NOTICE OF INTENT

Dual Degree in Engineering Science (Mechatronics) and Business Administration

Engineering Science Undergraduate Curriculum Committee
Faculty of Business Undergraduate Curriculum Committee

Simon Fraser University

November 15, 2007

Executive Summary

A new dual degree program in Business and Engineering Sciences (Mechatronic Systems Engineering) is proposed as a collaborative initiative by the Faculty of Business Administration and the Faculty of Applied Sciences to be administered under the Faculty of Business Administration and the School of Engineering Science.

The intent of this proposal is to bring together the expertise from these two areas and to allow for a broad and comprehensive undergraduate education recognizing the synergies that can be obtained by combining the skills acquired in both the Engineering Science (Mechatronics) and Business programs.

The proposed program addresses the following university goal as stated in the President's Agenda 2005-2009 (Michael Stevenson, June 2005)

> " we must continue to increase the diversification of our programmes, increasing the number of professional and quasi-professional programmes, as well as creating new interdisciplinary specializations."

Based upon existing courses, this program can be mounted immediately with minimum requirement for new resources.

The program will be directed by an undergraduate Coordinating Committee, comprised of two representatives from each of the Faculty of Business and the Faculty of Applied Sciences.

While we expect the first students in the new dual degree to be transfers from the current Business Administration, or Mechatronics programs, we are confident the program will attract new students to SFU.

Graduates of this dual degree will be well-prepared to move on to jobs in the areas of engineering and/or management with the broader set of skills.

Approval History:

- Reviewed by Faculty of Business Administration UCC
- Approved by ENSC UCC
- Approved by ENSC School meeting

Background

Engineering science students develop skills in systems design along with a high level of scientific knowledge. This demanding program is aimed at the superior student. The program's

goal is to produce well educated, innovative engineer/scientists who have entrepreneurial skills and attitudes and who are oriented to new technologies. Program entry is on a competitive basis.

Students undertake a basic core of pure, applied and engineering sciences followed by studies in a specialized option. The general BASc program may be completed in four years, which includes eight semesters. A BASc (honors) typically requires an additional two semesters for thesis completion.

ENSC courses emphasize learning, conceptualization, design and analysis. Built into the program are courses on social impacts of technology, finance, management, design methods and entrepreneurship intended to complement scientific studies. A special, integrated communications course taken throughout the program ensures that all graduates have the communication skills necessary to be effective engineers.

The undergraduate program in **Business Administration** emphasizes the value of a broadly based education. Students in their first 60 credit hours of study complete 24 credits of lower division requirements which are mainly tool courses to prepare for more advanced upper division business courses. Students then, choose courses to complete their breadth requirements based on intellectual interest or to achieve academic goals.

The last 60 credit hours of the degree program consists of the completion of the core upper division business courses, at least one area of concentration, and lower and upper division electives. The following concentrations are available at the Burnaby campus: accounting, finance, international business, human resource management, management information systems, management science, and marketing. The following concentrations are available at the Surrey campus: entrepreneurship, finance, management and technology, and marketing. Students must choose either Burnaby or Surrey as their primary campus; however, they may freely choose to take courses at both campuses.

The Dual Degree between Engineering Science (Mechatronics) and the SFU Business Administration program aims to prepare well rounded graduates who are equipped both with the expertise in engineering as well as solid business knowledge. Business offerings at SFU Surrey campus concentrate in Entrepreneurship, Management & Technology, Finance, and Marketing. In the Dual Degree, students will ultimately be able to combine any of the Options in the Bachelor of Science program with a business program concentrating in any of the nine available areas of concentration.

1. Credential to be awarded:

Engineering Science, BASc.

and

Business Administration, B.B.A.

2. Location:

SFU, all campuses, Surrey being considered the home campus

3. Faculty/Department/School offering the new program:

Engineering Science, Faculty of Applied Sciences, and

Faculty of Business

4. Anticipated program start date:

September 2008

5. Description of proposed program:

a) **Aims, goals, and/or objectives**

SFU Business@Surrey offers two innovative new areas of specialization – Entrepreneurship and Management and Technology – along with two of our most popular areas of study, Finance and Marketing. Taking an interdisciplinary approach to business, the BBA program at Surrey takes full advantage of on-line educational technology and alternative delivery methods combined with face to face learning to create a technology rich learning environment.

