**S.14-17**

SFU OFFICE OF THE ASSOCIATE VICE-PRESIDENT, ACADEMIC

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**MEMORANDUM**

| | | | |
|---|---|---|---|
| **ATTENTION** | Senate | **DATE** | December 6, 2013 |
| **FROM** | Gordon Myers, Chair<br>Senate Committee on Undergraduate Studies | **PAGES** | 1/1 |
| **RE:** | Faculty of Applied Sciences (SCUS 13-52) | | |

Gord Myers

For information:

Acting under delegated authority at its meeting of December 5, SCUS approved the following curriculum revisions effective Fall 2014.

1. General Studies Program (SCUS 13-52a)
   (i) Program requirement changes to the General Studies Program

2. Mechatronic Systems Engineering (REVISED SCUS 13-52c)
   (i) New Course Proposals:
      MSE 352-4, Digital Logic and Microcontrollers
      MSE 353-4, Power Electronics and Electric Machinery
      MSE 426-4, Introduction to Engineering Design Optimization
      MSE 427-4, Finite Element Analysis
   (ii) Prerequisite change to MSE 320, 450
   (iii) Requirement changes to the Mechatronic Systems Engineering Major, Honours, Double Degree Programs

**SFU Connect** **jahinchl@sfu.ca**

## SCUS Agenda Items

SCUS 13-52

**From :** Rob Cameron <cameron@sfu.ca> Mon, 28 Oct, 2013 12:53

**Subject :** SCUS Agenda Items 4 attachments

**To :** Gordon Myers <gmmyers@sfu.ca>

**Cc :** Jo Hinchliffe <joah@sfu.ca>, Rosa Balletta <rballett@sfu.ca>

Please put the following FAS UCC items on the agenda of the November 7 meeting of SCUS.

1. General Applied Sciences Program
   BSc degree for the double minor option.
2. Mechatronic Systems Engineering 2014 Curriculum Revisions
3. Termination of Multimedia Specialist Major in Computing Science
4. Suspension and Termination of Software Engineering Specialist Major in Computing Science

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**MMCMCON-termination-2013Oct17.pdf**
218 KB

**SWECON-suspension-2013Oct17.pdf**
219 KB

**MSE_2014-2-package.pdf**
968 KB

**GeneralAppliedSciences.pdf**
247 KB

# Faculty of Applied Sciences
# Undergraduate Curriculum Committee
# September 30, 2013

## Program Revisions – General Studies Program

Revisions are proposed to the General Studies program in the Faculty of Applied Sciences as described below. The principal changes are to introduce a Bachelor of Science double minor option and to phase out the Bachelor of General Studies (Applied Sciences) except as a graduation option for Applied Sciences students. These changes reflect similar changes to related general studies and general science programs in other Faculties.

**Background**

The current General Studies program in Applied Sciences predates the SFU faculty restructuring of 2009. Prior to that time, the Faculty of Applied Sciences had a broader range of programs including strong programs in both applied arts and applied sciences. With restructuring, the Faculty became more narrowly focused on science-based programs.

The Faculty of Arts and Social Sciences introduced a double minor option for the Bachelor of Arts degree in 2009, phasing out the Bachelor of General Studies except as a graduation option for students within the Faculty.

In 2012, the Faculty of Science revised its double minor General Science option leading to the Bachelor of Science degree. The revision allowed students to combine one minor in Science with one minor in any other Faculty, provided that at least 80 units of courses be taken from the Faculty of Science, including at least 28 units of upper division courses.

Because of faculty restructuring, students pursuing the double minor option of the existing BGS (Applied Sciences) necessarily must include a science-based minor. As this structure is similar to that of the Faculty of Science, it is now proposed to award the Bachelor of Science to students completing the double minor option. The general applied sciences option will remain under the BGS credential.

**Proposal**

The General Studies program within Applied Sciences is proposed to be restructured as follows.

1. The two options of the program are split into separate programs, the Double Minor Program leading to the Bachelor of Science and the General Applied Sciences Program leading to the Bachelor of General Studies (Applied Sciences).
2. The double minor program leading to the Bachelor of Science degree is patterned after that of the Faculty of Science. Students must take one minor from the Faculty of Applied Sciences and one additional minor (or extended) minor. The second minor may be from any other Faculty. A total of at least 80 units of courses must be taken from the Faculties of Science and Applied Sciences, including at least 30 units of upper division courses .

