of regulations and policy aspects of energy.
- A professional with evidence-based evaluation competency in recognizing how many non-technical issues impinge upon energy policy and why certain policy outcomes seem to be decided by these social and political considerations.
- A professional with a sound insight into what it entails to create the smart grid, the challenges ahead and the costs and benefits from it.
- A professional with a mastery of the concepts and constructs of energy, energy use and the implications of energy conversions, energy efficiency and demand response actions.

7. Development Plan: The delivery of the program would begin in September 2012 and roll out over the next two years. Of the 9 courses listed above, 5 courses are new and must be developed and 4 courses already exist. Faculty within FEAS and Fellows with the Centre for Urban Energy are in place to prepare these courses.

8. Societal Need: Energy is the critical sector for Ontario's economy, environment and society – it is at the centre of the climate change debate, fundamental to human welfare and essential to economic prosperity. Four and a half million smart meters have been deployed in the Province of Ontario – laying the foundation for the renewal of our aging infrastructure and modernizing our electrical grid (the smart grid) to allow intelligent, two-way communication and control and enabling distributed generation and the development and deployment of renewable energy technologies. The Ontario government continues to leverage the province's position as a global leader in energy solutions, focusing on: smart grid (grid automations and advanced metering infrastructure, data management (and data analytics) and electric energy storage including plug-in vehicles. The Certificate in Energy Management and Innovation will prepare our students for professional careers and to assume leadership positions in this growing sector.

9. Admissions Requirements: The admissions requirements for this certificate program are mature student status and evidence of relevant college or university level coursework; or equivalent, as determined by the Academic Coordinator. Alternatively, an applicant with mature student status together with relevant industrial or professional experience may be considered by the Academic Coordinator for entry into the Certificate in Energy Management and Innovation.

10. Academic Home: The Academic Home for the proposed certificate will be the Office of the Dean of the Faculty of Engineering and Architectural Science with the participation of the Centre for Urban Energy (CUE). CUE will liaise with the Office of the Dean in all matters concerning this certificate. Administrative support will be the responsibility of The G. Raymond Chang School of Continuing Education. Routine matters, both academic and administrative, will be the responsibility of the Academic Coordinator, Dr. Bala Venkatesh, Associate Professor in the Department of Electrical and Computer Engineering and Academic Director of CUE.

Recommendation

Having satisfied itself of the merit of this proposal, ASC recommends: *That Senate approve the proposed Chang School Certificate in Energy Management and Innovation.*

B. PROPOSAL FOR A CHANG SCHOOL CERTIFICATE IN ADVANCED NURSING LEADERSHIP AND MANAGEMENT

1. The Proposal: The Daphne Cockwell School of Nursing in cooperation with the G. Raymond Chang School of Continuing Education, are proposing to offer a six-course *Certificate in Advanced Nursing Leadership and Management*. This will replace the current eight-course *Certificate in Leadership and Management for Nurses*.

2. Rationale/Goals for the Certificate: The proposed Certificate in Advanced Nursing Leadership and Management has been designed specifically to meet the needs of nurses currently employed or aspiring to be employed in leadership and management roles within a health services setting. The proposed certificate program builds on the foundational leadership and management content encompassed by a baccalaureate degree; provides access to courses that will focus on a student`s main area of leadership and/or management interest; and provides students with the opportunity to apply newly acquired knowledge to a practical leadership and/or management issue.

3. Target Audience: The proposed post baccalaureate certificate program is targeted toward provincially and nationally baccalaureate prepared[1] staff level Registered Nurses[2] as well as those with functional management responsibilities.[3] The target audience also includes Registered Nurses who are working

[1] In 2010, 35,169 Registered Nurses in Ontario, and 104,105 in Canada, were prepared at the BScN level (CIHI, 2010).

[2] In 2010, of the 205,471 Registered Nurses working in staff positions (direct care and/or community health) throughout Canada, 72,242 were employed at the staff level in Ontario (CIHI, 2010).

[3] In 2010, of the 18,138 Registered Nurses working in management positions throughout Canada, 5,522 were employed in management positions in Ontario (CIHI, 2010).

internationally[4] who have a Canadian BScN or equivalent degree. The certificate is an initiative that may be used to build nursing leadership and management capacity internationally.

4. Certificate Learning Outcomes: The learning goals of the new certificate are to:

- develop core leadership and management capabilities for frontline leaders to perform and exercise influence within health care organizations and the health care system;
- apply theory and evidence to typical leadership and management challenges;
- enhance reflective and self-aware leadership skills;
- develop knowledge and skill required to engage others as a leader in an inter-professional health care environment;
- develop collaborative skills to enhance partnerships within health care organizations and government; and to
- develop expertise in planning and leading change and innovation to improve the health care service delivery using a systems approach.

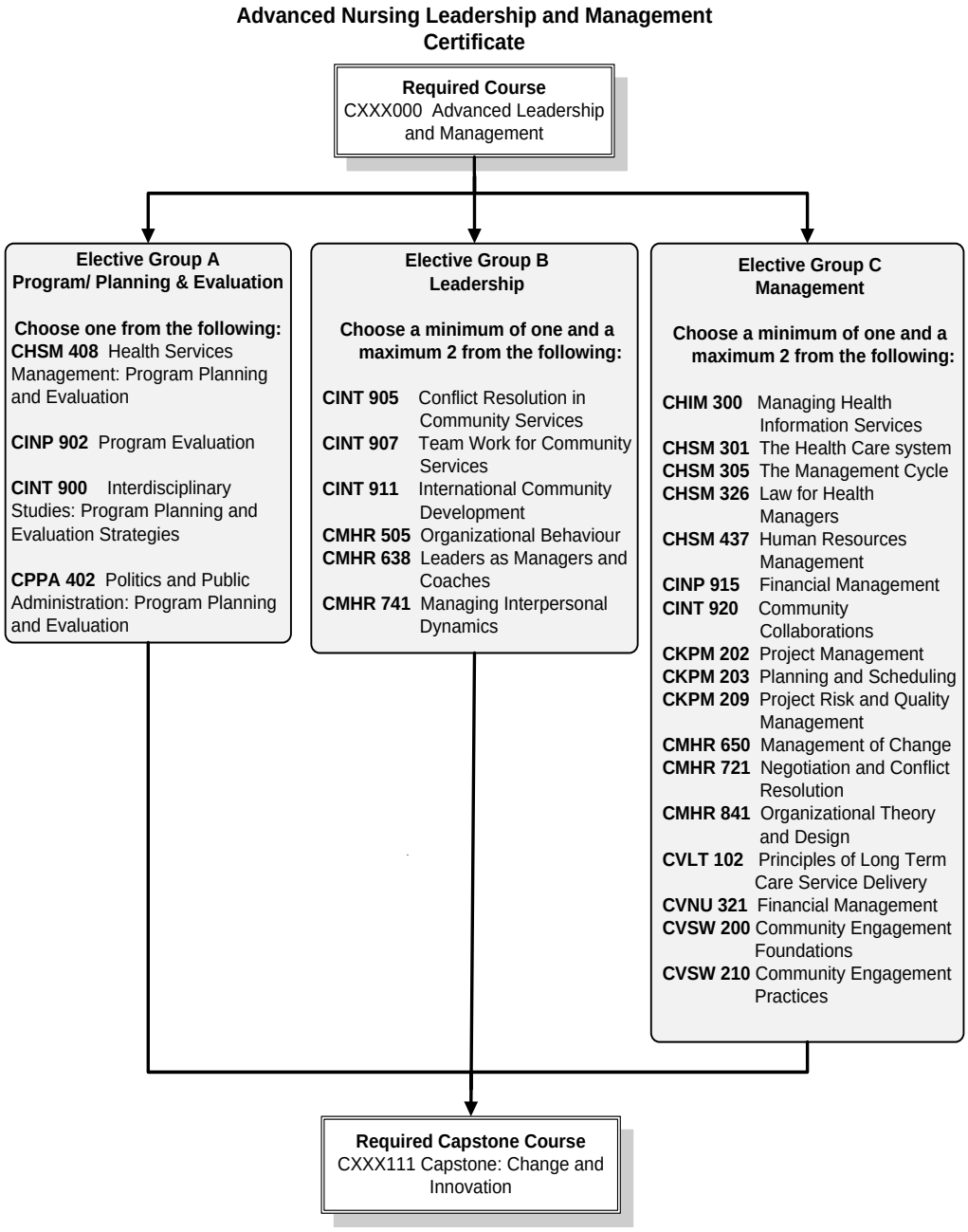
5. Curriculum: The 'LEADS in a Caring Environment Framework' (2008) was selected as the conceptual model to underpin the curriculum. The LEADS framework best aligns with the results of an environmental needs scan; had a supporting body of evidence to underpin the model dimensions; was focused on leader and manager development at all levels of the organization; and was future-oriented with a focus on change and innovation that is required to advance the current health care system. This relatively new framework has recently been endorsed by major health services institutions and professional associations across Canada.

The proposed redesigned certificate consists of six courses. This includes two required nursing courses, one of which is a capstone course; one course elective with a focus on program planning/evaluation (Group A); one to two leadership elective courses (Group B); and one to two management elective courses (Group C). The proposed curriculum, and a comparison to the current *Certificate in Leadership and Management for Nurses*, is presented in the chart on the following page.

6. Development Plan: The target implementation date for the proposed certificate is Fall 2012. Upon approval of the certificate, The Chang School, in collaboration with the Daphne Cockwell School of Nursing, will immediately identify faculty member(s) to develop the required nursing course CXXX000 Advanced Leadership and Management. The development of CXXX111 Capstone: Change and Innovation will proceed with a target implementation date of Fall 2013.

[4] Data on the number of Canadian baccalaureate prepared nurses working outside of the country is not available. However, 2010 data identifies that 6,708 Canadian Registered Nurses are working internationally.

Proposed Certificate Structure



It is recommended that students complete CXXX 000 early in their certificate program.
Students may take Elective Group A, B and C in any order.
The Capstone Course (CXXX111) is the final certificate course.
Please refer to the main proposal document for references related to pre-requisites .