Mechatronic Systems Engineering (MSE) program is a multidisciplinary engineering program at Surrey that uniquely integrates mechanical, electronics, control, software, and computer engineering for the design and development of computer controlled electromechanical products and systems. The new MSE program intended that the training of MSE students benefits from the Surrey campus entrepreneurship, management, business, and communication expertise.

The intent of this proposal is to bring together the expertise from these two areas and to allow for a broad and comprehensive undergraduate education combining business knowledge with the expertise in engineering with minimal requirement for new resources.

b) Anticipated contribution to mandate and strategic plan of the institution

The proposed program meshes well with one of the important dimensions in which our academic programmes should be improved as stated in the President's Agenda 2005-2009 (Michael Stevenson, June 2005)

- " we must continue to increase the diversification of our programmes, increasing the number of professional and quasi-professional programmes, as well as creating new interdisciplinary specializations."

c) Target audience

This Dual Degree program is responding directly to the growing demand of the current students, recent graduates, and new technology industries requiring the specialised technical skills acquired through studies in engineering combined with the solid business knowledge provided by the BBA program. In addition to the opportunities in the technology industry, the graduates will be well prepared for the advanced degrees in areas covering both technical and business aspects of engineering.

d) Content

Lower Division (LD) Requirements

Tech One: 9 required credits

Business: 27 required credits (includes MATH 151, ECON 103, 105)

ENSC Complimentary Electives I & II: ECON 103 and 105 (8-credits) appear in the ENSC list of approved complimentary courses and meet the engineering requirements

Engineering Sciences: 45 required credits (includes MATH 152, 232, 251, CHEM 120, CMPT 128, PHYS 140, 141)

Total Lower Division Requirements: 9 Tech One + 27 Bus + 45 ENSC = 81 credits

Upper Division (UD) Requirements

Business: 27 required credits plus 12-15 additional credits in a concentration (total 39-42 credits)

Engineering Science: 56 required credits 16 Engineering elective credits (total 72 credits)

Total Upper Division Requirements: 39-42 Business + 72 Engineering Science = 111-114 credits

Total Requirements

Subtotal: 81 Lower Division + 111-113 Upper Division = 192-195 credits

Total: 192-195 credits

Note: Students must obtain a grade of C- or higher in all required courses.

University Breadth Requirement:

The breadth requirements may not be fully satisfied in the areas B-Sci and B-Hum by this proposal. Students will have to complement the proposed coursework with selecting appropriate electives to satisfy the breadth requirements.

University Writing Intensive Requirement:

University lower division writing intensive requirement are satisfied by the TECH 101-3W Collaborative Process course. The required course BUS360W would satisfy the upper division writing requirement.

University Quantitative Requirement:

University lower division writing intensive requirement are satisfied by the Math and Statistics courses required by the dual degree program.

Co-Operative Education

- Mandatory
- Administered through the Faculty of Business and Engineering Science co-op coordinators

e) Delivery Methods

Since the program is based upon existing courses the standard delivery methods already in place for on campus education, Lecture/Lab/Tutorial, will be used.

f) Linkages between learning outcomes and curriculum design

g) Distinctive characteristics

The Faculty of Business Administration and Engineering Science have a joint interest in graduating students with complimentary management and technical skills. Until now there was no formal connection between two programs except both programs drawing on the TechOne students on the Surrey campus. The proposed new dual degree will benefit students who have otherwise been pursuing their interests through major/minor combinations. These interests are better accommodated by a dual degree program.

This dual degree will recognize a student's breadth of learning and his/her commitment to developing a combination of knowledge and skills in Engineering Science and Business Administration

h) Anticipated completion time

This Dual Degree program will be completed in five academic years if taken on a full-time basis. Students will be required to complete a minimum of 192 credits to achieve the requirements of both degrees. A course matrix is attached as Appendix I.

i) Enrolment plan for the length of the program

The students will be admitted to the Dual Degree program from the other programs at SFU or via transfer from other post-secondary institution. The students will be primarily those who were enrolled into the Business or Engineering Science programs and wish to broaden their area of study through the programming offered through program. Students in this category can enrol into the program anytime during their studies once they satisfy the criteria for enrolment into both of the degree programs. Another pool of potential students is TechOne program – a cohort program in Faculty of Applied Sciences offered on Surrey campus. The TechOne is a home to students who were admitted directly into one of the major programs in FAS or Business as well as those students who have not decided their major yet.