| Current | Proposed |
|---|---|
| **General ~~Studies (Faculty of Applied Sciences) Major~~**<br>Bachelor of General Studies<br>The non-specialist bachelor of general studies (applied sciences) (BGS) degree offers a broad education with an applied orientation~~, and is available as a general applied sciences option or a double minor option~~. | **General Applied Sciences Program**<br>Bachelor of General Studies **(Applied Sciences)**<br>The non-specialist bachelor of general studies (applied sciences) (BGS) degree offers a broad education with an applied orientation. |
| **Admission Requirements**<br>~~Faculty of Applied Sciences students may apply for admission to the general applied sciences option or the double minor option at any time. Students in other faculties may apply for the double minor option upon acceptance into two qualifying minors by the schools or departments concerned.~~<br>~~Limited spaces are available for students transferring to the general applied sciences option from other faculties. Admission is competitive, based on a grade point average (GPA) in upper division applied sciences courses. At least nine units of upper division applied sciences courses with a 2.25 GPA is required for admission.~~<br>~~Enrolment in the upper division courses of a particular school may be limited to those bachelor of general studies students who also meet the admission standards of that school. Admission to the BGS program may not be used to bypass the enrolment limitations of any other applied sciences program.~~ | **Admission Requirements**<br>Faculty of Applied Sciences students may transfer to the general applied sciences program at any time after completion of at least 60 units. This program is not open for general admission or inter-faculty transfer. |
| **~~Transfer Credit and Residency Requirements~~**<br>~~Transfer students are advised that Faculty of Applied Sciences residency requirements must be fulfilled.~~ | |

| Current | Proposed |
|---|---|
| **Program Requirements**<br>Students complete 45 upper division units and 120 units overall. A 2.00 graduation CGPA and upper division grade point average (UDGPA) is required.<br>~~**General Applied Sciences Option**~~<br>~~Students who choose this option will complete~~ 30 upper division Faculty of Science and Faculty of Applied Sciences units, subject to the following.<br>~~-no more than nine units of these courses may be from the Faculty of Science~~<br>~~-Faculty of Applied Sciences residency requirements must be satisfied.~~<br>~~-a 2.00 GPA is required on the courses used for the general applied sciences option.~~<br>~~For this requirement, MACM courses are counted as School of Computing Science courses.~~ | **Program Requirements**<br>Students complete 45 upper division units and 120 units overall.<br>**The general applied science program requires** 30 upper division Faculty of Science and Faculty of Applied Sciences units, subject to the following.<br>**- at least 21 units must be in CMPT, ENSC, MSE and MACM coursework.**<br>**- at least 21 units must be taken at Simon Fraser University**<br>**- a 2.00 GPA is required on the SFU courses used to fulfill this requirement.** |
| **Double Minor ~~Option~~**<br>~~Students who choose this option will satisfy the double minor option by completing~~ two minors (or extended minors), at least one of which must be in the Faculty of Applied Sciences. | **Double Minor Program**<br>**Bachelor of Science**<br>**The double minor program in the Faculty of Applied Sciences leads to the Bachelor of Science degree. Students complete** two minors (or extended minors), at least one of which must be in the Faculty of Applied Sciences. **For the BSc degree, students must complete additional work to reach at least 45 upper division units and at least 120 units overall. Within these totals, at least 30 upper division units and at least 80 units overall must be in Faculty of Science or Faculty of Applied Sciences courses.**<br>**Transfer students are advised that Faculty of Applied Sciences residency requirements must be fulfilled.** |

# Mechatronic Systems Engineering 2014 Curriculum Revisions

## Faculty of Applied Sciences Curriculum Committee

**Ahmad Rad and Robert D. Cameron**
**November 7, 2013**

## Introduction

The following curriculum revisions are proposed for the Mechatronics Systems Engineering program.

1. New required courses: (replacing MSE 350-4 and MSE 351-4).
   a) MSE 352-4 Digital Logic and Microcontrollers
   b) MSE 353-4 Power Electronics and Electric Machinery
   The new course proposals and outlines are attached.
2. New elective courses:
   a) MSE 426-4 Introduction to Engineering Design Optimization
   b) MSE 427-4 Finite Element Analysis
   The new course proposals and outlines are attached.
3. Revisions to the MSE Major and Honours programs.
4. Revisions to the MSE/Business Double Degree program.
5. Course prerequisite change for MSE 320 and MSE 450. Course change forms attached.

## Revisions to the MSE Major and Honours Programs

**New Required Courses.** MSE 352-4 and 353-4 are introduced as a more modern curriculum in place of MSE 350-4 and MSE 351-4. MSE 350-4 and MSE 351-4 are deleted.

**New Elective Courses.** MSE 426-4 and MSE 427-4 are introduced as electives that students may take towards overall requirements.

**Correction.** MSE 321-3 is added to the program requirements to correct a previous error in the curriculum revision process.

**Increasing Options.** As part of ongoing improvement to the MSE program and facilitating more choice and flexibility of the current program, the faculty committee of school approved minor changes to the program. The proposed changes provide greater flexibility for students to take courses within a specific focus or concentration and pave the way for future options. The essence of the change is that the two courses MSE 450 and MSE 481 that are currently offered within the compulsory common core can serve better purpose if they are offered as engineering elective courses. By removing these as required courses and making them electives instead, the number of engineering electives increases from 4 to 6.

The following tables shows the changes to the calendar text of the Mechatronic Systems Engineering Major and Honours programs, respectively.