The electives have been selected from existing courses offered by other schools/departments in the University in order to leverage the expertise and experience of those schools/departments in attending to specific leadership and management functions as addressed by the LEADS framework. Students will, therefore, have the opportunity to learn with professionals from other disciplines.

7. Societal Need: This certificate program is aimed at providing Registered Nurses with the enhanced professional knowledge and skill that will better position them to enact leadership and management roles. According to the Canadian Nurses Association (CNA), "Canadian nurses in all positions must develop and exert leadership. Nursing leadership plays a pivotal role in the immediate lives of nurses and it has an impact on the entire health system and the Canadians it serves" (CNA, 2009, p.2).

8. Admissions Requirements: Students registering in the proposed certificate program are Registered Nurses who are registered with the professional governance body of their jurisdiction. They must have a Canadian BScN or equivalent degree. In addition, applicants must complete an application for preapproval and be approved before registering in the course CXXX000 Advanced Leadership and Management.

9. Academic Home: The academic home for the proposed Certificate in Advanced Nursing Leadership and Management is the Daphne Cockwell School of Nursing, which will ultimately assume responsibility for the certificate. The academic homes for the individual elective courses will be their schools/departments. The External Advisory Committee of the DCSON will function as the Program Advisory Council for the certificate.

Recommendation

Having satisfied itself of the merit of this proposal, ASC recommends: *That Senate approve the proposed Chang School Certificate in Advanced Nursing Leadership and Management.*

C. PROPOSAL FOR A CERTIFICATE IN INFRASTRUCTURE ASSET MANAGEMENT AND RENEWAL FROM THE CHANG SCHOOL

1. The Proposal: The Department of Civil Engineering at Ryerson University in cooperation with The G. Raymond Chang School of Continuing Education proposes to offer a non-degree credit Certificate in Infrastructure Asset Management and Renewal.

2. Certificate Rationale: The Canadian governments (municipal, regional, provincial and national levels) have instituted legislation requiring local authorities to create and implement infrastructure asset management plans for the physical infrastructure under their control. This will add to the demand for technologists, infrastructure asset professionals and civil engineers with Infrastructure Asset Management qualifications. The demand for infrastructure management knowledge and skill sets is most significant in large local authorities where demand outstrips supply for specialist infrastructure asset managers.

3. Certificate Goals: This certificate is aimed at familiarizing the participants with the basic information, problems and solutions associated with infrastructure asset management, evaluation, preservation and rehabilitation of the existing infrastructures, repair materials and strategies, and risk, fiscal and

management concerns. It will provide a comprehensive knowledge of the fundamental processes and techniques required to establish an effective infrastructure asset management program. In addition, participants will obtain a broad education necessary to understand the impact of civil engineering solutions in a global, societal, and environmental context consistent with the principles of sustainable development.

The goals of this proposed certificate also include educating infrastructure asset professionals to possess the requisite knowledge and competencies to achieve sustainable outcomes by applying holistic, systematic and risk-based processes to decisions concerning the management and renewal of an organization's or a government's physical assets, including infrastructure, fixed plant & mobile equipment.

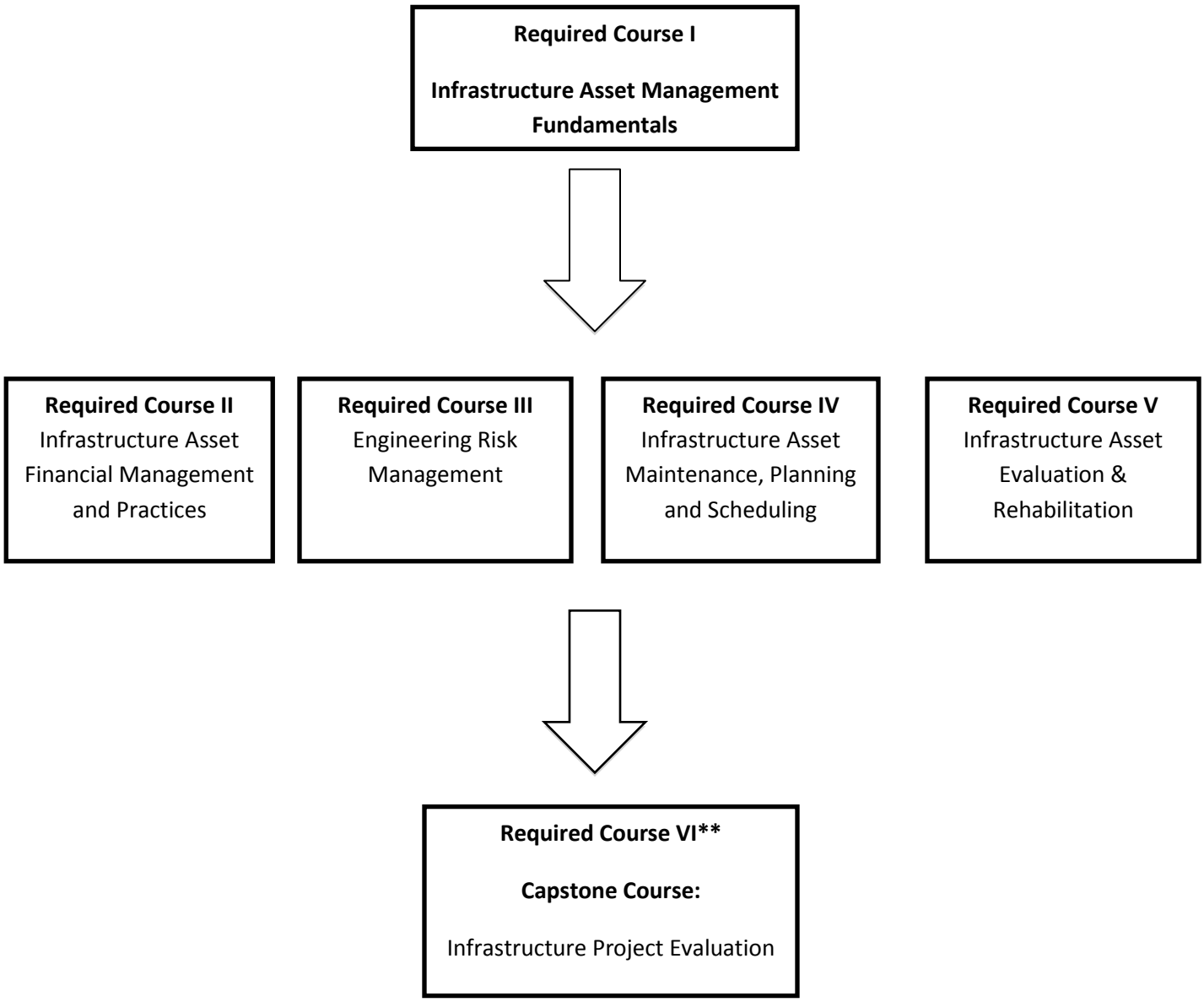
4. Target Group/Audience: The Certificate provides a prospective pathway into the infrastructure asset management industry for, in particular, aspiring technologists, 'place bound' infrastructure specialists, contractors and civil engineers who are seeking an opportunity to forge a career by developing current and relevant knowledge – together with a set of valuable competencies and employability skills — to repair, rehabilitate and renew infrastructures such as roads, airports, water systems, levees, tunnels, canals, dams, parks, hospitals, railroads, sewage, solid waste, broadband and public spaces.

5. Certificate Structure/Curriculum:

The proposed certificate consists of 6 mandatory certificate credit courses, one of which is the Capstone course: Each course is 39-hours in length for a total of 234 hours. The curriculum is described in the chart on the following page.

6. Development Plan: Delivery would commence in Fall 2012. Near term development includes the content authorship of the certificate's six certificate credit courses which will be staged for roll-out over Fall 2012, Winter 2013 and Spring/Summer 2013 terms. In order to run the program, an investment every academic year of approximately $15K will be required to rent appropriate and related equipment, purchase materials, and acquire infrastructure management software and multi-user licensing to educate participants.

7. Societal Need: Pressing concerns to rehabilitate and renew deteriorating infrastructure assets are at present drawing the attention of professionals and various levels of government. The need is acute to accommodate, with lean public works budgets, an increasing population in "old" ageing and deteriorating buildings, tunnels, water towers, bridges and public transit systems, and an ever growing traffic intensity on naturally deteriorating and inadequate bridges and roads. In response, infrastructure asset management and renewal (IAM&R) is an emerging inter-disciplinary field that combines the technical issues of infrastructure asset reliability, safety and performance with managerial skills. The correct knowledge and information about inventories, condition, and performance of infrastructure assets, acquired through effective management of the physical infrastructure, can support organizations and governments (federal, provincial or territorial, municipal) in order to ensure public safety, health, security, mobility of people and goods and to assess progress towards achieving sustainable communities.



*It is recommended that the Required Course I Infrastructure Asset Management Fundamentals be taken first.

**It is recommended that the required courses be taken before the Capstone course although the Capstone Course may be taken in conjunction with the fifth course of the certificate.

8. Admissions: The admissions requirements for this certificate program are one of the following sets of requirements depending on the status of the student:

1. Mature student status AND evidence of relevant college or university level coursework (or academic equivalent), as determined by the Academic Coordinator:
   OR

2. Mature student status AND relevant industry or professional experience, as determined by the Academic Coordinator.
   OR
3. Student who has completed the OSSD with six Grade 12 credits or equivalent AND who has relevant college or university level coursework (or academic equivalent), as determined by the Academic Coordinator;
   OR
4. Student who has completed the OSSD with six Grade 12 credits or equivalent AND who has relevant industry or professional experience, as determined by the Academic Coordinator.

9. Academic Home: The certificate's Academic Home will be the Department of Civil Engineering. The normal procedures and prescriptions mandated by Policy #76 will apply to the academic and administrative oversight of this certificate offering.

