

**Ryerson University**  
**School of Graduate Studies**

**Academic Council Submission**  
**September 17, 2002**

The School of Graduate Studies submits the following items:

1. **Communication and Culture** – Course additions and course name change (see attached documents), pending School of Graduate Studies Council approval on September 26, 2002.
2. **Mechanical Engineering** – MAsc course requirements

The Program for the MAsc in Mechanical Engineering and the Department of Mechanical, Aerospace and Industrial Engineering has unanimously agreed to change the MAsc course requirements for the Mechanical Engineering Graduate Program from six one-term graduate courses to five one-term graduate courses (see Agenda Item 8-10, section A, p. 119, Academic Council Meeting, May 7, 2002, re: similar change in the Electrical and Computer Engineering fields of power electronics & computer systems and applications).

3. **MAsc in Computer Networks** – Implementation of seven one-term courses plus thesis (equal to five credits) option in the master's program in Computer Networks.

**MAsc/MEng in Computer Networks** – Sub-Specialization within the MAsc/MEng program in Electrical and Computer Engineering (see attached document), pending School of Graduate Studies Council approval on September 26, 2002.

**Proposal for the Implementation  
of an M.A. Sc. Option in the Computer Networks Graduate Program**

**Preamble and Rationale**

In 2001, OCGS approved the Electrical and Computer Engineering Graduate Program Brief. This brief outlined the Master-level graduate programming for both of the M.A.Sc. and the M.Eng. degree program requirements and structures. The "Computer Networks" was one of the three major fields of specializations within the approved Electrical and Computer Engineering OCGS Brief. Due to the unique and focused academic structure of the Master-level program in Computer Networks, the University decided to implement this program as a full-cost recovery graduate program. Also initially, the professional nature of this specialization lended itself better to the M.Eng. programming philosophy.

After one year of actual implementation of this graduate program, our gained experience point to the following facts:

1. Four of the current graduate student cohort who were originally approved and enrolled in the program have indicated their strong interest in, and commitment to pursuing research rather than professional careers in the Computer Networks field. Two of these of students switched to the M.A.Sc. program in Electrical and Computer Engineering (E&CE) after one-and/ or two-terms respectively in the Computer Networks program. The other two students have been accepted in the E&CE M.A.Sc. graduate program for September 2002, but they will however first complete the M.Eng. degree requirements in the Computer Networks program.
2. All of those students who opted to transfer to the E&CE M.A.Sc. program in order to have the opportunity to pursue research careers are disadvantaged in terms of extra program completion time, additional fees, and limited number of allowable course transfer credits.
3. About half-a-dozen of the highly qualified graduate student candidates who accepted their offers of admission to the M.Eng. graduate program in Computer Networks for the September 2002 cycle, have enquired about the availability of the M.A.Sc. option in Computer Networks, and have indicated their strong interest in pursuing research careers in this area of specialization.
4. Many of the faculty members who are currently involved with the Computer Networks graduate program, including those faculty members who agreed to supervise the four graduate students referred to in item 1. above, have developed suitable, rational and relevant research thesis topics portfolios in only a very short one-year period of time. These new state-of-the-art topics in Wireless" Networks, Multimedia Technologies, Network Security and Advanced Transmission Protocols, bode well for the future expansion and sustainability of M.A.Sc. level thesis research topics in the Computer Networks specialization area.

5. Program has acquired an additional base of research quality Computer Networks specialized equipment in the research areas listed in item 4. above. This promises to provide a very suitable and relevant hardware and software research infrastructure support for at least the next two to three years.
6. The program's curriculum has been recently modified and upgraded to better reflect the state-of-the-art knowledge particularly in the research areas discussed in item 4 above.

## **Program Structure, Requirements and Implementation**

### **A) Admission**

Similar to the Electrical and Computer Engineering M.A.Sc. Admission requirements, the student candidates eligible for admission to the M.A.Sc. Program in Computer Networks must have a Bachelor degree in Electrical or Computer Engineering, Computer Science, or related engineering and applied science disciplines with an average overall grade of at least B+ (i.e. 77% or 3.33 CGPA) in the last two years of their undergraduate studies, and a minimum overall grade of B (i.e. 73% or 3.00 CGPA).

It is expected that an average of six M.A.Sc. graduate students will be admitted to this program each year, on full-time basis only. Students may be admitted to the graduate programs in Computer Networks (M.Eng. and M.A.Sc.) only in September, i.e. the Fall term, of each academic year. Each of the admitted M.A.Sc. students will be assigned to a faculty supervisor, and an advisory committee will be constituted for each of these student, early in the Fall term. It is expected that each of the M.A.Sc. students will interact extensively with the respective faculty supervisor throughout the first Fall term.