## Changes to the Calendar Text for the Mechatronic Systems Engineering Major

| Current | Proposed |
|---|---|
| **Program Requirements**<br>**Students complete all of**<br>CMPT 130 - Introduction to Computer Programming I (3)<br>MACM 316 - Numerical Analysis I (3)<br>MATH 152 - Calculus II (3)<br>MATH 251 - Calculus III (3)<br>MATH 232 - Applied Linear Algebra (3)<br>MATH 310 - Introduction to Ordinary Differential Equations (3)<br>MSE 100 - Engineering Graphics and Design (3)<br><br>*[MSE 101W through MSE 312 - unchanged]*<br><br>MSE 320 - Machine Design (3)<br>~~MSE 350 - Introduction to Digital Logic (4)~~<br>~~MSE 351 - Microprocessors and Interfacing (4)~~<br>MSE 380 - Systems Modeling and Simulation (3)<br><br>*[MSE 381 through MSE 402 - unchanged]*<br><br>MSE 410 - Capstone Design Technical Project I (3)<br>MSE 411W - Capstone Design Technical Project II (3)<br>~~MSE 450 - Real-Time and Embedded Control Systems (4)~~<br>~~MSE 481 - Industrial Control Systems (4)~~<br>PHYS 140 - Studio Physics - Mechanics and Modern Physics (4)<br>PHYS 141 - Studio Physics - Optics, Electricity and Magnetism (4)<br><br>*[additional requirements - unchanged]* | **Program Requirements**<br>**Students complete all of**<br>CMPT 130 - Introduction to Computer Programming I (3)<br>MACM 316 - Numerical Analysis I (3)<br>MATH 152 - Calculus II (3)<br>MATH 251 - Calculus III (3)<br>MATH 232 - Applied Linear Algebra (3)<br>MATH 310 - Introduction to Ordinary Differential Equations (3)<br>MSE 100 - Engineering Graphics and Design (3)<br><br>*[MSE 101W through MSE 312 - unchanged]*<br><br>MSE 320 - Machine Design (3)<br>**MSE 321 - Engineering Thermodynamics and Heat Transfer (3)**<br>**MSE 352 - Digital Logic and Microcontrollers (4)**<br>**MSE 353 - Power Electronics and Electric Machinery (4)**<br>MSE 380 - Systems Modeling and Simulation (3)<br><br>*[MSE 381 through MSE 402 - unchanged]*<br><br>MSE 410 - Capstone Design Technical Project I (3)<br>MSE 411W - Capstone Design Technical Project II (3)<br>PHYS 140 - Studio Physics - Mechanics and Modern Physics (4)<br>PHYS 141 - Studio Physics - Optics, Electricity and Magnetism (4)<br><br>*[additional requirements - unchanged]* |

<table>
<tr><th>Current</th><th>Proposed</th></tr>
<tr><td>

Engineering Elective Courses<br>
Students must also complete <s>four</s> engineering <s>science</s> elective courses selected from a list of pre-approved MSE and ENSC electives that is available at http://mse.ensc.sfu.ca/undergraduate-students/academic-programs/4-year-ugrad-curriculum.html. With undergraduate curriculum committee chair permission, students may replace one engineering 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.
</td><td>

Engineering Elective Courses<br>
Students must also complete six engineering elective courses selected from a list of pre-approved MSE and ENSC electives that is available at http://mse.ensc.sfu.ca/undergraduate-students/academic-programs/4-year-ugrad-curriculum.html. With undergraduate curriculum committee chair permission, students may replace one engineering 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.
</td></tr>
</table>

## Changes to the Calendar Text for Mechatronic Systems Engineering Honours

<table>
<tr><th>Current</th><th>Proposed</th></tr>
<tr><td>

Program Requirements<br>
Students complete all of<br>
CMPT 130 - Introduction to Computer Programming I (3)<br>
MACM 316 - Numerical Analysis I (3)<br>
MATH 152 - Calculus II (3)<br>
MATH 251 - Calculus III (3)<br>
MATH 232 - Applied Linear Algebra (3)<br>
MATH 310 - Introduction to Ordinary Differential Equations (3)<br>
MSE 100 - Engineering Graphics and Design (3)<br>
<br>
[MSE 101W through MSE 312 - unchanged]<br>
<br>
MSE 320 - Machine Design (3)<br>
<s>MSE 350 - Introduction to Digital Logic (4)</s><br>
<s>MSE 351 - Microprocessors and Interfacing (4)</s><br>
MSE 380 - Systems Modeling and Simulation (3)<br>
<br>
[MSE 381 through MSE 402 - unchanged]
</td><td>