Recommendation

Having satisfied itself of the merit of this proposal, ASC recommends: *That Senate approve the proposed Chang School Certificate in Infrastructure Asset Management and Renewal.*

D. PROPOSAL FOR A CHANG SCHOOL CERTIFICATE IN ROBOTICS AND EMBEDDED SYSTEMS

1. The Proposal: The Faculty of Engineering and Architectural Science, in collaboration with The G. Raymond, Chang School of Continuing Education proposes a six-course Certificate in Robotics and Embedded Systems.

2. Certificate Goal: The goal of the proposed Certificate is to provide a pathway into the Robotics and Embedded Systems industry, including the applied technologies and sciences fields. There is an identified and soaring demand for computer/product technologists, but there is a modicum of avenues for professional development and continuing adult education for the applied technology sector writ large.

3. Target Audience: The target audience comprises aspiring computer/product technologists who are seeking an opportunity to enter and gain experience working with hardware- and software-related robotics and embedded systems design and development.

Candidates undertaking this certificate are principally programmers, technologists, hardware/software programmers and technologists, communications and networking professionals, control systems technologists, C programming software specialists and other technical professionals involved with or having an interest in Robotics and Embedded Systems design and development.

4. Certificate Learning Outcomes: The key learning outcomes of this certificate are for certificate graduands to have the capacity, competencies and leadership expertise to respond effectively to our collective societal need to:

- Provide innovation and advances in robotics and embedded systems product and device development, ranging from microprocessor-based control systems, to systems-on-chip (SoC) design, and to device software development for the purposes of consumer and commercial product development, green technology inventions and life-saving medical devices.
- Support the identification of opportunities, gaps and complementarities in Ontario's innovation and entrepreneurial agenda when it comes to both small and large business research and development, and commercialization of embedded systems devices and products; and
- Demonstrate leadership in the facilitation of new and rapidly advanced embedded systems design, program and software device product development in order to serve Canadian business, industry, government and its citizens well.

5. Certificate Structure: The certificate structure is described in the chart on the following page.

6. Development Plan: In planning for the development of this certificate program, the certificate's courses will be rolled-out over the next two years. Delivery would commence in Winter 2013. Near term development includes the content authorship of the certificate's six courses, with anticipated staging for roll-out over 2012-13 and 2013-2014.

7. Societal Need: In its new report, "The Race for Global Leadership in Innovation: An Analysis of National R&D Strategies," [5] the Toronto Region Research Alliance offers a supply/demand analysis of more than 60 occupations including in applied technology, applied science, health and business. The report finds that Research and Design applied technology and engineering occupations will be in demand and undersupplied in Toronto in 2012.The report observes a high demand for combined applied technical and entrepreneurial skills by innovation leader companies in the technological industries. This certificate assists in meeting this demand. In the "Sectors to Watch" section of the 2011 Annual TOP Report – Toronto's Opportunities and Priorities, Local Labour Market Update authored by TWIG (Toronto Workforce Innovation Group), technology-centric industries were cited as having the fastest rising demand for employees. The report also notes that Toronto is the third largest "employer city" in North America in the technology sector. Also noted is the soaring demand for "technology literacy skills across applied technology and applied sciences' occupations."

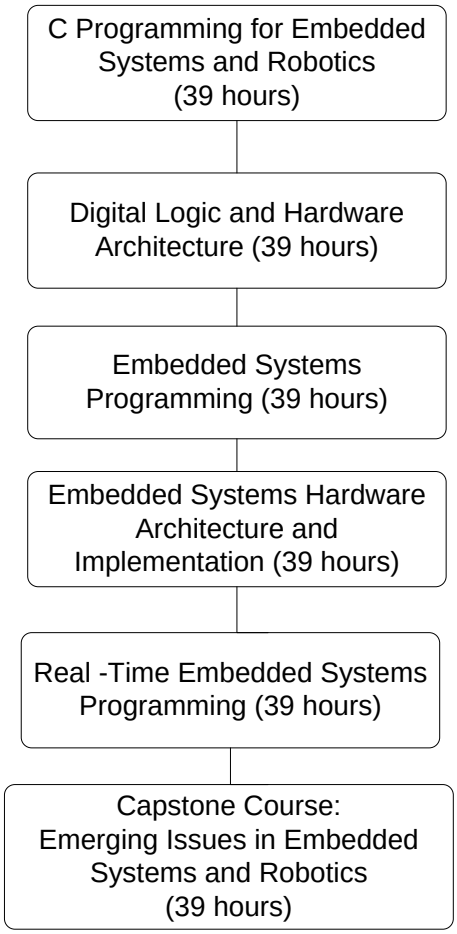
Top of the list for emerging themes and priorities in the labour market are the "green economy" and 'green' careers in response to a surge in demand. Careers writ large include computer programmers, robotics and embedded systems technologists, solar panel technicians and technicians who can design and build the embedded systems technology contained in medical equipment, electronics, and commercial products (e.g. wind turbines' technology). Among other top emerging labour market priorities mentioned were technological advancement and economic transformation.

[5] http://www.trra.ca/en/index.asp, accessed on February 26, 2012.

Certificate in Robotics and Embedded Systems

Curriculum Structure

Required Courses*



*It is recommended that the required courses be taken before the Capstone course although the Capstone Course may be taken in conjunction with the fifth course of the certificate.

The Certificate will consist of six (6) 39-hour courses for a total of 234 hours of instruction. The last course in the certificate is a Capstone course.

In the certificate, candidates would develop current and relevant knowledge together with a set of valuable competencies and employability skills to meet the identified societal need, particularly in

perform embedded device product development found in green technology, electronics, medical equipment and commercial applications.

8. Admissions: The admissions requirements for this certificate program are one of the following sets of requirements depending on the status of the student:

1. Mature student status and evidence of relevant college or university level coursework; or equivalent as determined by the Academic Coordinator:
   OR
2. Mature student status and relevant industry or professional experience; or equivalent as determined by the Academic Coordinator.
   OR
3. Student who has completed the OSSD with six Grade 12 U or M credits, including a credit in English with a minimum grade of 70 percent; or equivalent; who has relevant college or university level coursework; or equivalent as determined by the Academic Coordinator;
   OR
4. Student who has completed the OSSD with six Grade 12 U or M credits, including a credit in English with a minimum grade of 70 percent; or equivalent;
   who has relevant industry or professional experience; or equivalent as determined by the Academic Coordinator.

It is recommended that certificate candidates have previous knowledge and experience that are technically-based in nature. For academic advising, students are encouraged to contact the Academic Coordinator for further details. This certificate is principally for programmers, technologists, hardware/software programmers and technologists, communications and networking professionals, control systems technologists, C programming software specialists and other technical professionals involved with or having an interest in Robotics and Embedded Systems design and development.

Additionally, this certificate for professionals of all backgrounds who had experience with computer programming – in any language(s) – and/or who have technical industry experience.

9. **Academic Governance**: The academic home of this certificate will be the Department of Mechanical and Industrial Engineering in close collaboration and consultation with the Department of Electrical and Computer Engineering and the Department of Computer Science. The normal procedures and prescriptions mandated by Policy #76 shall apply to the academic and administrative oversight of this certificate offering.

Recommendation

Having satisfied itself of the merit of this proposal, ASC recommends: *That Senate approve the proposed Chang School Certificate in Robotics and Embedded Systems.*

E. PROPOSAL FOR A CHANG SCHOOL CERTIFICATE IN MINING MANAGEMENT

1. The Proposal: The Chang School, in collaboration with The Ted Rogers School of Management, is proposing a Certificate in Mining Management. The Certificate courses are all at fourth-year degree level and are for-credit courses.

2. Certificate Goals: The primary goal of this certificate is to provide students with additional competences in natural resource development, financing, and value creation in the mining industry. Aligned with this goal is that of providing reputable, university-level education which elevates the competency and relative desirability of certificate graduates in their fields. Ensuring employment-relevance continues to be a high priority, and so the certificate has been developed in close consultation with industry experts and Ryerson faculty. Finally, the certificate may be programmed in a 'module' format to afford students maximal flexibility.

3. Certificate Structure: The proposed Mining Management Certificate is designed with three components:

Preparation – ensuring prospective students have the correct background to be successful in the program through an application for pre-approval.

Mining Management – five required courses (195 hours) focus on business issues in the global mining sector (includes a specific region when partner institutions are involved); and

Certificate completion – 39 hours on an experiential/workplace project delivered as a capstone course.

The charts on the following two pages depict the curriculum components and structure.

4. Development Plan: Course development of the proposed certificate's new curriculum (six courses, certificate credit) will begin as soon as the certificate is approved and an Academic coordinator selected. The Academic Coordinator will select individuals to develop the courses. To date, individuals from TRSM, the Certificate Steering Committee, instructors from the Project Management Certificate and other interested faculty have expressed interest in developing courses for the certificate. The certificate launch date is Fall 2012.

5. Societal Need and Target Group: The Program Advisory Committee confirms that there is an urgent need in the mining industry for employees who have practical as well as theoretical skills such as project management, and who understand and have been exposed to real world cases and simulations. The proposed Mining Management certificate will produce graduates who can work in a global environment and span the disconnects between science and business and community development and business. They may have job titles as managers, financial analysts, environmental coordinator, community developer and other positions requiring the application of cross-disciplinary skills.

Mining is an incredibly diverse sector, with more than 120 occupations ranging from skilled trades to high tech professionals. In the assessment of the societal need for the proposed Mining Management.

