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MEMORANDUM

ATTENTION	Senate	**DATE**	December 16, 2010
FROM	Jon Driver, Vice-President, Academic and Provost, and Chair, SCUP	**PAGES**	1/1
RE:	Faculty of Applied Sciences and Faculty of Business Administration: Full Program Proposal for a Double Degree in Engineering Science (Mechatronics) and Business Administration (SCUP 10-88)		

At its December 15, 2010 meeting SCUP reviewed and approved the Full Program Proposal for a Double Degree in Engineering Science (Mechatronics) and Business Administration with the Faculty of Applied Sciences and Faculty of Business Administration.

Motion

That Senate approve and recommend to the Board of Governors the Full Program Proposal for a Double Degree in Engineering Science (Mechatronics) and Business Administration within the Faculty of Applied Sciences and Faculty of Business Administration, effective September 2011.

encl.

c: A. Gemino
F. Golnaraghi

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MEMORANDUM

ATTENTION	Senate Committee on University Priorities	DATE	December 3, 2010
FROM	Bill Krane, Chair Senate Committee on Undergraduate Studies	PAGES	1/1
RE:	Faculty of Applied Sciences and Business Administration (SCUS 10-56)		

Action undertaken by the Senate Committee on Undergraduate Studies at its meeting of December 2, 2010, gives rise to the following recommendation:

Motion:

That SCUP approve and recommend to Senate the full program proposal for the Double Degree in Engineering Sciences within the Faculty of Applied Sciences (Mechatronics) and Business Administration effective September 2011.

The relevant documentation for review by SCUP is attached.

SCUS 10-56

FACULTY OF APPLIED SCIENCES

MEMO

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ATTENTION	**Bill Krane, Chair SCUS**
FROM	Rob Cameron, Associate Dean, Faculty of Applied Sciences
RE	Faculty of Applied Sciences/Faculty of Business Double Degree MSE/BUS
DATE	October 25, 2010

The following FPP is appended here for approval and recommendation to senate.

1. Full Program Proposal – Double Degree in Engineering Science (Mechatronics) and Business Administration

   Please note that the proposal includes a one-course waiver of University breadth requirements.

Full Program Proposal

Double Degree in Engineering Science (Mechatronics) and Business Administration

Engineering Science Undergraduate Curriculum Committee
Faculty of Business Undergraduate Curriculum Committee

Simon Fraser University

December 2, 2010

Executive Summary

A new Double Degree program in Business and Engineering Science (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 School of Engineering Science .

While we expect the first students in the new Double 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 double 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 Notice of Intent:

- NOI Approved by ENSC UCC – November 6, 2007
- NOI Approved by ENSC School meeting – November 14, 2007
- NOI Reviewed by Faculty of Business Administration UCC – January 31, 2008.
- NOI Approved by Faculty of Business Administration UCC – April 28, 2010
- NOI Approved by the FAS Executive Committee (FAX) – May 25, 2010
- NOI Approved by SCUP – July 7, 2010

Approval History Full Program Proposal (FPP):

- FPP Approved by Faculty of Business Administration UCC – October 19, 2010
- FPP Approved by ENSC UCC – October 20, 2010
- FPP Approved in ENSC Faculty meeting – October 21, 2010
- FPP modifications for Co-op approved by BUS and FAS – November 18, 2010
- FPP approved by SCUS with admission requirement changes – Dec. 2, 2010

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 units of lower division requirements which are mainly tool courses to prepare for more advanced upper division business courses. The last 60 credit hours of the degree program consists of the completion of the core upper division business courses (24 units) and at least one area of concentration (12-15 units). The following concentrations are available at the Surrey campus: Entrepreneurship and Innovation, Finance, and Marketing. Students may choose to take courses at both campuses. For students who take courses at both campuses, they will have access to concentrations in accounting, international business, Human Resource Management, Management Information Systems, and Management Science.

The Double 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.