Program Requirements<br>
Students complete all of<br>
CMPT 130 - Introduction to Computer Programming I (3)<br>
MACM 316 - Numerical Analysis I (3)<br>
MATH 152 - Calculus II (3)<br>
MATH 251 - Calculus III (3)<br>
MATH 232 - Applied Linear Algebra (3)<br>
MATH 310 - Introduction to Ordinary Differential Equations (3)<br>
MSE 100 - Engineering Graphics and Design (3)<br>
<br>
[MSE 101W through MSE 312 - unchanged]<br>
<br>
MSE 320 - Machine Design (3)<br>
MSE 321 - Engineering Thermodynamics and Heat Transfer (3)<br>
MSE 352 - Digital Logic and Microcontrollers (4)<br>
MSE 353 - Power Electronics and Electric Machinery (4)<br>
MSE 380 - Systems Modeling and Simulation (3)<br>
<br>
[MSE 381 through MSE 402 - unchanged]
</td></tr>
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<table>
<tr><th>Current</th><th>Proposed</th></tr>
<tr><td>MSE 410 - Capstone Design Technical Project I (3)<br>MSE 411W - Capstone Design Technical Project II (3)<br>~~MSE 450 - Real-Time and Embedded Control Systems (4)~~<br>~~MSE 481 - Industrial Control Systems (4)~~<br>MSE 498 - Mechatronic Systems Engineering Thesis Proposal (3)<br>MSE 499 - Mechatronic Systems Engineering Undergraduate Thesis (9)<br>PHYS 140 - Studio Physics - Mechanics and Modern Physics (4)<br>PHYS 141 - Studio Physics - Optics, Electricity and Magnetism (4)<br>*[additional requirements - unchanged]*</td><td>MSE 410 - Capstone Design Technical Project I (3)<br>MSE 411W - Capstone Design Technical Project II (3)<br>MSE 498 - Mechatronic Systems Engineering Thesis Proposal (3)<br>MSE 499 - Mechatronic Systems Engineering Undergraduate Thesis (9)<br>PHYS 140 - Studio Physics - Mechanics and Modern Physics (4)<br>PHYS 141 - Studio Physics - Optics, Electricity and Magnetism (4)<br>*[additional requirements - unchanged]*</td></tr>
<tr><td>**Engineering Elective Courses**<br>Students must also complete ~~four~~ engineering ~~science~~ elective courses selected from a list of pre-approved MSE and ENSC electives that is available at http://mse.ensc.sfu.ca/undergraduate-students/academic-programs/4-year-ugrad-curriculum.html. With undergraduate curriculum committee chair permission, students may replace one engineering 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.</td><td>**Engineering Elective Courses**<br>Students must also complete **six** engineering elective courses selected from a list of pre-approved MSE and ENSC electives that is available at http://mse.ensc.sfu.ca/undergraduate-students/academic-programs/4-year-ugrad-curriculum.html. With undergraduate curriculum committee chair permission, students may replace one engineering 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.</td></tr>
</table>

## Changes to the Calendar Text for MSE/BUS Double Degree Program

The following changes are made to the MSE/BUS Double Degree Program to correct the mislabelling of the program as a "Major" as well as to incorporate the new required courses MSE 352 and MSE 353 in place of MSE 350 and MSE 351.

| Current | Proposed |
|---|---|
| **Mechatronic Systems Engineering and Business Double Degree ~~Major~~** | **Mechatronic Systems Engineering and Business Double Degree Program** |
| **Program Requirements**<br>**Students complete a total of 197-201 units including all of**<br>BUS 251 - Financial Accounting I (3)<br>BUS 254 - Managerial Accounting I (3)<br>BUS 272 - Behavior in Organizations (3)<br><br>*[BUS336 through MSE 312 - unchanged]*<br><br>MSE 320 - Machine Design (3)<br>MSE 321 - Engineering Thermodynamics and Heat Transfer (3)<br>~~MSE 350 - Introduction to Digital Logic (4)~~<br>~~MSE 351 - Microprocessors and Interfacing (4)~~<br>MSE 380 - Systems Modeling and Simulation (3)<br><br>*[additional requirements - unchanged]* | **Program Requirements**<br>**Students complete a total of 197-201 units including all of**<br>BUS 251 - Financial Accounting I (3)<br>BUS 254 - Managerial Accounting I (3)<br>BUS 272 - Behavior in Organizations (3)<br><br>*[BUS336 through MSE 312 - unchanged]*<br><br>MSE 320 - Machine Design (3)<br>MSE 321 - Engineering Thermodynamics and Heat Transfer (3)<br>**MSE 352 - Digital Logic and Microcontrollers (4)**<br>**MSE 353 - Power Electronics and Electric Machinery (4)**<br>MSE 380 - Systems Modeling and Simulation (3)<br><br>*[additional requirements - unchanged]* |

SFU

SENATE COMMITTEE ON
UNDERGRADUATE STUDIES

**NEW COURSE PROPOSAL**



**COURSE SUBJECT/NUMBER**

**COURSE TITLE**

LONG — for Calendar/schedule, no more than 100 characters including spaces and punctuation

MSE 352-4: Digital Logic and Microcontrollers

**AND**

SHORT — for enrollment/transcript, no more than 30 characters including spaces and punctuation

Digital Logic&Microcontrollers

**CAMPUS** where course will be taught: ☐ Burnaby ☑ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

**COURSE DESCRIPTION (FOR CALENDAR). 50-60 WORDS MAXIMUM. ATTACH A COURSE OUTLINE TO THIS PROPOSAL.**

Introduction to digital systems and number representation. Combinational systems and sequential logic. Counter design and registers. Synchronous sequential design. Microprocessor applications, memory and I/O systems. Microcontrollers: features, architecture and programming model. Introduction to assembly language and microcontroller programming. Addressing modes, assembling and linking programs. Timer/counter programming. ADC, DAC, and sensor interfacing.