Overview of the Certificate Components

Sub Area	Courses	Code	Duration	Format
Preparation				
Application for Pre-Approval	To review the prospective students' education and work experience to determine what gaps, if any, need to be addressed before starting the certificate program.		TBD	Online
Mining Basics (as required)	Required prerequisite courses (or their equivalent) include:			
	Introduction to Mining Management	CZMM100	39 hours	Class
	Geoscience for Managers	CZMM200	39 hours	Class
Business Basics (as required)	Required prerequisite courses (or their equivalent) include:			
	Financial Accounting	CACC100	39 hours	Both
	Management Accounting	CACC406	39 hours	Class
	Managerial Finance I	CFIN300	39 hours	Both
	Business Law	CLAW122	39 hours	Both
Mining Management				
The Certificate Courses	**Required**			
	CSR, Sustainability and Mining	CZMM403	39 hours	Onsite
	Resource Valuation, Financing and Investor Relations	CZMM420	39 hours	Onsite
	Electives (Choose three)			
	Exploration and Development Operations	CZMM411	39 hours	Online
	Mining Sector Accounting	CZMM422	39 hours	Online
	Risk Management and the Mining Sector	CZMM421	39 hours	Online
	Mining in the Global Environment	CZMM430	39 hours	Online
Certificate Completion				
Capstone	Capstone Course	CZMM500	39 hours	Individual
Total Hours			**234 hours**	

The Curriculum Structure

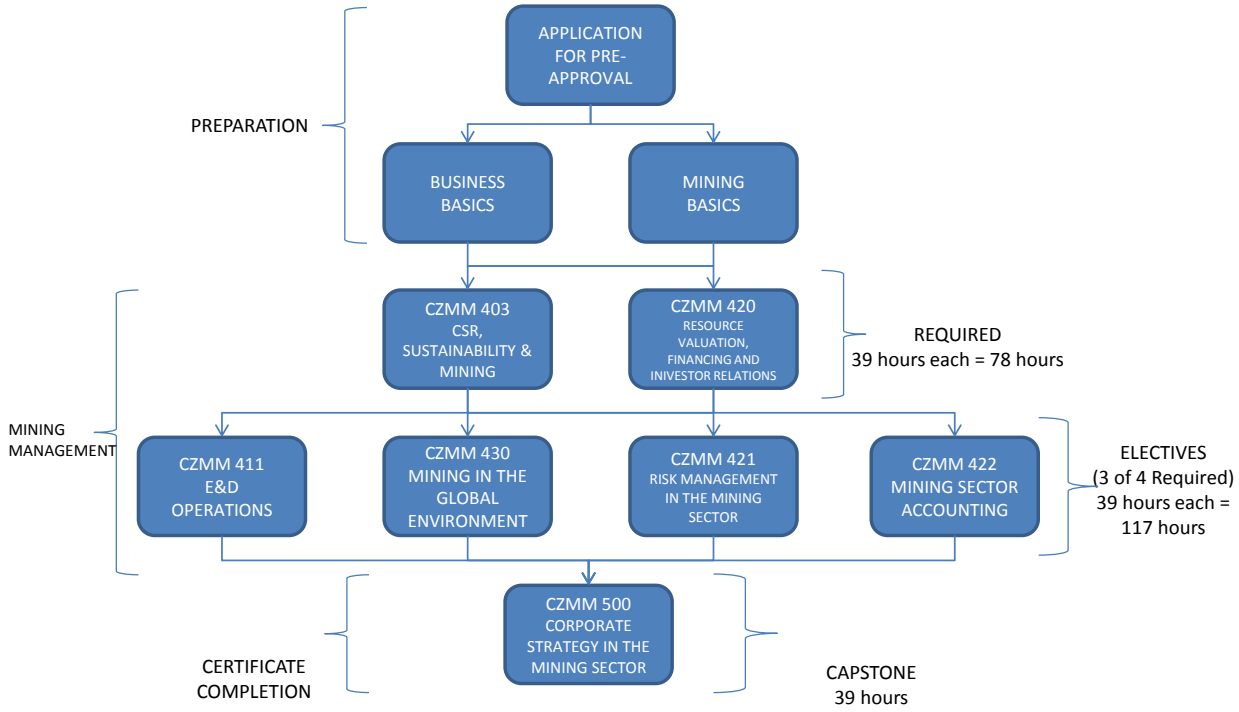


Figure 1 - Proposed Curriculum Structure – Certificate in Mining Management
(234 total hours of instruction)

Certificate, current and historical employment circumstances in Canada have been examined. See Appendix D for the full report.

6. Admissions Requirements: To be admitted into the certificate, the candidate must have a relevant bachelor's degree and/or a minimum of 5 years work experience in a relevant industry. Depending on the nature of their degree and of their work experience, certificate candidates may need preparatory courses. What, and how many, courses a certificate candidate may need must be determined in consultation with the Certificate Academic Coordinator, consistent with the application pre-approval process.

Specifically admission requirements are: Bachelors degree in a relevant area with a GPA of 2.0, or equivalent; **OR** A post-secondary diploma in a relevant area with a GPA of 2.0, or **e**quivalent, subject to the approval of the academic coordinator; **OR** Five years of work experience in a related industry in a social or technical capacity, subject to the approval of the academic coordinator.

7. Academic Management and Governance: This certificate proposal, once approved, shall be governed by the provisions of Senate Policy No. 76, including the composition and functioning of the Certificate's Standing Curriculum Committee.

The Standing Curriculum Committee shall consist of experts in mining and business-relevant fields including faculty members (who must comprise a majority) from the Ted Rogers School of Management

Recommendation

Having satisfied itself of the merit of this proposal, ASC recommends: *That Senate approve the proposed Chang School Certificate in Mining Management.*

F. PROPOSAL FOR A BACHELOR OF SCIENCE DEGREE PROGRAM IN BIOMEDICAL SCIENCES

1. Introduction: There is a clear need for a workforce literate in the principles of biomedical sciences (BMS) that can take advantage of the career opportunities available now and in future. To meet this need, an undergraduate BMS Program will impart knowledge of advanced principles of genetics, cell and molecular biology, infectious diseases (microbiology) and other biomedical fields to Ryerson's undergraduate students interested in careers and graduate studies in all health-related sciences, biotechnology and pharmaceutical industries.

The proposed program has a target intake of 100 students, 310 at steady state, who will be affiliated with the Faculty of Science. The proposal calls for the hire of 7 new hires, 2.5 technical support staff and 1 administrative assistant. The program will be administered by the Department of Chemistry and Biology. The proposed degree program has no licensing or accreditation requirements. The proposed start date for the program is Fall 2013.

2. Societal Need and Career Opportunities: Ontario is the fourth-largest life science cluster in North America, mostly concentrated in the GTA. In downtown Toronto alone, there are nine research hospitals, two Universities (including Ryerson), 5,000 principal investigators and a research budget of $1 billion per year. There are over 300 biotechnology and pharmaceutical companies within Ontario that include multi-nationals such as Sanofi Pasteur, Apotex, GlaxoSmithKline, AstraZeneca and Eli Lilly. Pharmaceutical companies alone employ 10,000 people and spend about $500 million per year in research and development in the GTA. Significantly, the pharmaceutical and biotechnology industries are predicted to continue growing within the GTA. For example, the MaRS Project, an incubator for biotech start-ups steps away from Ryerson University, is now in its second phase of construction and will be adding 230,000 m^2 of new space when complete.

Given the significant presence of the life sciences in the Toronto area, BMS graduates may seek direct employment and develop careers in clinical and forensic laboratories, in the biotechnology and pharmaceutical industries, and in biomedical research institutions. Alternatively, a deep understanding of BMS will better position many of our students for admission to graduate studies and/or professional degrees. Lastly, individuals literate in BMS are often sought by non-standard sectors including various non-governmental organizations, health administration, policy organizations, consulting management and patent law firms. Overall, the BMS degree aims to produce highly-qualified individuals that will successfully support societaly-relevant sectors including the pharmaceutical and biotech industries, and

biomedical research. The BMS Program will also be a facilitating step to establish ties with the University Health Network in Toronto and enhance SRC productivity within Ryerson.

3. Admission Requirements: Ontario Secondary School Diploma (OSSD) or equivalent with a minimum of six Grade 12 U or M courses including the following program specific requirements (a minimum overall average of 70% establishes eligibility for admission consideration; subject to competition individual programs may require higher pre-requisite grades and/or higher overall averages):

- English/Anglais (ENG4U/EAE4U preferred)
- Advanced Functions (MHF4U)
- Two of Biology (SBI4U), Chemistry (SCH4U) or Physics (SPH4U)

The minimum grade(s) required in the subject prerequisites (normally in the 65-70% range) will be determined subject to competition. All three grade 12U sciences are recommended. This program selects students on the basis of academic achievement /grades only. Additional non-academic requirements are not required for admission consideration.

4. Curriculum: The BMS program structure is composed of forty-two courses that will be integrated into a four-year B.Sc. degree and are categorized as follows:

- 1 Orientation Course (SCI 180) in year 1
- 1 BMC-specific orientation course in year 2
- 7 First-year Science courses
- 1 First-year Psychology course
- 2 Science Core courses in the second year
- 15 BLG/BCH/BMS Core courses throughout years 2, 3 and 4
- 3 BMS Core elective courses
- 6 Open elective courses
- 6 Liberal Studies Courses

The curriculum has 6 available open electives, which students can use to increase their knowledge in a specific biomedical area or complement their knowledge in some other area. The 6 open electives permit the student to obtain a minor in a different subject matter.

Compatibility with the Common Science First Year and the BSc (Biology) Program: A significant portion of the first and second year curriculum will be similar to the current general biology program to establish the basic fundamentals of science. This also facilitates student transfer opportunities. In third year, the students will begin to select electives designed to advance their knowledge in areas relevant to biomedical sciences which requires the development of 17 new courses (5 required, 12 elective). Some of these new courses will be carefully cross-listed with other programs including Biology, Medical Physics and Biomedical Engineering.