1. Credential to be awarded:

Engineering Science, BASc.

and

Business Administration, BBA

2. Location:

SFU, all campuses, Surrey being considered the home campus

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

School of Engineering Science, Faculty of Applied Sciences, and

Faculty of Business

4. Anticipated program start date:

September 2011

5. Description of proposed program:

a) Aims, goals, and/or objectives

SFU Business at Surrey offers four areas of specialization – Entrepreneurship and Innovation, Finance, and Marketing. Taking an interdisciplinary approach to business, students receive a solid foundation in all fundamental disciplines in business. 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 the 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 Double 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. Once engineering graduates are established in their field, they often are moved into management positions and then seek to complete an MBA which can cause disruptions in their careers. The double degree will provide the management skills to enable a smooth transition to management.

d) Content

Lower Division (LD) Requirements

Systems One: 15 required units (includes CMPT 128, ENSC 104, 105W, 106, and 182)

Business: 27 required units (includes BUEC 232, ECON 103, 105)

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

Engineering Sciences: 48 required units (includes MATH 151, 152, 232, 251, CHEM 120, PHYS 140, 141)

B-Hum requirement: 3 units

Total Lower Division Requirements: 12 Systems One + 24 Bus + 48 ENSC + 3 B-Hum = 87 units

Upper Division (UD) Requirements

Business: 24 required units plus 12-15 additional units in a concentration plus 1 extra unit if ECON 301-4 is used for BUS 207-3 (total 36-40 units)

Engineering Science: 58 required units 16 Engineering elective units (total 74 units)

Total Upper Division Requirements: 36-40 Business + 74 Engineering Science = 110-114 units

Total Requirements

87 Lower Division + 110-114 Upper Division

Total: 197-201 units

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

University Breadth Requirement:

B-Sci requirements are met by PHYS 140 and PHYS 141, and B-Soc requirements are met by ECON 103 and 105. However, a waiver reducing the B-Hum requirement to 3 units from 6 is requested.

University Writing Intensive Requirement:

University lower division writing intensive requirements are satisfied by the Lower Division W course in SystemsOne, ENSC 105W. The required courses BUS360W, ENSC 305W and ENSC 442W satisfy the upper division writing requirement.

University Quantitative Requirement:

University lower division quantitative requirement are satisfied by the Math and Statistics courses required by the double degree program.

Co-Operative Education

- Mandatory 3 co-op terms.
- 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

Not applicable; this program is based on the integration of two existing programs. No new curriculum is being introduced.

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 the two programs except both programs drawing on the TechOne students at the Surrey campus. The proposed new Double Degree will benefit students who have otherwise been pursuing their interests through major/minor combinations. These interests are better accommodated by a double degree program.

This Double 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 Double 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 197 units to achieve the requirements of both degrees. A course matrix is attached as Appendix I.

i) Enrolment plan for the length of the program

Mechatronics Systems Engineering students may be admitted to the double degree program by meeting the competitive entry requirements for entry into the Faculty of Business Administration at any time.

However, accelerated admission is available to those students who complete at least 30 credits of the Mechatronics Systems Engineering Major plus ECON 105-3 with a CGPA of 3.0.

We will facilitate the enrolment of students into the Double Degree program by providing business course offerings at Surrey as required by the Double Degree program (Note: Mechatronics courses are primarily offered on Surrey campus).

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

The interest of existing students indicates that this Double 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 Double 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 Double 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 Double Degree program. All academic units at SFU are subject to review by external experts and agencies every six to ten years.

m) 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 Science 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 with 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 double 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 20 students. Such students are requesting and will be attracted to the proposed program requiring only 192 units 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**

Andrew Gemino, Associate Dean, Academic Director, Undergraduate Program
Faculty of Business Administration
Telephone: (778) 782-3653
gemino@sfu.ca

Maureen Fizzell, Executive Director, Undergraduate Program
Faculty of Business Administration
Telephone: (778) 782-3700
fizzell@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.)**

Coursework totalling 197-201 units, including: at the 100-200 level, 87 units including 15 units from Systems One, 27 units required by Business, and 48 units required by

Engineering Science (Mechatronics) and 3 units of humanities breadth required by SFU university curriculum; at the 300-400 level, a total of 110 - 114 units including at least 36-39 units of upper division Business and 74 units of upper division Engineering Science (Mechatronics) requirements, plus three to five semesters of co-op education.