**LIBRARY RESOURCES**

NOTE: Senate has approved (S.93-11) that no new course should be approved by Senate until funding has been committed for necessary library materials. Each new course proposal must be accompanied by a library report and, if appropriate, confirmation that funding arrangements have been addressed.

Library report status Requested.

**RATIONALE FOR INTRODUCTION OF THIS COURSE**

This course provides a foundation in understanding the concepts and implementation of digital logic and microcontroller based systems, which are essential building blocks in Mechatronic Systems Engineering and Design. This includes the basic operation and implementation of hardware elements (e.g. transistor level gate design for logic circuit implementation), design of combinational and sequential circuit elements, realistic use and programming in Mechatronic Systems. This course effectively integrates MSE 350 (Introduction to Digital Logic, previously ENSC 329) and MSE 351 (Microprocessors and Microcontrollers, previously ENSC 332) into a coherent offering. The course has been delivered in this integrated format three times under special topics numbers ENSC 364/ MSE 391.

**SCHEDULING AND ENROLLMENT INFORMATION**

Indicate effective **term and year** course would first be offered and planned **frequency** of offering thereafter:

This course would first be offered with an MSE course number in Fall 2014 and annually thereafter.

Will this be a required or elective course in the curriculum? ◉ Required ○ Elective

What is the probable enrollment when offered? Estimate: 75-85

**CREDITS**
Indicate number of credits (units): 4

Indicate number of hours for: Lecture 3 Seminar 3 Tutorial 1 Lab 2 Other

**FACULTY** Which of your present CFL faculty have the expertise to offer this course?

Amr Marzouk
Kevin Oldknow
Mehrdad Moallem

**WQB DESIGNATION** (attach approval from Curriculum Office)

**PREREQUISITE**
Does this course replicate the content of a previously-approved course to such an extent that students should not receive credit for both courses? If so, this should be **noted in the prerequisite.**

CMPT 130 and either MSE 251 or ENSC 226.

**COREQUISITE**

**STUDENT LEARNING OUTCOMES**
Upon satisfactory completion of the course students will be able to:

Analyze and synthesize basic combinational and sequential logic networks/circuits, including development of minimum-cost implementations and detailed schematic representation at the transistor level.
Analyze and synthesize synchronous sequential logic networks/circuits incorporating logic gates, counters, timers and registers.
Implement combinational and sequential logic designs in FPGA hardware using schematic and/or VHDL representation.
Identify the functions, features, architectures and programming models of common microcontrollers and the criteria for practical selection of microprocessor/microcontroller devices in systems design.
Develop and implement microcontroller programs in assembly language, making use of addressing modes, timer/counter programming. ADC, DAC, and sensor interfacing.

**FEES**
Are there any proposed student fees associated with this course other than tuition fees? ○ YES ◉ NO

## RESOURCES

List any outstanding resource issues to be addressed prior to implementation: space, laboratory equipment, etc:

This course will make use of the laboratory space and hardware that had already been established for ENSC 364 (offered as a special topics course, integrating ENSC 329 and ENSC 332 as noted above).

## OTHER IMPLICATIONS

Articulation agreement reviewed? ○ YES ○ NO ◉ Not applicable

Exam required: ◉ YES ○ NO

Criminal Record Check required: ○ YES ◉ NO

## APPROVALS: APPROVAL IS SIGNIFIED BY DATE AND APPROPRIATE SIGNATURE.

1 **Departmental approval indicates that the Department or School has approved the content of the course, and has consulted with other Departments/Schools/Faculties regarding proposed course content and overlap issues.**

________________________________________

**Chair, Department/School** **Date**

________________________________________

**Chair, Faculty Curriculum Committee** **Date**

2 **Faculty approval indicates that all the necessary course content and overlap concerns have been resolved, and that the Faculty/School/Department commits to providing the required Library funds.**

________________________________________

**Dean or designate** **Date**

LIST which other Departments, Schools and Faculties have been consulted regarding the proposed course content, including overlap issues. Attach documentary evidence of responses.