Students registered in the M.Eng. program can request to transfer to the M.A.Sc. program option no later than the end of the first fall term (i.e. mid-December of a given year).

### **B) Program Requirements**

The M.A.Sc. program in Computer Networks requires twelve academic credits, the same as the requirements of the M.Eng. program in Compute Networks. These requirements consist of:

- 4 Compulsory courses, each has a weight of one academic credit. These credits are:
  - CN 8811: Multimedia Processing and Digital Communication
  - CN 8812: LAN and WAN switching
  - CN 8813: IP Protocols
  - CN 8814: Network Mathematics and Simulations
- 3 Elective courses, each has a weight of one academic credit. These courses are to be selected from the remaining five graduate courses in Computer Networks (not including CN 8810), depending on the expected area of the research thesis, and as advised by the respective faculty supervisor.

- Research Thesis equivalent to five credits, the same as the Thesis weight in the Electrical and Computer Engineering M.A.Sc. program.

### **C) Program Structure**

The M.A.Sc. program in Computer Networks is designed in such a manner so that it can be completed in no more than four academic terms, from September of a given year to no later than December of the following year. The program has the following structure:

#### **First Fall Term:**

- . Register in, and successfully complete three of the required compulsory courses.
- . Research Seminar: Intensive interaction between students and faculty supervisors

#### **Winter and Spring Terms:**

- . Register in, and successfully complete the remaining required compulsory course and the three elective courses.
- . Complete, submit and successfully defend the Research Thesis Proposal, which would then be approved no later than the end of May of a given academic year.

#### **Summer and Second Fall Terms:**

- . Concentration on the Thesis research activities effectively start in June of a given academic year in the Research Annex of the Computer Networks Laboratory Facilities.
- . It is expected that the thesis research would be successfully completed, and the related thesis report be submitted no later than the third week of November of a given academic year. The Oral Thesis Defence should take place within the month following the submission of the Thesis Report.
- . Extension period may be granted based on the student petition to the Program Director, providing the rationale for approving to grant such an extension. Granting of an extension period to complete the Thesis research requires the payment of an additional tuition fee to be set at \$2,500/term.

### **D) Program Implementation**

The Computer Networks M.A.Sc. program fees, and fees schedule, are exactly the same as for the full-time Computer Networks M.Eng. program. Both of these programs are full-cost recovery programs. No research or teaching assistantships or stipends are currently available, however it may be possible from time to time that certain research scholarship awards could be made available in certain research areas depending on the program's ability to successfully secure external research funding in these areas.

Depending on the process of approval of this proposal, the new M.A.Sc. option in Computer Networks could be implemented as early as January, 2003 (i.e. Winter '03 term) for the benefit of the upcoming program student cohort.

*(Updated: June 3, 2002)*

Meng/MASc in Computer Networks  
sub-specialization within the  
MASc/MEng program in Electrical and Computer Engineering  
at  
Ryerson University

This application for sub-specialization status for the Meng/MASc program in Computer Networks at Ryerson University fits well the 'Guidelines for Appraisal of Sub-Specializations' (OCGS *Statutes, By-Laws, Procedures, and Guidelines*). It is a specialization that has taken part of an existing appraised 'parent' program (the MASc/MEng program in Electrical and Computer Engineering), but offers it separately on a cost recovery basis to both full and part-time students in a different mode of delivery (modular form) -- in late afternoons and early evenings (largely for practicing professionals).

The MASc/MEng. program in Electrical and Computer Engineering was approved to commence by OCGS on December 1,2001 (Appendix A) in three fields:

- power electronics;
- computer systems and applications; and,
- computer networks.

The entire program was implemented for the 2001/2002 academic year, with the computer networks field only being offered on a cost recovery basis. The computer networks field is managed separately, with its own Program Director, from the 'parent' program, because of its cost recovery status and special mode of delivery. During the first year of operation, the MEng. option was implemented. In the second year of operation, the MASc. option is being implemented. Both options accord with the curriculum structure of the 'parent' program.

