S.90-9

SIMON FRASER UNIVERSITY

MEMORANDUM

To: Senate

From: L. Salter
Chair, SCAP

Subject: School of Engineering Science - Changes to M.A.Sc. and M.Eng. Programs
SCAP 89-57

Date: November 16, 1989

Action undertaken by the Senate Committee on Academic Planning/Senate Graduate Studies Committee gives rise to the following motion:

Motion:

"That Senate approve and recommend approval to the Board of Governors as set forth in S. 90-9 , the changes to the Master of Applied Science Program and the Master of Engineering Program in the School of Engineering Science."

SCHOOL OF ENGINEERING SCIENCE

SIMON FRASER UNIVERSITY

M E M O

TO: Senate Graduate Studies Committee

FROM: Vladimir Cuperman, Director, Graduate Programs
School of Engineering Science

DATE: October 10, 1989

SUBJECT: PROPOSED CALENDAR CHANGES

Enclosed please find the proposed Calendar Changes for the graduate program in the School of Engineering Science. These changes include:

1. **M.A.Sc. Graduate Program Policies**

   Change: New regulations regarding (1) Thesis Work in Industry and (2) Transfer from M.Eng. Program to M.A.Sc.

   Justification: We needed written regulations in the calendar formalizing our internal policy on these two activities.

2. **Degree Requirements - M.Eng. Program**

   Change: 6 credits have been assigned to the M.Eng. project and these 6 credits are included within the total minimum requirement of 30 credit hours.

   Justification: There was too much emphasis on courses and not enough on the project. Also, we are only able to offer some courses every second year and this situation made it difficult for students to complete 10 courses within 5 years. With this new requirement the student has to take 8 courses and complete a project worth 6 credits.

These changes were approved at a meeting of the Faculty of Applied Sciences Graduate Studies Committee on 4 October 1989.

Vladimir Cuperman

Attachments

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SCHOOL OF ENGINEERING SCIENCE

Calendar Change

(to be inserted after the M.A.Sc. Degree Requirements pp.222)

1.) **M.A.Sc. - Thesis work in industry**

In addition to the Degree Requirements for the M.A.Sc. Program the following conditions will apply if a student wishes to undertake thesis work in industry.

a) Proposal. The proposal must be approved by the Supervisory Committee and by the Graduate Committee. The proposal must include the following:

- justification for undertaking the work in industry
- agreement regarding intellectual property and publications
- funding arrangement

b) On Campus Presence. During the thesis work in industry the student must spend one day per week (or equivalent as approved by the Graduate Committee) on campus to meet with his/her supervisor and attend regular seminars. This is in addition to time spent on campus for course work.

c) Oral Presentations. A minimum of two oral presentations for the Supervisory Committee (not including the thesis defence) on the progress of the student's work will be given during the duration of the thesis.

d) Failure to Comply. See General Regulations pp. 208 1.8

Transfer from M.Eng. Program to M.A.Sc.

Normally transfer from M.Eng. Program to M.A.Sc. Program will be considered under the following conditions:

a) Undergraduate GPA. Minimum undergraduate cumulative GPA. of 3.3 required

b) M.Eng. GPA. On at least 2 courses, a minimum cumulative GPA of 3.5

Diane V. Ingraham	Adaptive systems including neural network theory, flexible manufacturing systems
John D. Jones	Applications of artificial intelligence to engineering design, design for manufacturing, finite element analysis, heat transfer and thermodynamics
Albert M. Leung	Microelectronics, integrated circuit technology, integrated sensors
B.T. (Tad) McGeer	Robotics, automatic control, aircraft design, bipedal locomotion
Andrew H. Rawicz	Reliability physics and engineering, VLSI reliability, physical transducers, integrated sensors, film, technology, nonlinear optics, materials processing in microelectronics
Mehrdad Saif	Control theory, large scale systems, optimization theory and application to engineering systems
Shawn Stapleton	Passive microwave circuits, GaAs monolithic microwave integrated circuits, nonlinear microwave devices, active microwave circuits
Marek Syrzycki	microelectronics, semiconductor devices, digital and analog VLSI design, integrated circuit technology, sensors, production defects, yield and reliability

Degrees Offered

Engineering Science offers two distinct programs of study, leading to a Master of Engineering (M.Eng.), or Master of Applied Science (M.A.Sc.). The M.Eng. program is designed for part-time study by practicing engineers and is based on a set of courses, normally offered in the evenings, plus a project performed in industry. The principal areas of study offered in the M.Eng. program are electronics, communications and signal processing. The M.A.Sc., on the other hand, is a full-time program in which primary emphasis is on the thesis, rather than course work. It is more exploratory than the M.Eng., and hence the areas of study cover a greater range.