Other Faculties' approval indicates that the Dean(s) or Designate of other Faculties AFFECTED by the proposed new course support(s) the approval of the new course:

________________________________ Date ________________

________________________________ Date ________________

3 **SCUS approval indicates that the course has been approved for implementation subject, where appropriate, to financial issues being addressed.**

**COURSE APPROVED BY SCUS (Chair of SCUS):**

________________________________ Date ________________

SFU

SENATE COMMITTEE ON UNDERGRADUATE STUDIES



**COURSE SUBJECT/NUMBER**

**COURSE TITLE**

LONG — for Calendar/schedule, no more than 100 characters including spaces and punctuation

MSE 353-4: Power Electronics and Electric Machinery

**AND**

SHORT — for enrollment/transcript, no more than 30 characters including spaces and punctuation

Power Electronics & Machinery

**CAMPUS** where course will be taught: ☐ Burnaby ☑ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

**COURSE DESCRIPTION (FOR CALENDAR). 50-60 WORDS MAXIMUM. ATTACH A COURSE OUTLINE TO THIS PROPOSAL.**

3-phase circuits, power quality, and transformers, Characteristic of power semiconductor devices, Line frequency controlled rectifiers, Buck, boost, and buck-boost dc-dc power converters, Pulse Width Modulation (PWM) techniques, Voltage source inverters and full-bridge topology, Introduction to dc machines, Introduction to stepper motors, Introduction to induction motors, Introduction to synchronous machines

**LIBRARY RESOURCES**

NOTE: Senate has approved (S.93-11) that no new course should be approved by Senate until funding has been committed for necessary library materials. Each new course proposal must be accompanied by a library report and, if appropriate, confirmation that funding arrangements have been addressed.

Library report status Requested

**RATIONALE FOR INTRODUCTION OF THIS COURSE**

To fill the gap in the curriculum on power electronics, power systems and electric machines.

**SCHEDULING AND ENROLLMENT INFORMATION**

Indicate effective **term and year** course would first be offered and planned **frequency** of offering thereafter:

This course would first be offered with an MSE course number in Summer 2014 and annually thereafter.

Will this be a required or elective course in the curriculum? ◉ Required ○ Elective

What is the probable enrollment when offered? Estimate: 75-85

**CREDITS**
Indicate number of credits (units): 4

Indicate number of hours for: Lecture 3 Seminar 3 Tutorial 1 Lab 1 Other

**FACULTY** Which of your present CFL faculty have the expertise to offer this course?

Amr Marzouk
Ahmad Rad

**WQB DESIGNATION** (attach approval from Curriculum Office)

**PREREQUISITE**
Does this course replicate the content of a previously-approved course to such an extent that students should not receive credit for both courses? If so, this should be **noted in the prerequisite.**

MSE 251 (previously ENSC 226)

**COREQUISITE**

**STUDENT LEARNING OUTCOMES**
Upon satisfactory completion of the course students will be able to:

- To understand the fundamentals of electric machines
- Power electronics components and conversion
- 3-phase power transmission
- Select power systems and design basic power electronic converter topologies

**FEES**
Are there any proposed student fees associated with this course other than tuition fees? ◯ YES ◉ NO

## RESOURCES

List any outstanding resource issues to be addressed prior to implementation: space, laboratory equipment, etc:

Power electronics lab equipment is already present at the MSE undergraduate labs.

## OTHER IMPLICATIONS

Articulation agreement reviewed? ○ YES ○ NO ◉ Not applicable

Exam required: ◉ YES ○ NO

Criminal Record Check required: ○ YES ◉ NO

## APPROVALS: APPROVAL IS SIGNIFIED BY DATE AND APPROPRIATE SIGNATURE.

1 **Departmental approval indicates that the Department or School has approved the content of the course, and has consulted with other Departments/Schools/Faculties regarding proposed course content and overlap issues.**

______________________________________________

**Chair, Department/School** **Date**

______________________________________________

**Chair, Faculty Curriculum Committee** **Date**

2 **Faculty approval indicates that all the necessary course content and overlap concerns have been resolved, and that the Faculty/School/Department commits to providing the required Library funds.**

______________________________________________

**Dean or designate** **Date**

LIST which other Departments, Schools and Faculties have been consulted regarding the proposed course content, including overlap issues. Attach documentary evidence of responses.

Other Faculties' approval indicates that the Dean(s) or Designate of other Faculties AFFECTED by the proposed new course support(s) the approval of the new course:

______________________________ Date ______________

______________________________ Date ______________

3 **SCUS approval indicates that the course has been approved for implementation subject, where appropriate, to financial issues being addressed.**

**COURSE APPROVED BY SCUS (Chair of SCUS):**

______________________________ Date ______________

SFU

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

**NEW COURSE PROPOSAL**



**COURSE SUBJECT/NUMBER** MSE 426

**COURSE TITLE**

LONG — for Calendar/schedule, no more than 100 characters including spaces and punctuation

Introduction to Engineering Design Optimization

**AND**

SHORT — for enrollment/transcript, no more than 30 characters including spaces and punctuation

Design Optimization

**CAMPUS** where course will be taught: ☐ Burnaby ☑ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

**COURSE DESCRIPTION (FOR CALENDAR). 50-60 WORDS MAXIMUM. ATTACH A COURSE OUTLINE TO THIS PROPOSAL.**

Theories, methods, and applications of optimization in support of engineering design. Topics include classic optimization methods, metaheuristics and evolutionary algorithms, Design of Experiments, and metamodel-based design optimization approaches.