Both the computer networks field and the 'parent' program had extremely successful first years. The number and quality of applications proved greater than predicted, and the registration rate higher than forecast. In consequence, the computer networks field had 23 continuing students (rather than 16 in the original plan) in 2001/2; while the 'parent' program had 51 continuing students as planned. Enrolment targets are being met for 2002/3. Hence, computer networks has established itself as a viable field-worthy of 'sub-specialization' program status - within a new 'parent' program that has had an encouraging start<sup>1</sup>.

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<sup>1</sup> In this context, it may be useful to note that research in the program will be enhanced this 2002/3 academic year by a recently announced (August, 2002) unrestricted gift from Cisco Systems of \$US65,000, in support of a project "Novel algorithms and architectures for high-speed switching". The gift also includes: a Cisco 7206 Router; a Cisco 7505 Router; Cisco 12008 Router (GSR); a Cisco 7200 series DPT OC-12 single mode interface; a Cisco 7500 series DPT OC-12 single mode interface; and, a Cisco 12000 series OC-12 SRP line card.

## **The MAsc/MEng. program in Electrical and Computer Engineering: field of Computer Networks**

The program in this field is geared towards both networking professionals already in the area who wish to increase the depth and breadth of their knowledge, and to those less familiar with the area who wish to enter the high-demand field of computer networks /internetworking. For the 2002-2003 academic year, the tuition and ancillary fees are \$21,000 for full-time students. The duration of the full-time program is 12 months from September in an academic year, and 24 months for the part-time program.

**The MEng. curriculum.** Similar to the requirements in the 'parent' program, the MEng. in the computer networks field requires 10 courses and a final project (two course weight). In several courses, significant laboratory experiments and projects supplement the lectures. The program concludes with an individual project/case study completed under the supervision of a faculty member using the Computer Networks Laboratory. Alternatively, if students find co-op placements with a company, they are expected to undertake their final projects in an area related to their industrial placements, under the co-supervision of one of the program's faculty members. (Ryerson neither guarantees placements nor assists with placement searches -- responsibility for finding co-op placements rests solely with the students.)

Each of the following courses are compulsory in the computer networks field (course descriptions are on the web site: [www.ee.ryerson.ca/grad/meng-cn](http://www.ee.ryerson.ca/grad/meng-cn)).

### Fall Term

CN 8810: Introduction to Computer Networks

CN 8811: Multimedia Processing and Digital Communication

CN 8812: LAN and WAN Switching

CN 8813: IP Protocols

### Winter Term

CN 8814: Network Mathematics and Simulations

CN 8815: Network Architectures

CN 8816: Network Security

CN 8817: Wireless Networks

### Spring/Summer

CN 8818: Software Engineering and Real-time Operating Systems

CN 8819: Multimedia Networks

CN 8001: Project/Case Study (two course weight)

The courses have pre-requisite/co-requisite relationships, which necessitate a specific academic structure for the field. Courses are paired (i.e. combined in groups of two), and both of the courses in a specific pair are delivered simultaneously over a period of six weeks. Each course is offered in a 3 hours lecture format, twice per week (i.e. six

hours/week). All of the lectures are scheduled from 5:00pm to 8:00pm. The week following each of the six-weeks sessions is an examination week. This is followed by the next six-weeks academic session for the next pair of courses. Full-time program students complete all of the four courses offered over each of the 14 weeks during the Fall and Winter academic terms. Part-time students are enrolled in only half of these courses (i.e. they complete one course per six-weeks session, or two courses per academic term).

**The MASC. curriculum.** This degree option is being implemented in the computer networks field in 2003. Whereas the requirements in the 'parent' program for the MASC are at least five courses plus a thesis, in the MASC. computer networks the requirements are at least seven courses plus a thesis.

Compulsory Courses:

CN 8811: Multimedia Processing and Digital Communication

CN 8812: LAN and WAN Switching

CN 8813: IP Protocols

CN 8814: Network Mathematics and Simulations

Electives -- select three from:

CN 8815: Network Architectures

CN 8816: Network Security

CN 8817: Wireless Networks

CN 8818: Software Engineering and Real-time Operating Systems

CN 8819: Multimedia Networks

Thesis:

CN 8002: Computer Networks Thesis.

Normally, six students will be admitted to the program each year, which, as with the 'parent' program, will be offered only on a full-time basis.

**Admission Requirements:** In accordance with the admission requirements for the 'parent' program, applicants are expected to hold, or have completed by the time of registration, a four year bachelor's degree in Electrical, Computer, or Mechanical Engineering, or Computer Science, or related applied science disciplines, from a recognized university.