Curriculum Details: The following tables present the curriculum for both the regular and co-op versions of the program:

a. COMMON TO ALL OPTIONS		**Mode of delivery (hours per week)**		
Semester 1		**Lecture**	**Lab**	**Tutorial**
BLG 143	Biology I	3.0	1.5	
CHY 103	General Chemistry I	3.0		
MTH 131	Modern Mathematics I	4.0		1.0
PCS 120	Physics I	3.0	1.0	1.0
Liberal	Table A	3.0		
SCI 180	Orientation	1.0		

Semester 2		**Lecture**	**Lab**	**Tutorial**
BLG 144	Biology II	3.0	1.5	
CHY 113	General Chemistry II	3.0	3.0	
PCS 130	Physics II	3.0	1.0	1.0
Elective	Open Elective	3.0	*	
PSY 102	Intro to Psychology I	3.0		

Semester 3		**Lecture**	**Lab**	**Tutorial**
BLG 151	Microbiology I	3.0	3.0	
BLG 311	Cell Biology	3.0	1.5	
CHY 142	Organic Chemistry I	3.0	3.0	
MTH 380	Statistics I	3.0		1.0
Elective	Open Elective	3.0	*	

BMS 280	BMS Orientation II	1.0		

Semester 4		**Lecture**	**Lab**	**Tutorial**
BCH 261	Biochemistry	3.0	3.0	
BLG 400	Genetics	3.0		1.0
BLG 411	Cell biology II	3.0		
BLG 600	Physiology	3.0		
Liberal	Table A	3.0		

b. REGULAR PROGRAM

		Mode of delivery (hours per week)		
Semester 5		**Lecture**	**Lab**	**Tutorial**
BCH 361	Advanced Biochemistry I	3.0	3.0	
BLG 307	Molecular Biology	3.0		
BLG 856	Immunology	3.0		
Elective	Open Elective	3.0	*	
Liberal	Table A	3.0		

Semester 6		**Lecture**	**Lab**	**Tutorial**
BMS XX6	Experimental Design	3.0		2.0
BLG 888	Molecular Biology Lab		3.0	1.0
Elective	Table X	3.0	*	
Elective	Open Elective	3.0	*	
Liberal	Table B	3.0		

Semester 7		**Lecture**	**Lab**	**Tutorial**
BMS XX2	Systems Biology	3.0		
BMS X13	Critical Thinking in BMS	3.0		2.0
Elective	Table X	3.0	*	
Elective	Open Elective	3.0	*	
Liberal	Table B	3.0		

Semester 8		**Lecture**	**Lab**	**Tutorial**
BLG 8X1	Cancer Biology	3.0		
BMS X12	Stem Cell Biology	3.0		
Elective	Table X	3.0	*	
Elective	Open Elective	3.0	*	
Liberal	Table B	3.0		

Table X: Electives. Students must select three (3) courses

BMS 40A/B* Project-Thesis	BLG 251 Microbiology II	CHY 436 Pharmaceutical Chemistry
BMS 6X1 Molecular Genetics and Epigenetics	BLG 408 Viruses	PCS 229 Introduction to Medical Physics
BMS XX1 Advanced Immunology	BLG 409 Biometry	PCS 227 Biophysics
BMS XX3 Biochemistry of Disease	BLG 578 Pharmacology	PCS 230 Photonics and Optical Devices
BMS XX4 Medical Microbiology	BLG 678 Current Topics in Biology	PCS 300 Modern Physics
BMS XX5 Advanced Physiology	BLG 700 Anatomy	PCS 352 Nuclear Physics/Radiation Protection
BMS XX7 Infection and Immunity	BLG 702 Genomics and its Applications	PCS 354 Radiation Biology
	BLG 785 Developmental Biology	PCS XX1 Cellular Biophysics
	BLG 788 Current Topics in	

BMS XX8 Human Genetics BMS XX9 Medical Epidemiology BMS X10 Model organisms BMS X11 Neurobiology BCH 362 Advanced Biochemistry II BCH 501 Protein Biochemistry and Proteomics BCH 580 Cell Signalling	Biotechnology BLG 800 Genomics and Proteomics BME 501/ CPS 501 Bioinformatics MTH 231 Modern Mathematics II CHY 241 Organic Chemistry II	PCS XX2 Nanophysics PSY 202 Introduction to Psychology II PSY 214 Psychopharmacology PSY 215 Psychology of Addictions PSY 324 Biological Psychology PSY 325 Psychological Disorders

c. CO-OPERATIVE EDUCATION PROGRAM

Co-operative Semester (Spring/Summer)		Mode of delivery (hours per week)		
		Lecture	Lab	Tutorial
WKT 405	Work Term I	1.0		

Semester 5		Lecture	Lab	Tutorial
BCH 361	Advanced Biochemistry I	3.0	3.0	
BLG 307	Molecular Biology	3.0		
BLG 856	Immunology	3.0		
Elective	Open Elective	3.0	*	
Liberal	Table A	3.0		

Co-operative Semester (Winter)		Lecture	Lab	Tutorial
WKT 505	Work Term II	1.0		

Co-operative Semester (Spring/Summer)		Lecture	Lab	Tutorial
WKT 506	Work Term III	1.0		

Co-operative Semester (Fall)		Lecture	Lab	Tutorial
WKT 605	Work Term IV	1.0		

Semester 6		Lecture	Lab	Tutorial
BMS XX6	Experimental Design	3.0		2.0
BLG 888	Molecular Biology Lab		3.0	1.0
Elective	Table X	3.0	*	
Elective	Open Elective	3.0	*	
Liberal	Table B	3.0		

Co-operative Semester (Spring/Summer)		Lecture	Lab	Tutorial
WKT 606	Work Term V	1.0		

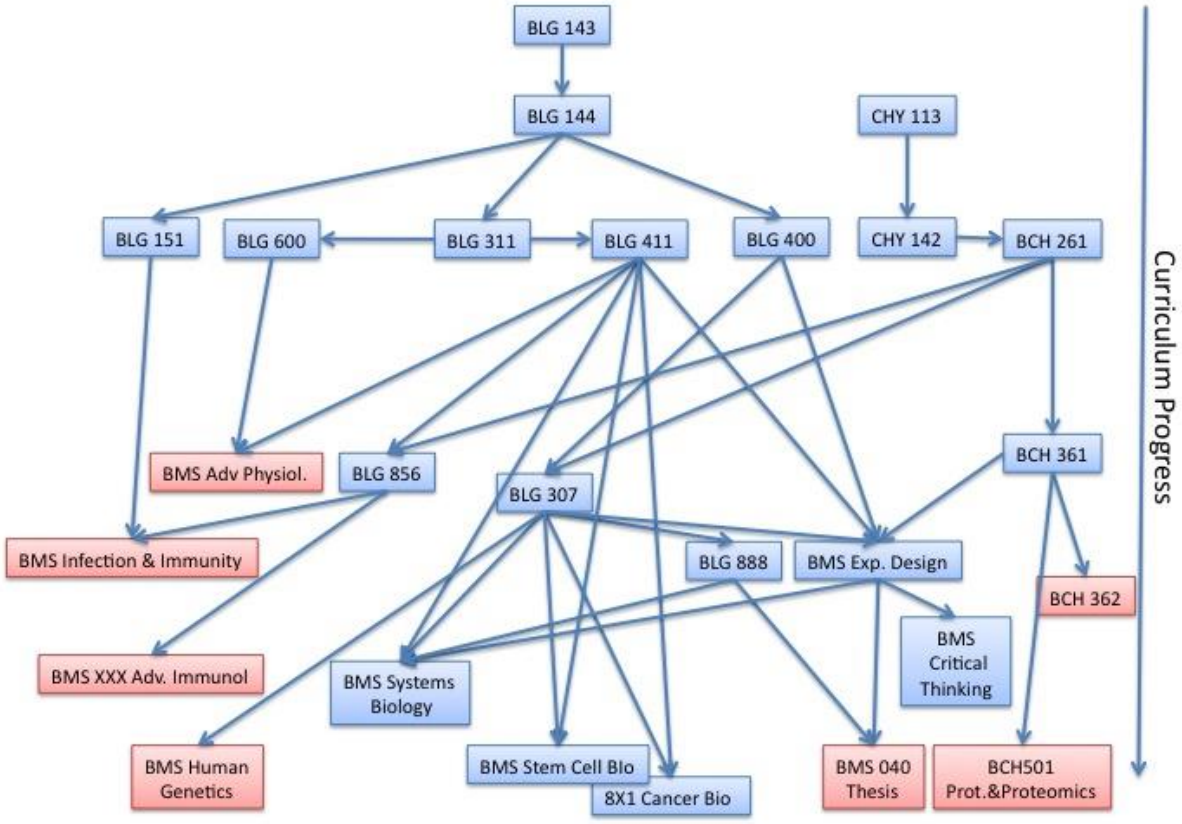
Semester 7		Lecture	Lab	Tutorial
BMS XX2	Systems Biology	3.0		
BMS X13	Critical Thinking in BMS	3.0		2.0
Elective	Table X	3.0	*	
Elective	Open Elective	3.0	*	
Liberal	Table B	3.0		

Semester 8		Lecture	Lab	Tutorial

BMS 8X1	Cancer Biology	3.0		
BMS X12	Stem Cell Biology	3.0		
Elective	Table X	3.0	*	
Elective	Open Elective	3.0	*	
Liberal	Table B	3.0		

The co-operative education curriculum is optional. Admission to the co-op option requires a minimum GPA of 2.67.

Prerequisite tree for proposed curriculum:



Blue are core courses and in those in pink are BMS elective courses. Note that the two orientation courses, SCI180 and BMS280, are also core program requirements.

Mode of Delivery: The course content will be delivered through a combination of lecture, laboratory and/or tutorial formats, as appropriate. These modes of instruction the curriculum will best deliver conceptual, theoretical and experiential learning to BMS students, while achieving the program goals and meeting our obligations under the IQAP (i.e., UDLEs). These modes of delivery are commonly employed in most science-based programs at Ryerson and in comparator institutions.

*Differentiation and Integration of the Program with other Existing or Planned Programs at Ryerson: T*he core curriculum differs from the Department's current general biology program as it will emphasize mechanisms of disease and health, biomedical methodology and experimentation. The BMS program will greatly expand the courses offered in the Department and will synergize with programs in Biology, Chemistry and Medical Physics. The new program will facilitate the expansion or formation of additional multi-disciplinary programs that could include biology, chemistry, psychology, medical physics, engineering, business, nursing, health administration and public policy.