**LIBRARY RESOURCES**

NOTE: Senate has approved (S.93-11) that no new course should be approved by Senate until funding has been committed for necessary library materials. Each new course proposal must be accompanied by a library report and, if appropriate, confirmation that funding arrangements have been addressed.

Library report status

**RATIONALE FOR INTRODUCTION OF THIS COURSE**

Engineering design is emphasized today in every engineering curriculum. However in general there lacks of courses on formal design approaches. Engineering optimization and Design of Experiments (DOE) are two of those formal methods, which have sound mathematical basis and are currently used by major Original Equipment Manufacturers in the world. Our students need to learn those methodologies, along with adequate tools, to be more competent in engineering design.

In the proposed course, students will learn classical engineering optimization methods which include both unconstrained and constrained gradient-based optimization methods. They will focus on how to formulate an optimization problem and will apply the proper optimization algorithms for their specific engineering problems. Furthermore, for experiment-based or simulation-based engineering problems where explicit equations are lacking, students will learn the formal Design of Experiments (DOE) methods to optimize the design with a minimum number of expensive physical experiments or computer simulations. Modern engineering optimization methods such as genetic algorithms and metamodel-based optimization methods will be introduced.Students will also use Matlab Optimization Toolbox and in-house developed codes for optimization. Therefore labs are required.

**SCHEDULING AND ENROLLMENT INFORMATION**

Indicate effective **term and year** course would first be offered and planned **frequency** of offering thereafter:

Fall 2014, annually thereafter

Will this be a required or elective course in the curriculum? ○ Required ◉ Elective

What is the probable enrollment when offered? Estimate: 15

**CREDITS**

Indicate number of credits (units): 4

Indicate number of hours for: Lecture 3 Seminar 3 Tutorial Lab 3 Other

**FACULTY** Which of your present CFL faculty have the expertise to offer this course?

Prof. G. Wang

**WQB DESIGNATION** (attach approval from Curriculum Office)

**PREREQUISITE**

Does this course replicate the content of a previously-approved course to such an extent that students should not receive credit for both courses? If so, this should be **noted in the prerequisite.**

Math 232, MATH 251, MSE 320 or ENSC 382

**COREQUISITE**

Nil.

**STUDENT LEARNING OUTCOMES**

Upon satisfactory completion of the course students will be able to:

- build knowledgement base in engineering design optimization
- analyze an engineering design problem from the perspective of optimization ("optimal" thinking)
- gain insight of a design problem by deciding key design variables, objectives, and constraints
- use state-of-the-art optimization tools for problem solving
- gain teamwork experience in course project
- gain communication skills through in-class presentation and report writing
- gain project management skills
- enhance life-long learning through learnign from latest literatures

**FEES**

Are there any proposed student fees associated with this course other than tuition fees? ○ YES ◉ NO

**RESOURCES**

List any outstanding resource issues to be addressed prior to implementation: space, laboratory equipment, etc:

Nil.

**OTHER IMPLICATIONS**

| | | | |
|---|---|---|---|
| Articulation agreement reviewed? | ○ YES | ○ NO | ● Not applicable |
| Exam required: | ● YES | ○ NO | |
| Criminal Record Check required: | ○ YES | ● NO | |

**APPROVALS: APPROVAL IS SIGNIFIED BY DATE AND APPROPRIATE SIGNATURE.**

1 **Departmental approval indicates that the Department or School has approved the content of the course, and has consulted with other Departments/Schools/Faculties regarding proposed course content and overlap issues.**

**Chair, Department/School** **Date**

**Chair, Faculty Curriculum Committee** **Date**

2 **Faculty approval indicates that all the necessary course content and overlap concerns have been resolved, and that the Faculty/School/Department commits to providing the required Library funds.**

**Dean or designate** **Date**

LIST which other Departments, Schools and Faculties have been consulted regarding the proposed course content, including overlap issues. Attach documentary evidence of responses.