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 Double Degree BBA and BASc in Engineering Sciences

- The following is the suggested plan for completion in five years, including ten semesters of study and up to 5 co-op semesters

Semester	Courses					
1 Fall Year 1 20 units	**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	**ENSC 104-3** Engineering Graphics and Design	**ECON 105-4**[#1] Principles of Macroeconomics **CREDIT TOWARDS:** ENSC - Complementary **Elective I**
2 Spring Year 1 19 units	**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	**ENSC 105W-3W** Process, Form, and Convention in Professional Genres	**ENSC 106-3** Science Technology and Society
	Summer Year One Optional Co- op – Take B-Hum-3 elective or in Summer year two					
3 Fall Year 2 19 units	**ENSC 281-3** Statics and Strength of Materials	**MATH 251-3** Calculus III	**MATH 310-3** Introduction to Differential Equations	**ENSC 231-3** Engineering Materials	**ECON 103-4** Principles of Microeconomics **CREDIT TOWARDS:** ENSC - Complementary **Elective II**	**ENSC 220-3** Electric Circuits I
4 Spring Year 2 19 units	**ENSC 282-3** Kinematics & Dynamics of Rigid bodies & Mechanisms	**ENSC 280-3** Engineering Measurement and Data Analysis	**BUS 207-3** Commercial Law	**BUEC 232-4** Managerial Accounting I	**BUS 251-3** Financial Accounting I	**BUS 272-3** Behavior in Organizations
	Summer Year Two Optional Co-op – Take B-Hum-3 elective					
5 Fall Year 3 19 units	**BUS 360-4W** Business Communication	**BUS 381-3** Introduction to Human Resource Managem't	**BUS 393-3** Managerial Economics (or ECON 301)	**BUS 343-3** Introduction to Marketing	**ENSC 388-3** Thermodynamics and Heat Transfer	**BUS 254-3** Data and Decisions
6 Spring Year 3 20 units	**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-3** Business Concentration Elective	**BUS 336-4** Data & Decisions II

[1] Students **must** take ECON 105-4 either in place of the ENSC – Complementary Elective I, or later on, to be eligible to enter the MSE-Business Double Degree Program. See Admission Requirements.

	Summer Year Three 1st Mandatory Co-op					
7 Fall Year 4 21 units	**ENSC 382-3** Machine Design	**ENSC 381-3** Systems Modeling and Simulation	**ENSC 387-4** Introduction to Electromechanical Sensors and Actuators	**ENSC 329-4** Introduction to Digital Logic	**BUS-4XX-3** Business Concentration Elective	**BUS 312-4** Introduction to Finance
	Spring Year Four 2nd Mandatory Co-op					
8 Summer Year 4 19 units	**ENSC 384-4** Mechatronics Design II	**ENSC 383-4** Feedback Control Systems	**ENSC 332-4** Micro-processors and Interfacing	**ENSC 331-3** Introduction to MEMS	**BUS-4XX-3** Business Concentration Elective	
	Fall Year Five 3rd Mandatory Co-op					
9 Spring Year 5 19 units	**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 305W-1** Project Documentation and Group Dynamics
10 Summer Year 5 20 units	**ENSC 484-4** Industrial Control Systems	**ENSC 442W-3** Capstone Design Technical Project	**BUS-4XX-3** Business Concentration Elective	**ENSC-4** Engineering Elective III	**ENSC-4** Engineering Elective IV	**ENSC 406-2** Engineering Ethics, Law, and Professional Practic
Total: 198 units, including 3 units for B-Hum						

Appendix II – Proposed Calendar Description

Mechatronics Systems Engineering – Business Administration Double Degree Program

This double-degree program leads to a bachelor of applied science degree and a bachelor of business administration degree.

Admission Requirements

Admission to the double degree program is normally via the Mechatronics Systems Engineering Major. Students are admitted based on a CGPA of 3.0 obtained on the first 30 credits of the MSE Major plus ECON 105-3. Otherwise, MSE majors may later gain admission by meeting the competitive requirements for entry into the Faculty of Business Administration. Business administration students may gain admission by meeting the internal transfer requirements of the Mechatronics Systems Engineering Major.

Co-operative Education Work Experience

This double degree program includes a mandatory co-operative education program of at least three and up to five semesters of practical work experience. During the first two years, students may take up to two optional co-op terms including one nontechnical engineering experience (ENSC 194) and one business practicum (BUS 225).