Also, and again in accordance with the 'parent' program:

- (i) For the MEng. option, applicants must have a minimum of a B standing (ie. 73% or 3.00 CGPA, or equivalent) over all courses in the final half of the previously completed undergraduate degree program.
- (ii) For the MASC. option, applicants must have an average grade of at least B+ (ie. 77% or 3.33 CGPA or equivalent) in the last two years of their undergraduate studies, and a minimum overall grade of B.

Students registered in the MEng option in computer networks can request to transfer to the MASC option in computer networks no later than mid-December in a given year.

Students whose previous language of instruction was not English must have a score of at least 550 (or equivalent) on the Test of English as a Foreign Language (TOEFL), or at least 90 on the Michigan English Language Assessment Battery (MELAB), or equivalent.

**Laboratory Facilities.** Students in the program learn the practical aspects of internetworking in the Computer Networks Laboratory. It houses numerous switches, routers, ATM switches and LAN/WAN traffic analyzers. Each full-time student registered in the program has access to a computer workstation and networking equipment, which will allow them to design, simulate, and carry out experiments to test and verify network configurations and performance.

The Computer Networks Laboratory facility is open for supervised access Monday to Friday from 1 :00 p.m. to 4:00 p.m. and Saturday from 10:00 a.m. to 1:00 p.m. each week, for work on course related assignments and projects. Other arrangements are made to provide the program students with additional unsupervised access to the laboratory facility.

### **Faculty**

The following faculty are involved in the MEng./MAsc. sub-specialization in computer networks (CVs in Appendix B):

Jaseemuddin, Muhammad	Associate Professor	PhD (1997, University of Toronto)
Khan, Gul N.	Associate Professor	PhD (1989, University of London)
Kim, Chul (Charles)	Assistant Professor	PhD (1989, North Carolina State U.)
Krishnan, Sridhar	Assistant Professor	PhD (1999, University of Calgary)
Ma, Ngog-Wah	Professor	PhD (1988, University of Waterloo)
Nagendra, Bhaskar	Professor	MEng.(1968, University of Toronto)
Raahemifar, Kaarnran	Assistant Professor	PhD (1999, University of Windsor)
Santos, Marcus Vinicius	Assistant Professor	PhD (2000, University of Sao Paulo)

Faculty time commitments, with respect to the 'parent' program and other research/teaching responsibilities, were harmonized during the first year of operation in 2001/2.



Appendix A

ONTARIO COUNCIL ON  
GRADUATE STUDIES

CONSEIL ONTARIEN DES  
ETUDES SUPERIEURES

December 1, 2000

Dr. Rena Mendelson  
Associate Vice-President, Academic  
Ryerson Polytechnic University  
School of Graduate Studies  
Toronto, Ontario

Dear Dr. Mendelson:

This is to indicate that the attached report was approved by the Ontario Council on Graduate Studies at its meeting of December 1, 2000.

Sincerely,  
*(original signed by)*  
David Leyton-Brown  
Executive Director, OCGS

DLB:db

ONTARIO COUNCIL ON  
GRADUATE STUDIES

CONSEIL ONTARIEN DES  
ETUDES SUPERIEURES

REPORT OF THE APPRAISAL COMMITTEE  
.SECTION III

to the

ONTARIO COUNCIL ON GRADUATE STUDIES  
2000 12 01

STANDARD APPRAISAL

RYERSON POLYTECHNIC UNIVERSITY - MAsc/MEng, ELECTRICAL AND COMPUTER  
ENGINEERING

At its meeting of November 20, 2000, the Appraisal Committee (Section III) decided to recommend to  
Council that:

The proposed MAsc/MEng program in Electrical and Computer Engineering at Ryerson  
Polytechnic University be approved to commence.

The following fields have been approved:

- . Power Electronics
- . Computer Systems and Application
- . Computer Networks

The above recommendation is based on the Committee's consideration of the University's written  
submission, the consultants' reports and the University response.

Consultants:

Dr. Saif Mehrdad  
School of Engineering Science  
Simon Fraser University  
Burnaby, British Columbia  
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Dr. Victor Leung  
Department of Electrical & Computer Engineering  
University of British Columbia  
Vancouver, British Columbia  
V6T 1 Z4

Suzanne Zeller  
Co-Chair

## Appendix B

### **Computer Networks: Faculty**

Jaseemuddin, Muhammad

Khan, Gul N.

Kim, Chul (Charles)

Krishnan, Sridhar

Ma, Ngog-Wah

Nagendra, Bhaskar

Raahemifar, Kaamran

Santos, Marcus Vinicius