We will facilitate the enrolment of students into the dual degree program by providing course offerings of Business courses in Surrey as required by the dual degree program (Note: Mechatronics courses are primarily offered on Surrey campus).

We were monitoring an increase of interest in the programming covered by this dual degree program within the current student population. We anticipate limited enrolment in this extremely rigorous program.

The interest of existing students indicates that this dual degree program can be a specific program offering that can target a new student audience resulting in the increases enrolment into SFU programs.

j) Policies on student evaluation (degree requirements)

As per general regulations of the University, the Faculty of Business Administration and the Faculty of Applied Sciences.

k) Policies on faculty appointment (minimum qualifications)

Students enrolled in the dual degree will enrol in courses currently already offered by the Faculty of Business Administration and the School of Engineering Sciences. We do not anticipate that there will be any additional faculty appointments directly related to this joint program. Should there be any such appointments they will conform to SFU policies as defined by the Board of Governors.

l) Policies on program assessment

The Dual Degree in Business Administration and Engineering Sciences will be governed and managed in conformity with Faculty and University regulations. The Undergraduate Curriculum Committees meet regularly (usually at least two times a semester) to discuss curriculum-related issues including the content and governance of this dual degree program. All academic units at SFU are subject to review by external experts and agencies every six to ten years.

k) Level of support and recognition from other post-secondary institutions (including plans for admission and transfer within BC) and relevant regulatory or professional bodies

There is already a high demand for the Business program from high schools and colleges within BC and internationally. The opportunity to combine this program with technical skills offered through the School of Engineering Sciences should increase the appeal of both programs.

As per SFU's transfer credit procedures, students may transfer from BC colleges or universities to enrol into this program.

Engineering programs are accredited by the Canadian Engineering Accreditation Board (CEAB). MSE as in any new engineering program in Canada is required to go through the accreditation process.

Engineering practice is regulated by the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC).

n) Evidence of student interest and labour market demand

Businesses are looking for students who have been broadly educated and who have expanded their education through co-operative education and extra-curricular activities.

We are monitoring an increase of interest in the dual degree program within the current student body. Based on the current enrolment of students in the respective single versions of both programs, on the enrolment of students on the upper division courses, and increased inquiries to student advisors we estimate the initial enrolment to be at 40 students. Such students are requesting and will be attracted to the proposed program requiring only 188 credits as opposed to the greater number required in their combination programs.

o) Related programs at SFU and other British Columbia post-secondary institutions

The combination of the two programs is unique in the context of SFU and British Columbia.

6. Additional Information Required by SFU:

1. Contact information for the faculty member responsible for program development

Maureen Fizzell, Associate Dean, Academic Director, Undergraduate Program
Faculty of Business Administration
Telephone: (604) 291-3653
fizzell@sfu.ca

Bill Holmes, Executive Director, Undergraduate Program
Faculty of Business Administration
Telephone: (604) 291-3700
wholmes@sfu.ca

Farid Golnaraghi, Associate Director for ENSC Surrey,
School of Engineering Science,
Telephone: 778-782-8054
mfgolnar@sfu.ca

2. Summary of requirements for graduation (courses, project/thesis, etc.)

A minimum of 192 credit hours, including: at the 100-200 level, 81 credits including 27 credits required by Business, and 45 credits required by Engineering Science (Mechatronics); at the 300-400 level, a minimum of 111 credits including at least 39 credits of upper division Business and 72 credits of upper division Engineering Science (Mechatronics).

3. Summary of resources (faculty members, space, and equipment) required to implement the program

Minimal additional resources are required. The program can be accommodated with present courses and faculty. No new courses are required.

4. **Brief description of any program and associated resources that will be reduced or eliminated when the new program is introduced**

None.