After the first two years, students must complete three mandatory work terms and it is strongly recommended that at least one is in engineering industry (ENSC 195, 295, 395), one is in business (BUS 225, 325, 326, 327) and a third is in industry, business or in a special co-op term (ENSC 196, 296, 396). Special co-op may include, but is not restricted to, self-directed, entrepreneurial, service or research co-op work terms. Permission of the engineering science co-op office is required.

Grade Requirements

Students must obtain a minimum grade of C- in all required courses. A minimum 2.40 CGPA must be maintained for continuation in the double degree program.

Program Requirements

Students complete 197-201 units for the double degree program, as specified below.

Students complete all of

- BUEC 232-4 Data and Decisions I
- BUS 251-3 Financial Accounting I
- BUS 254-3 Managerial Accounting I
- BUS 272-3 Behavior in Organizations
- BUS 312-4 Introduction to Finance
- BUS 336-4 Data and Decisions II
- BUS 343-3 Introduction to Marketing
- BUS 360W-4 Business Communication
- BUS 381-3 Introduction to Human Resource Management
- BUS 393-3 Commercial Law
- BUS 478-3 Seminar in Administrative Policy
- CHEM 120-3 General Chemistry I
- CMPT 128-3 Introduction to Computing Science and Programming for Engineers
- ECON 103-4 Principles of Microeconomics
- ECON 105-4 Principles of Macroeconomics
- ENSC 104-3 Engineering Graphics and Design
- ENSC 105W-3 Process, Form, and Convention
- ENSC 106-3 Applied Science, Technology and Society
- ENSC 182-3 Mechatronics Design I
- ENSC 220-3 Electric Circuits I
- ENSC 226-4 Electronic Circuits
- ENSC 231-3 Engineering Materials
- ENSC 280-3 Engineering Measurement and Data Analysis
- ENSC 281-3 Statics and Strength of Materials
- ENSC 282-3 Kinematics and Dynamics of Rigid Bodies and Mechanisms
- ENSC 283-3 Introduction to Fluid Mechanics

- ENSC 305-1W Project Documentation and Team Dynamics
- ENSC 329-4 Introduction to Digital Logic
- ENSC 331-3 Introduction to MEMS
- ENSC 332-4 Microprocessors and Interfacing
- ENSC 380-3 Linear Systems
- ENSC 381-3 Systems Modelling and Simulation
- ENSC 382-3 Machine Design
- ENSC 383-4 Feedback Control Systems†
- ENSC 384-4 Mechatronics Design II †
- ENSC 387-4 Introduction to Electromechanical Sensors and Actuators
- ENSC 388-3 Engineering Thermodynamics and Heat Transfer
- ENSC 406-2 Engineering Ethics, Law and Professional Practice
- ENSC 441-3 Capstone Design Technical Project I
- ENSC 442-3W Capstone Design Technical Project II
- ENSC 451-4 Real Time and Embedded Systems
- ENSC 484-4 Industrial Control Systems
- MACM 316-3 Numerical Analysis I
- MATH 151-3 Calculus I
- MATH 152-3 Calculus II
- MATH 232-3 Elementary Linear Algebra
- MATH 251-3 Calculus III
- MATH 310-3 Introduction to Differential Equations
- PHYS 140-4 Studio Physics – Mechanics and Modern Physics
- PHYS 141-4 Studio Physics – Optics, Electricity and Magnetism

†strongly recommended to be completed concurrently

and one of

- BUS 207-3 Managerial Economics I
- ECON 301-4 Microeconomic Theory I: Competitive Behavior

Elective Course Requirements

Business Concentration Elective Courses

Students must also complete four upper division courses in a Business concentration including at least 3 courses at the 400 division.

Engineering Science Elective Courses

Students must also complete four engineering science elective courses selected from a pre-approved ENSC electives list that is available at http://www.ensc.sfu.ca/courses/electives. With undergraduate curriculum committee chair permission, students may replace one engineering science elective with either a directed study or a special project laboratory course. Special topics courses that have been approved by the undergraduate curriculum committee chair and the director may be counted here.

Writing, Quantitative, and Breadth Requirements

Students admitted to Simon Fraser University beginning in the fall 2006 term must meet writing, quantitative and breadth requirements as part of any degree program they may undertake. For students in this double degree program, the general university requirements are modified by reduction of the Humanities (B-Hum) breadth requirement from 6 units to 3 units. The B-Hum should be taken during one of the optional co-op terms.