Alignment of the Curriculum with Degree Level Expectations: The BMS curriculum structure is designed to incrementally develop the program goals in compliance with UDLEs. The full proposal provides maps of the program goals to UDLEs and the course content to the program goals. The curriculum builds all program goals from an introductory to proficiency level over the four years of the program. The program goals are listed here:

1. *Demonstrate understanding of fundamental and advanced concepts, theories, models in biomedical sciences and mechanisms underlying health and disease states*
2. *Seek, interpret, summarize and primary sources and data and critically evaluate these to synthesize new questions, testable hypotheses and models*
3. *Articulate the theory, uses and limitations of research methodologies and tools employed in biomedical sciences*
4. *Select techniques, and formulate strategies for testing hypotheses.*
5. *The ability to effectively communicate concepts, models, theories and methods in biomedical sciences*
6. *Articulate the uses and value of knowledge including multi-disciplinary knowledge, and recognize and explain the limits of knowledge*
7. *Identify, recognize and apply general and professional skills related to the field of bio-medical sciences and related industries.*

5. Peer Review Team Site Visit and Report: The Peer Review Team (PRT)[6] site visit took place on April 13, 2012. The PRT "enthusiastically recommends approval of this exciting new program. The creation of this BMS program at Ryerson is timely and constitutes a logical and highly desirable extension to the

[6] The PRT members were Profs. Roy Baker (University of Toronto), Justin Nodwell (McMaster University) and Catherine Beauchemin (Ryerson University).

Department of Chemistry and Biology's current offerings, building on the Department's strengths and diversity." The PRT indicates that approval of the BMS program will be instrumental in promoting growth and advancing Ryerson's reputation in research and in the delivery of a societally-relevant education. In particular, the PRT feels that the additional faculty hires requested in the proposal are not only vital to the proposed BMS program, but have the potential to be transformative for Ryerson's research landscape.

The PRT feels that the level of flexibility in the choice of courses offered to students in the proposed BMS program is unusual at the undergraduate level, is novel, and is a key asset of this program. BMS programs typically attract students seeking admission to medical school. While this is a laudable goal, given that only ~5% of medical school applicants can usually expect to gain admission, it is very important that students have alternative plans built into their degree, preferably from the outset of their time in university.

The number of elective courses (core and open) built into the proposed BMS curriculum makes it uniquely suited to facilitate this. In order to ensure the students are properly guided in making course selections that are consistent with their priorities, the PRT made recommendations to the program committee and these are listed below. The PRT encourages an approach where students would be encouraged/expected to make intelligent choices regarding specializations within the BMS program as soon as they start university. To facilitate this there should be interactive counselling and guidance provided by the BMS program office.

The proposed core curriculum is in line with the offerings of BMS programs at other institutions. Core upper year courses such as *Stem Cell Biology* and *Cancer Biology* give Ryerson's BMS program a very attractive currency. The PRT is particularly excited by the upper year core courses in *Experimental Design* and *Critical Thinking* in BMS which will compel students to apply their theoretical knowledge to practical issues. These two core courses ensure all students graduating from Ryerson's BMS program will have an opportunity to apply their knowledge to real-world problems and experience the relevance of their newly-acquired skills.

The PRT notes that upper year core courses in the BMS program do not include laboratories and that some should be added to ensure students can put into practice their newly-acquired critical thinking skills and cement these concepts. The PRT encourages the Department to seek accreditation for its courses from Canadian and US medical schools to further increase the appeal of the program.

In order to insure the program is genuinely medically relevant, the PRT recommends the Department ensures courses relate their topics to health and diseases whenever possible. The visitors strongly encourage consistent application of theoretical knowledge to real-world concerns throughout the curriculum.

For a BMS student to find her or his ultimate career goal within the program, the PRT feels that simply providing students with options will not be sufficient. The Department rightfully asks for additional administrative support to establish a program office to help guide students in the BMS program through these choices. The PRT echoes the Department's request for this resource. However, it is the opinion of

the PRT that the student's personal experience and exposure to a topic, more so than advice they receive from others, shapes their decisions. As such, the PRT proposes that the Department consider the following two suggestions:

1. Addition of a 2nd year course which would expose students to the range careers in health-related fields.

2. The construction of job-related course packages to make choosing elective courses easier for students and to encourage a more strategic approach in course selection. A near-term objective for the program director should be the identification of course packages drawing on existing courses and/or developed in collaboration with other programs in relevant career streams. These include but are not limited to, the biotechnology sector, entrepreneurship, business management, financial planning, health policy and law.

The PRT feels the new faculty positions must be tenure-stream to attract high-quality researchers. The PRT also recommends that these hires be moved up by one year (first two in 2013) to allow the new faculty to adapt to their new institution, explore funding opportunities, and set up their research laboratory before they are asked to focus on the design and construction of the program's new courses. It is critical that the new faculty members be provided with appropriate space to set up their research laboratory.

The PRT remarked that the research output of current faculty in the Department is outstanding considering their heavy teaching load (3 courses per year) which is atypical for BMS programs. The PRT cautions the administration that such a heavy teaching load could make it difficult to retain high-calibre faculty in the research areas identified in the proposal. This program will be in direct competition with existing programs at more research-intensive universities such as McMaster and the University of Toronto.

Immediate recommendations:

- Implementation of a course choice table (noting suitable electives from a variety of departments) for a few (1 or 2) practical employment streams with additional streams to be developed later
- The addition of a BMS-specific career-orientation course (BMS280)
- Moving the hiring of the new faculty members up by one year from 2014 to 2013
- Closer interaction with departments outside the immediate Life Science sphere (Business Management, Health Management, Economics) in designing suitable “pods” of business and health care relevant collections of elective courses

Long-term recommendations:

- More labs in upper year courses
- Lowering the teaching load of research intensive faculty

6. Program Response to PRT Report: The PRT made 6 recommendations for improvements or modifications of the program. This section describes the program's responses to these recommendations.

1. Implementation of courses choice table: One mandate of the appointed program director for this program will be to design such tables for counselling purposes and to use in the 2nd BMS year orientation course.

2. Addition of a career-focused orientation course: The program agrees with this suggestion and has already implemented such a course (BMS 280) into the curriculum in 3rd semester.

3. Move the hiring of the faculty up one year from 2014 to 2013: The program has no control over this although it is an excellent suggestion. It would allow new faculty the time to establish their research and secure funding before dedicating time to the design and delivery of new courses.

4. Closer interaction with departments outside of chemistry and biology: Again a great suggestion and the program did send the draft proposal to several other departments for their input as they envision that biomedical students with a minor in other areas such as public administration, policy development, business would be a great asset to the program. So far the program has had a very positive response from the Entrepreneurship and Strategy department and hopes to design a course choice table for this option in the very near future.

5. More labs in upper year: The program has already implemented this suggestion and added 4.5 more labs hours from semesters 4 to 8.

6. Lower teaching loads: The program has no control over this suggestion, although it does see value in the implementation of lower teaching loads for research intensive faculty.

7. Dean's Response to the PRT Report: The Associate Dean (writing on behalf of the Dean) is very excited about the prospective avenues that a BMS program will provide, and enthusiastically endorses the program.

The PRT and Advisory Council members expressed enthusiasm for the program. They felt that the proposed curriculum was current, in line with that at other institutions, and intellectually rigorous. They also expressed excitement over some of the program's more unique elements, such as a course in *Critical Thinking* and *Experimental Design*, as well as cutting-edge elements such as *Stem Cells* and *Systems Biology* in the core. One Advisory Council member did express reservations about the same courses that were lauded by the PRT. However, his opinion is not that these courses lack value, but that they need to be better defined, to maintain intellectual content. The Dean expressed agreement with this view.

The PRT were very positive about the open curriculum, which allows for substantial student choice; however, they also felt that providing choice would not benefit the students unless appropriate career guidance was also provided. During their discussions, the committee and PRT agreed that adding a

second-year seminar course (1 h/wk, P/F grading with mandatory attendance and brief assignments or online quizzes) would go a long way to educating students on their options. The course has been added to the core in the latest version of the proposal. Although its addition brings the total number of credits to 42, it should be kept in mind that two of those credits are for the orientation course in first year (SCI 180, 1 h/wk, P/F) and the proposed second year course (BMS280).

During the site visit, the committee and the PRT had lengthy discussions about the creation of joint programs with other departments and Faculties at Ryerson. In particular, they expressed enthusiasm for a joint program between BMS and Entrepreneurship, and felt that it would be a missed opportunity for Ryerson if we did not pursue it. At this point, the Dean does not recommend suspending the implementation of the current proposal in order to add joint programs to the document. The proposed program should rather be viewed as a foundation with tremendous potential to be built upon.

While the PRT believed that the program has the necessary intellectual rigour, they also felt that there was a lack of laboratories in the upper level courses. The committee agrees, and has added three half-labs (3 h/wk every other week) in *Immunology*, *Cancer Biology* and *Systems Biology*. The committee has also discussed linking the labs with the *Experimental Design* course; i.e., *Experimental Design* would be a prerequisite to these upper level labs and students would be expected to use the principles of experimental design to complete the labs. I am supportive of that link and believe that it will help students to develop a more independent and critical mind-set in the lab.

The addition of these labs will not be without cost to the University. The proposed program will increase the biology intake by roughly 50%, which is unlikely to be accommodated by the current teaching lab space, even with a full slate of night sections. The Department is currently conducting an analysis of the need for new lab space as is the University Planning Office.

The PRT and Advisory Council members stressed the importance of the experiential component, especially of encouraging our students to explore research opportunities. This year the Biology professors hosted 25 undergraduates as thesis students in their laboratories. That accounts for about 25% of the graduating class. Each year nearly all of the students seeking positions in the thesis course are accommodated. Because of the high faculty time commitment and materials cost of hosting a student for a lab-based research project, the committee feels, and I agree, that making the thesis course mandatory would not be achievable or desirable. On the other hand, all students will be encouraged to participate in research where possible. This can be achieved through a summer employment opportunity, for example. In terms of experiential learning, students can also opt to take the Co-op version of the degree.

The PRT has indicated that recruiting faculty with expertise in the biomedical sciences will be difficult without adequate funding and lab space. While the low teaching loads suggested by the PRT members may be unachievable at Ryerson, a *lower* teaching assignment must be seriously considered.