Appendix I: Matrix for Proposed Dual Degree BBA and BASc in Engineering Sciences

- Students must meet entrance requirements for both programs
- The following is the suggested plan for completion in ten semesters

Semester		Courses					
1-A-FA 19 credit hours		**CHEM 120-3** General Chemistry I	**MATH 151-3** Calculus I	**CMPT 128-3** Introduction to Computing Science and Programming for Engineers	**PHYS 140-4** Studio Physics: Mechanics and Modern Physics	**TECH 114-3** Technology in Everyday Contexts	**TECH 106-3** Spatial Thinking and Communicating
1-B-SP 19 credit hours		**MATH 232-3** Elementary Linear Algebra	**MATH 152-3** Calculus II	**PHYS 141-4** Studio Physics: Optics, Electricity and Magnetism	**ENSC 182-3** Mechatronics Design I	**TECH 101-3W** Collaborative Process	**BUS 251-3** Financial Accounting I
1-C-SU		**Summer Year One** Optional Co-op					
2-A-FA 20 credit hours		**ENSC 281-3** Statics and Strength of Materials	**MATH 251-3** Calculus III	**MATH 310-3** Introduction to Differential Equations	**ECON 105-4** Principles of Macroeconomics **CREDIT TOWARDS:** ENSC - Complementary **Elective I**	**ECON 103-4** Principles of Microeconomics **CREDIT TOWARDS:** ENSC - Complementary **Elective II**	**ENSC 220-3** Electric Circuits I
2-B-SP 18 credit hours		**ENSC 282-3** Kinematics & Dynamics of Rigid bodies & Mechanisms	**BUS 207-3** Managerial Economics (or ECON 301)	**BUS 393-3** Commercial Law	**BUS 254-3** Managerial Accounting I	**BUS303-3** Business, Society and Ethics	**BUS 272-3** Behavior in Organizations
2-C-SU		**Summer Year Two** Bus Optional Co-op					
EXTRA	**2x-A-FA** 20 Cr hrs	**ENSC 231-3** Engineering Materials	**BUS 312-4** Introduction to Finance	**BUS 381-3** Introduction to Human Resource Management	**ENSC 331-3** Introduction to MEMS	**BUS 343-3** Introduction to Marketing	**BUEC 232-4** Data and Decisions
EXTRA	**2x-B-SP** 20 Cr hrs	**ENSC 283-3** Introduction to Fluid Mechanics	**ENSC 226-4** Electronic Circuits	**ENSC 380-3** Linear Systems	**MACM 316-3** Numerical Analysis I	**BUS** 3XX Business Concentration Elective	**BUS 336-3** Data & Decisions II
2x-C-SU		**Summer Year Two** 1st **Mandatory Co-op**					
3-A-FA 20 credit hours		**ENSC 382-3** Machine Design	**ENSC 381-3** Systems Modeling & Simulation	**ENSC 329-4** Introduction to Digital Logic	**PHYS 344-3** Thermal Physics	**BUS-4XX-3** Business Concentration Elective	**BUS** 360-4W Business Communication I
3-C-SP		**Spring Year Three** 2nd **Mandatory Co-op**					
3-B-SU 19 credit hours		**ENSC 384-4** Mechatronics Design II	**ENSC 383-4** Feedback Control Systems	**ENSC 332-4** Micro-processors and Interfacing	**ENSC 387-4** Introduction to Electro-mechanical Sensors and Actuators	**BUS-4XX-3** Business Concentration Elective	
		Fourth Year on next page					

4-C-FA	**Fall Year Five**	**3rd Mandatory Co-op**				
4-A-SP **19 credit hours**	**ENSC 451-4** Real Time and Embedded Systems	**ENSC 441-3** Capstone Design Technical Project	**BUS 478-3** Seminar in Administrative Policy	**ENSC-4** Engineering Elective I	**ENSC-4** Engineering Elective II	**ENSC 305-1** Project Documentation and Group Dynamics
4-B-SU **18 credit hours**	**ENSC 484-4** Industrial Control Systems	**ENSC 442-3** Capstone Design Technical Project	**BUS-4XX-3** Business Concentration Elective	**ENSC-4** Engineering Elective III	**ENSC-4** Engineering Elective IV	

Year	FA	SP	SU
1	**1-A**	**1-B**	1-C
2	**2-A**	**2-B**	2-C
3	**2-A**	**2x-B**	2x-C
4	**3-A**	3-C	**3-B**
5	4-C	**4-A**	**4-B**