Admission

The normal admission requirement to the M.Eng. and M.A.Sc. program is a Bachelor's degree in electrical engineering, computer engineering, engineering science or a related area, with a cumulative GPA of at least 3.0 (B) from a recognized university, or the equivalent. Note that the size of the faculty limits the number of M.A.Sc. students.

Degree Requirements — M.Eng. Program

Course Work

M.Eng. candidates are required to complete a minimum of 30 semester hours course work, at least 20 of which must be at the graduate level, plus a project. Of the courses listed below, ENSC 805, 810, 815 and 820 are required. The prerequisite ENSC 800 will be waived if the student has equivalent preparation.

A key component of the M.Eng. program is a significant industrial project which integrates knowledge gained during the course of the student's graduate studies. This project is to be performed in the workplace, typically in industry or government laboratories. An appropriate level of design, documentation and reporting responsibility is required. The project would be expected to take a minimum of one person-month.

During the project, the student will receive academic supervision, as required, from the student's senior supervisor at the university, and day-to-day supervision from the student's manager, or a designated associate, in his or her place of work. These industrial supervisors, who will sit on the student's Supervisory Committee, will be appointed by the Faculty. In the case of very small companies, alternative arrangements will be made for supervision.

In addition to submission of a technical report at the completion of the project, the student will make an oral presentation to at least the Supervisory Committee and one other faculty member.

Degree Requirements — M.A.Sc. Program

M.A.Sc. candidates are required to complete 30 semester hours work as a minimum of 12 semester hours course work, plus a thesis with a weight of 18 semester hours. The course will, in consultation with the senior supervisor, normally be selected from the list below. Additional courses may be required to correct deficiencies in the student's background. The M.A.Sc. thesis is to be based on an independent project with a significant research component. The student is required to defend the thesis at an examination, in accordance with general University regulations.

Graduate Courses

ENSC 800-3 Linear Systems Dynamics
A unified presentation of systems and signals analysis techniques. Linear algebra up to Cayley-Hamilton. Linear systems: superposition, convolution for differential and difference equations. State variables: canonic forms, model decomposition. Transforms: Fourier, Laplace, Z. Random processes: discrete time processes, AR and ARMA models, least squares estimation. Communication signals and their representation. *Prerequisite: undergraduate degree in engineering, mathematics or physics.*

ENSC 805-3 Techniques of Digital Communications
Modulation, detection and synchronization techniques for digital transmission. Decision theory and optimum detectors. Channel impairments: random phase, random gain, restricted bandwidth, nonlinearities. Comparison of signal sets.Carrier and bit synchronization. Precoding for dispersive channels. Adaptive equalization. Sequence decoding by Viterbi algorithm. *Prerequisite: ENSC 800.*

ENSC 810-3 Digital Signal Processing
Techniques for digital processing of one and two dimensional signals. Filter design. Finite word length effects. Canonical forms, lattice filters. Estimation of power spectrum. Homomorphic signal processing. *Prerequisite: ENSC 800.*

ENSC 815-3 Signal Processing Electronics
Hardware implementation tools and design techniques. CCDs, switched capacitor filters. Noise and dynamic range in sampled analog circuits. Special purpose and general purpose digital signal processors. Signal processing architectures: pipeline, systolic arrays, data flow architectures. *Prerequisite: ENSC 800.*

ENSC 820-3 Engineering Management for Development Projects
This course focuses on the management and reporting activities of typical engineering development projects. Through seminars and workshops it builds the student's skills at estimating project cost and schedule, keeping a project on track, and handing over the completed project to a customer or another team. A writing workshop emphasizes techniques for writing proposals, and writing and controlling documentation. *Prerequisite: Permission of instructor.*