8. ASC Evaluation: The ASC agrees with the PRT evaluation of the program as being strongly designed, current, in line with those at other institutions, and intellectually rigorous. The flexibility in the curriculum, described as a program strength by the PRT, is also well aligned with the direction of Ryerson's curriculum renewal initiative.

The ASC also recognizes that a program of this type will add breadth to the offerings of the new Ryerson *Faculty of Science* as well as build its research capacity. The location of the program within the Toronto Discovery District, with its major cluster of biomedical research institutions, provides potential synergies for the program as well as opportunities for employment or further education for program graduates. The ASC would also like to recognize that the program proposal was exceptionally well prepared and written and thanks the proposers for their efforts.

The ASC recognizes the value of the program-specific orientation course BMS280 (*BMS Orientation II*) in helping program students consider career directions beyond possible admission to medical school. **The ASC recommends that as the course content is developed, the program consult with others on campus who have experience developing university-orientation courses.** In particular, BUS100 in the Ted Rogers School of Management stands out as a successful course of this type. Further, the Learning and Teaching Office has expertise and best practice advice for such courses which should be considered. The goal of this consultation is to make BMS280 as effective as possible.

The program design includes discussions of bio-ethics. ASC applauds this feature but **recommends that discussion of ethics in the program be sufficiently broad to include elements that intersect with aspects of inclusion, diversity and equity**. Personalized medicine is an example of an issue where bio-ethics and inclusion/equity intersect. In addition, the program should ensure that the bio-ethics content include discussion of ethical treatment of animal subjects, as well as alternatives to animal models in research.

Recommendation

Having satisfied itself of the merit of this proposal, ASC recommends: *That Senate approve the proposed Bachelor of Science degree program in Biomedical Sciences.*

G. PROPOSAL FOR A BACHELOR OF COMMERCE DEGREE PROGRAM IN REAL ESTATE MANAGEMENT

1. Introduction: Real estate is a large industry sector – of great importance to the economies of Canada and the Greater Toronto Area. Only two Canadian business schools (Guelph and UBC) offer undergraduate programs in real estate. This presents an opportunity for Ryerson to serve the community by producing well-educated management professionals to lead the real estate industry into the future.

This proposal recommends a new Major in Real Estate Management to be offered through a new Real Estate Management department within the Ted Rogers School of Business Management. The proposed

intake target is 100 students per year with a steady-state of 315 students in a four-year program. The proposal indicates a need for three new tenure-stream hires as well as one administrative staff position. Authorization to proceed on this proposal was granted by the Provost in a letter dated February 16, 2012. The anticipated program launch is Fall 2013. Since this program will share a common first year with all other Business Management Majors, the first students will not start taking specialized program courses until Fall 2014.

2. Societal Need: The real estate industry accounts for a significant share of Canadian employment. In Toronto, over 68,000 jobs are in the real estate sector. These jobs include professionals in real estate property development, leasing management, real estate investment, property appraisal and brokerage. Not included in the above figure are the thousands of jobs in construction management and real estate-related jobs in banking and government.

The Government of Canada website "Working in Canada" provides labour market information and projections for the number of job openings by sector. They project that there will be 236,339 openings for the jobs classified as (1) Insurance, Real Estate and Financial Brokerage Managers, (2) Real Estate Agents and Salespersons and (3) Assessors, Valuators and Appraisers over the period 2011-2020 in Canada. They also predict just 174,090 job seekers in this sector, meaning that there is a favourable employment outlook for these professions. Students graduating with Ryerson's new Major in Real Estate Management will enjoy opportunities in these job categories and in many others as well. In addition, industry support for the proposed real estate program has been very strong. Appendix I of the proposal provides a list of distinguished real estate industry professionals who have agreed to serve on the advisory council.

One unique feature of the proposed Major is the required course on Sustainability in Real Estate and the program's commitment to green principles. This aspect also addresses societal needs for intelligent development.

Currently, only two of the many business schools in Canada offer education in real estate management. These are the Urban Land Economics program at the Sauder School of Business at the University of British Columbia, and the Real Estate and Housing program from the Department of Marketing and Consumer Studies at the University of Guelph. There are more than 50 universities in the U.S. where undergraduate students can pursue an undergraduate degree specifically in real estate. In contrast, the vast majority of real estate practitioners in Canada do not have the benefit of a comparable educational foundation.

3. Alignment with Expertise/Student Demand: Currently, students enrolled in the TRSM Master of Business Administration (MBA) may choose to specialize in Retail and Commercial Development. Existing MBA-level courses already taught by faculty associated with the planned new Department of Real Estate Management include Real Estate Finance and Real Estate Development. Therefore, this new undergraduate program is consistent with expertise already present within Ryerson. The proposed program is a natural fit because of Ryerson's excellent existing programs in real estate related fields such as Geography and Urban Planning, our location in the heart of the city, our overarching goal to

strike a balance between theory and application, our support from industry, our existing faculty teaching in the MBA program in real estate and our level of student interest.

The anticipated student clientele for the Major in Real Estate Management are those students in the Ted Rogers School of Business Management with an interest in the field. An additional 100 students will be admitted to the Ted Rogers School of Business Management annually after the approval of this program, and it is expected that approximately this same number will choose to major in Real Estate Management. This level of interest is supported by the large size of the membership in the Ryerson Real Estate Club.

4. Admission Requirements: The requirements listed here are the same as all other full-time Business Management majors. The admission requirements for the direct entry and part-time programs are not included for brevity's sake, but can be found in the current edition of Ryerson's undergraduate calendar.

ADMISSION: O.S.S.D. with six Grade 12 U/M courses including Grade 12 U courses in: English and Mathematics (one of Grade 12 U Advanced Functions (MHF4U), Calculus and Vectors (MCV4U) or Mathematics of Data Management (MDM4U)).

NOTES:

1. ENG4U/EAE4U is the preferred English.
2. The grade(s) required in the subject prerequisites (normally in the 70 percent range) will be determined subject to competition.
3. Grade 12 U Advanced Functions (MHF4U) or Grade 12 U Calculus and Vectors (MCV4U) are the preferred Mathematics courses.

Subject to competition, candidates will be required to present averages/grades above the minimum.

5. Curriculum:

Program Description - The structure of the program will be consistent with other Majors in the Ted Rogers School of Business Management: seventeen core business courses, six liberal studies courses, six professionally-related courses and thirteen discipline-specific real estate management courses comprise the degree. Of these thirteen real estate management courses, seven will be required and the remaining six will be selected by students from a list of professional electives. These courses are new, with the exception of the existing *Advanced Business Law* course offered by the Department of Law & Business and three courses offered by the Department of Geography.

The proposed curriculum will give students a strong foundation in real estate management. It provides students some opportunity to select courses to customize their experience given their own interests and career aspirations. There will be an emphasis on the principles of sustainability, integrity, ethical behaviour and social responsibility in the *Sustainability in Real Estate* course and in the *Real Estate Project* capstone course.

Description of the Curriculum – The proposed curriculum is provided in the following tables.

Overview of the entire program:

Semester 1	Semester 2
BUS100 Strategies for Success	GMS200 Introduction to Global Management
ECN104 Introductory Microeconomics	MHR523 Human Resources Management
ITM102 Business Information Systems I	MKT100 Principles of Marketing
ACC100 Introductory Financial Accounting	ACC406 Introductory Management Accounting
QMS102 Business Statistics I	ECN204 Introductory Macroeconomics
Liberal studies elective	QMS202 Business Statistics II
Semester 3	Semester 4
CMN279 Intro to Professional Communication	LAW122 Business Law
FIN300 Managerial Finance I	Liberal studies elective - Table A
GMS401 Operations Management	FIN401 Managerial Finance II
Liberal studies elective	**REM400 Real Estate Finance I**
REM300 Introduction to Real Estate	**REM420 Sustainability in Real Estate**
Semester 5	Semester 6
Professionally-related course	Professionally-related course
Liberal studies elective	Professionally-related course
REM500 Real Estate Development and Project Mgmt	Liberal studies elective
REM620 Real Estate Economics I	**Real Estate Management professional elective**
LAW603 Advanced Business Law	**Real Estate Management professional elective**

Semester 7	Semester 8
Professionally-related course	BUS800 Strategic Management
Professionally-related course	Liberal studies elective
Professionally-related course	**Real Estate Management professional elective**
Real Estate Management professional elective	**Real Estate Management professional elective**
Real Estate Management professional elective	**REM800 Real Estate Project Capstone**

Real estate management specific courses, required and professional electives:

Course name	Course code	New or existing?
REQUIRED COURSES		
Introduction to Real Estate	REM300	New
Real Estate Finance I	REM400	New
Real Estate Economics I	REM520	New
Real Estate Development and Project Management	REM500	New
Sustainability in Real Estate	REM420	New
Advanced Business Law	LAW603	Existing
Real Estate Project Capstone	REM800	New
PROFESSIONAL ELECTIVES *Students choose six.*		
Real Estate Law	LAW703	New
Housing and Construction Management	REM600	New
Real Estate Finance II	REM620	New
Real Estate Economics II	REM750	New
Real Estate Valuation	REM700	New

Real Estate Strategic Management	REM660	New
Location, Location, Location	GEO151	Existing
Principles of Demography	GEO231	Existing
GIS and Business	GEO719	Existing

The curriculum as described is consistent with the new curriculum framework approved by Senate in July 2011.

An additional feature of the program expected to draw students is a "career-related summer employment" opportunity planned for the summer after the third year. This summer employment opportunity will be paid whenever possible but will not be compulsory for students as it is not-for-credit. It is not part of the degree curriculum *per se*, but the Department will help students connect with potential employers.

The proposed curriculum has been discussed with chairs and directors in the Ted Rogers School of Management. The Geography department has approved the plan to allow B. Comm. students majoring in Real Estate Management to enroll in the selected Geography classes.

The proposed new program is consistent with all the criteria associated with the AACSB accreditation.

Experiential Learning - Classes will balance theory and practicality and will provide a very significant number of experiential learning opportunities. To date, many of the firms represented on the Advisory Council such as RealNet and Cadillac Fairview, have agreed to participate in various experiential learning programs for students. The proposed new program will use a variety of experiential learning methods. Certainly the summer employment opportunity will give students an opportunity to obtain industry experience related to their academic studies. This form of experiential learning is valuable in helping students apply concepts from the classroom to the real world. The industry experience will also give students valuable real estate-related experience on their curriculum vitae when they enter the job market after graduation.

Besides the summer employment opportunity, there are several other experiential learning activities planned for students. There are two capstone courses in the program. The first is BUS800, an existing required course for all Bachelor of Commerce students that integrates strategic thinking, finance, accounting and other business disciplines. The second capstone course is a *Real Estate Project Capstone*, a new, required course for students majoring in real estate management. This course will unite topics from earlier courses such as real estate financial analysis and real estate management through the use of a major project. Field trips to real estate sites will be an element of three courses: *Real Estate Development and Project Management*, *Sustainability in Real Estate*, and *Housing and Construction Management*.

6. Comparable Programs in Real Estate: The University of British Columbia (UBC) and the University of Guelph are the only universities in Canada with an undergraduate Major or specialization in real estate. Curriculum requirements are summarized in the table below.

	Required business courses	Elective courses	Real Estate courses
UBC	21	15	5
Guelph	17	11	12
Proposed new program	17	12	Select 13 of 16

UBC students earn a specialization by taking five courses in real estate. All five of these courses have an equivalent course in the curriculum for our proposed program. UBC has an internship program analogous to what Ryersion will offer. Guelph has a co-op program, while Ryerson will offer a summer employment opportunity. Guelph offers a course in Design and a course in Urban Planning. The program considers both of these to be excellent and relevant topics and plans to work with the Architecture and the Urban Planning departments in the future to find a way for Real Estate Management students to access courses of this kind.

7. Undergraduate Degree Level Expectations: The goals for the program are listed below with their associated learning outcomes.

1. **Analyze and solve quantitative problems arising in the real estate industry.**
    a. Analyze and solve problems in diverse areas within the real estate industry including mortgage investment, real estate investment, real estate development and real estate valuation
    b. Identify and apply appropriate mathematical tools
    c. Apply mathematical formulas to real estate decision-making
    d. Interpret the results of the quantitative analysis within the context of the issue under consideration to make appropriate recommendations
2. **Communicate information, arguments and analyses accurately and reliably, orally and in writing to a range of multi-disciplinary participants in the real estate industry.**
    a. Develop sound arguments
    b. Communicate effectively in written form for various audiences
    c. Communicate effectively in oral form for various audiences

3. **Apply an integrated multi-disciplinary knowledge of major theories, concepts and related research to solve real estate problems.**
    a. Identify the relevant legal framework and explain the implications
    b. Accurately conduct quantitative analysis
    c. Compare and contrast various stakeholder perspectives
    d. Interpret research literature
    e. Make decisions incorporating uncertainty and limits to knowledge and how this might influence analyses and interpretations
4. **Explain the value and advantages to incorporating principles of sustainability, to respecting the diversity of the community through the values of equity and inclusivity, and to implementing ethical behavior consistent with integrity and social responsibility.**
    a. Gather, review, evaluate and interpret information and research
    b. Question assumptions concerning sustainability with research evidence
    c. Compare the merits of alternative hypotheses or creative options
5. **Formulate tactical and strategic directions in the management of real estate.**
    a. Determining scope
    b. Assessing data from various sources
    c. Analyzing the needs and requirements of all stakeholders and developing integrated solutions
    d. Management skills
    e. Analyzing alternative strategies
    f. Communicating information and preparing reports
6. **Work productively in teams to solve complex, interdisciplinary problems related to real estate.**
    a. Communicate effectively
    b. Describe effective team dynamics
    c. Solve team problems
    d. Apply project management skills

e. Work productively and effectively as team members

f. Integrate information from various sub-disciplines to solve problems

In order to achieve mastery of a program goal, students will take courses that progress from an introductory level to reinforcement level and then finally to mastery. The curriculum mapping tables are provided in the full proposal.

8. Peer Review Team (PRT) Report: The PRT[7] visited Ryerson on March 30, 2012. The PRT noted that the proposed major clearly fits with the University's objective to provide undergraduate programs that balance theory and application, and prepare students for professional careers – in this case a professional career in real estate. The team is satisfied with the thoroughness of this pre-brief evaluation by the University.

In general, the team regards the proposed program, which dovetails nicely with the general B.Comm curriculum, as well conceived. There is a strong market for this kind of real estate education in the GTA as the only other similar programs are at the University of British Columbia and the University of Guelph. The program covers the finance, economics, and management issues that a strong real estate program must cover.

The proposed curriculum is coherent and constitutes a well-thought out package. The two business finance courses and two real estate finance courses provide ample instruction and experience to students in the most demanding aspects of any real estate program. There is more than one innovative feature to the proposed program. First, there is the course in sustainability, featuring green building, which should include significant material from environmental economics. This course would also benefit from the resources of the architecture program at Ryerson. A most important innovative feature is the inclusion of a course in GIS and its applications, along with the Principles of Demography, where GIS is applied further. The third course in law (LAW 603) is also an innovative and noteworthy feature.

In summary, this is a strong proposal and there is no doubt that it warrants approval. The team does, however, **recommend that (1) the program be strengthened by adding Real Estate Economics I to the list of required courses, and (2) inclusion of a module in real estate ethics. As the program develops a (3) planning course should also be added. Where possible, (4) presentations, reports, and like activities, should replace midterm exams in most third and fourth year courses.**

The proposed number of faculty is entirely suitable and realistic. The proposed levels of support staff and infrastructure are ample for the program.

[7] Profs. Lu Han (University of Toronto), Marion Steele (Emeritus, University of Toronto), William Strange, (University of Toronto), Maurice Yeates, (Ryerson University, Team Chair).

9. Program Response to the PRT Report: The team considers the proposed curriculum to be coherent and recognizes the innovative features which include the emphasis on sustainability, a course in GIS and an advanced course in real estate law. The PRT has four recommendations that have already been addressed in a revised proposal document.

1. Real Estate Economics I should be made compulsory.

    - The program will implement this recommendation and will make Real Estate Finance II into an elective course. The overall level of choice will therefore not be affected.

2. A module in Real Estate Ethics should be added.

    - The program plans to address Real Estate Ethics in many courses, most specifically the Sustainability in Real Estate course.

3. A Planning course should be offered.

    - The program agrees and will pursue this idea with the Planning department in the future.

4. Presentations, reports and like activities should replace midterm exams.

    - The program plans for presentations, reports and like activities to be a significant portion of the final grade for upper level real estate courses, although these are not expected to always displace midterm exams.

10. Dean's Response to the PRT Report: The Peer Review Team provided an extremely positive assessment of the proposed major in Real Estate Management in our Bachelor of Commerce program. Indeed the committee was extremely supportive of a number of specific attributes of the curriculum. These Included:

- the overall goals and objectives of the program;
- the innovative nature of the curriculum and in particular courses in the program that focused on sustainability and GIS and real estate and business management;
- our proximity and ability to link with the real estate industry;
- the quality and diverse expertise of the current faculty;
- the management focus of the program and
- the financial support for the program as reflected in the plan for new hires.

Three suggestions were raised in the review. The major concern, the need to add of a compulsory course in Real Estate Economics to the program, has been addressed by a minor curricular modification. This involves a transfer of Real Estate Finance II to the Professional Elective and a corresponding switch of Real Estate Economics from the elective to the Required course category.

The second issue related to the issue that a module in real estate ethics was incorporated in the program. Real estate ethics are discussed in a number of courses throughout the program and not just in a single module.

Finally, the review team did discuss the potential benefits from providing access to the resources of the architecture and urban planning programs. One on-going initiative that could provide this benefit would be the creation an interdisciplinary minor in real estate that would include courses from real estate management, geography, urban planning and architecture. If developed this minor would provide an option for students in the program that would broaden their perspective on real estate development.

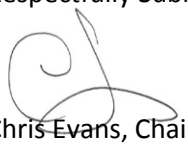
11. ASC Evaluation: The ASC finds that the program design is strong and the societal need and graduate career pathways are well established. The ASC was also impressed with the explicit commitment to sustainability, professional ethics, and diversity/inclusion/equity expressed in the proposal (Program Goal 4). It sees the weaving of policy elements relevant to real estate throughout the curriculum, as opposed to presenting them in a stand-alone course, as strength of the design.

The experiential learning component of the program is a bit on the light side. While the summer employment opportunity is positive, **the ASC recommends that the program seriously consider the possibility of a formal co-operative education option at some future date**. ASC felt that the REM program would be an ideal program to host a co-op version.

Recommendation

Having satisfied itself of the merit of this proposal, ASC recommends: *That Senate approve the proposed Bachelor of Commerce degree program in Real Estate Management.*

Respectfully Submitted,



Chris Evans, Chair for the Committee

ASC Members:

Keith Alnwick, Registrar
Ian Baitz, Faculty of Communication and Design, Graphic Communications Management
Jennifer Cartwright, Ted Rogers School of Management, Business Management, Student ASC Member
Trina Gover, Librarian, Library
Chris Evans, Vice-Chair and Vice Provost Academic
Jacob Friedman, Faculty of Engineering, Architecture, and Science, Mechanical and Industrial Engineering
Noel George, Faculty of Engineering, Architecture, and Science, Chemistry and Biology
Jacqui Gingras, Faculty of Community Services, Nutrition
Des Glynn, Chang School of Continuing Education
Andrew Hunter, Faculty of Arts, Philosophy
Suanne Kelman, Faculty of Communication and Design, Journalism
Tim McLaren, Ted Rogers School of Management, Information Technology Management
Pamela Robinson, Faculty of Community Services, Urban and Regional Planning
Diane Schulman, Secretary of Senate, Non-voting ASC Member
John Turtle, Faculty of Arts, Psychology
Andrew West, Faculty of Arts, Politics, Student ASC Member