ENSC 832-3 Mobile and Satellite Communications
Propagation phenomena, modulation techniques and system design considerations for mobile and satellite networks. Topics include: fading and shadowing, noise and interference effects, analog and digital transmission, cellular designs, multiple access techniques. *Prerequisites: ENSC 800.*

ENSC 833-3 Network Protocols and Performance
Practical techniques of design and performance analysis of data networks up to layer 3 of the Open System Interconnection protocol hierarchy. Point to point and polling data links. Networks of queues: stochastic and mean value analysis. Packet networks: loading, transit time, routing strategies. *Prerequisite: ENSC 800.*

ENSC 834-3 Optical Processing and Communications
This course will give an overview of fibre optics communications and integrated optics, with emphasis on the latter. The discussion will include multimode and single-mode technology, semiconductor sources, photo detectors, communications systems and fibre optic sensors. *Prerequisite: ENSC 800.*

ENSC 836-3 Error Correcting Codes
Introduction to error detecting and correcting codes and their implementations. *Prerequisite: undergraduate courses in probability and discrete mathematics.*

ENSC 851-3 Integrated Circuit Technology
Review of semiconductor physics. Technology of semiconductor devices and integrated circuits: material evaluation, crystal growth, doping, epitaxy, thermal diffusion, ion implantation, lithography and device patterning, and thin film formation. Design and fabrication of active and passive semiconductor devices, packaging techniques and reliability of integrated circuits. *Prerequisite: Permission of the instructor.*

ENSC 852-3 Analog Integrated Circuits
Integrated circuit (IC) technology, IC component models and analog circuit configurations. Computer aided design tools for circuit simulation and physical layout of ICs. Students are required to complete a project in which he/she will design, lay out, fabricate and test a semicustom IC using the fast turn-around IC fabrication facility at the School of Engineering Science.

ENSC 853-3 Digital Semiconductor Circuits and Devices
MOS device electronics. Second Order Effects in MOS transistors. BJT device electronics. Static and transient analysis of inverters. Digital gates, circuits and circuit techniques. Speed and power dissipation. Memory systems. Gate arrays, semicustom and customized integrated circuits. CAD tools. Students are required to complete a project. *Prerequisite: Permission of the instructor.*

ENSC 861-3 Source Coding for Speech and Images
Source characterization and rate-distortion functions. Sampling and quan-

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DEGREE REQUIREMENTS - M.ENG. PROGRAM

(Replaces Degree Requirements - M.Eng.Program on pp.222)

Course Work

M. Eng. candidates are required to complete a minimum of 24 semester hours course work, at least 20 of which must be at the graduate level. Of the courses listed below, ENSC 805, 810 and 820 are required. The prerequisite ENSC 800 will be waived if the student has equivalent preparation.

A key component of the M.Eng. program is a significant industrial project which integrates knowledge gained during the course of the student's graduate studies. This project is to be performed in the workplace, typically in industry or government laboratories. An appropriate level of design, documentation and reporting responsibility is required. The project would be expected to take a minimum of two person-months.

During the project, the student will receive academic supervision, as required, from the student's senior supervisor at the university, and day-to-day supervision from the student's manager, or a designated associate, in his or her place of work. The industrial supervisors, who will sit on the student's Supervisory Committee, will be appointed by the Faculty. In the case of very small companies, alternative arrangements will be made for supervision.

2)

Degree Requirements — M.Eng. Program

Course Work

M.Eng. candidates are required to complete a minimum of 30 semester hours course work, at least 20 of which must be at the graduate level, plus a project. Of the courses listed below, ENSC 805, 810, 815 and 820 are required. The prerequisite ENSC 800 will be waived if the student has equivalent preparation.

A key component of the M.Eng. program is a significant industrial project which integrates knowledge gained during the course of the student's graduate studies. This project is to be performed in the workplace, typically in industry or government laboratories. An appropriate level of design, documentation and reporting responsibility is required. The project would be expected to take a minimum of one person-month.

During the project, the student will receive academic supervision, as required, from the student's senior supervisor at the university, and day-to-day supervision from the student's manager, or a designated associate, in his or her place of work. These industrial supervisors, who will sit on the student's Supervisory Committee, will be appointed by the Faculty. In the case of very small companies, alternative arrangements will be made for supervision.

In addition to submission of a technical report at the completion of the project, the student will make an oral presentation to at least the Supervisory Committee and one other faculty member.