Other Faculties' approval indicates that the Dean(s) or Designate of other Faculties AFFECTED by the proposed new course support(s) the approval of the new course:

Date

Date

3 **SCUS approval indicates that the course has been approved for implementation subject, where appropriate, to financial issues being addressed.**

**COURSE APPROVED BY SCUS (Chair of SCUS):**

Date

SFU

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

**NEW COURSE PROPOSAL**



**COURSE SUBJECT/NUMBER** MSE 427

**COURSE TITLE**

LONG — for Calendar/schedule, no more than 100 characters including spaces and punctuation

Finite Element Analysis

**AND**

SHORT — for enrollment/transcript, no more than 30 characters including spaces and punctuation

Finite Element Analysis

**CAMPUS** where course will be taught: ☐ Burnaby ☑ Surrey ☐ Vancouver ☐ Great Northern Way ☐ Off campus

**COURSE DESCRIPTION (FOR CALENDAR). 50-60 WORDS MAXIMUM. ATTACH A COURSE OUTLINE TO THIS PROPOSAL.**

Overview of the finite element method (FEM) and its use in industry; finite element procedures with applications to the solution of general problems in 2-D and 3-D solid, structural, fluid mechanics, and heat and mass transfer; continuum mechanics equations; Galerkin and other residual methods; potential energy method; practice with FEA software tools with guidelines for real-world applications.

**LIBRARY RESOURCES**

NOTE: Senate has approved (S.93-11) that no new course should be approved by Senate until funding has been committed for necessary library materials. Each new course proposal must be accompanied by a library report and, if appropriate, confirmation that funding arrangements have been addressed.

Library report status

**RATIONALE FOR INTRODUCTION OF THIS COURSE**

Finite Element Analysis (FEA) is an advanced computational tool used widely in engineering analysis and design. FEA is used in diverse disciplines and industries including automotive, aerospace, construction, and electronics industries. Built on fundamental physical laws and equations, FEA empowers engineers to analyze complex structures, fluids, and electrmagnetic fields.

This course differs from the FEA course offered from a math department as this course focuses on engineering mechanics and applications. Contents, examples, labs, and projects will be based on structural analysis, fluids, heat and mass transfer problems. Tools will be used include a Matlab problem on Truss and Beam analysis, as well as the commericial tool ANSYS.

**SCHEDULING AND ENROLLMENT INFORMATION**

Indicate effective **term and year** course would first be offered and planned **frequency** of offering thereafter:

Spring 2015, biennually thereafter

Will this be a required or elective course in the curriculum? ○ Required ◉ Elective

What is the probable enrollment when offered? Estimate: 15

**CREDITS**
Indicate number of credits (units): 4

Indicate number of hours for: Lecture 3 Seminar 3 Tutorial Lab 3 Other

**FACULTY** Which of your present CFL faculty have the expertise to offer this course?

Prof. G Wang

**WQB DESIGNATION** (attach approval from Curriculum Office)

**PREREQUISITE**
Does this course replicate the content of a previously-approved course to such an extent that students should not receive credit for both courses? If so, this should be **noted in the prerequisite**.

MSE 280 or ENSC 380, MSE 320 or ENSC 382, MSE 321 or ENSC 388
Students who have taken ENSC 888 or equivalent cannot take this course for further credit.

**COREQUISITE**

**STUDENT LEARNING OUTCOMES**
Upon satisfactory completion of the course students will be able to:

- gain knowledge in fundamentals of FEA including theories, methods, assumptions, and solution approaches
- perform advanced analysis on complex engineering problems
- use FEA as a tool for design support, sensitivity analysis, and optimization
- use commercial tools ANSYS and Matlab for practical FEA
- work individually as well as in team in the course project
- gain communication skills through in-class oral presentation and written reports
- gain project management skills
- enhance life-long learning by exploring to untaught capabilities of ANSYS for projects

**FEES**
Are there any proposed student fees associated with this course other than tuition fees? ○ YES ◉ NO

## RESOURCES

List any outstanding resource issues to be addressed prior to implementation: space, laboratory equipment, etc:

We need to renew the licenses for ANSYS annually for a cost about US$7500.

## OTHER IMPLICATIONS

Articulation agreement reviewed? ○ YES ○ NO ◉ Not applicable
Exam required: ◉ YES ○ NO
Criminal Record Check required: ○ YES ◉ NO

## APPROVALS: APPROVAL IS SIGNIFIED BY DATE AND APPROPRIATE SIGNATURE.

1 **Departmental approval indicates that the Department or School has approved the content of the course, and has consulted with other Departments/Schools/Faculties regarding proposed course content and overlap issues.**

______________________________________________
**Chair, Department/School** **Date**

______________________________________________
**Chair, Faculty Curriculum Committee** **Date**

2 **Faculty approval indicates that all the necessary course content and overlap concerns have been resolved, and that the Faculty/School/Department commits to providing the required Library funds.**

______________________________________________
**Dean or designate** **Date**

LIST which other Departments, Schools and Faculties have been consulted regarding the proposed course content, including overlap issues. Attach documentary evidence of responses.

Other Faculties' approval indicates that the Dean(s) or Designate of other Faculties AFFECTED by the proposed new course support(s) the approval of the new course:

______________________________ Date ______________

______________________________ Date ______________

3 **SCUS approval indicates that the course has been approved for implementation subject, where appropriate, to financial issues being addressed.**

**COURSE APPROVED BY SCUS (Chair of SCUS):**

______________________________ Date ______________

SFU

SENATE COMMITTEE ON
UNDERGRADUATE STUDIES

**COURSE CHANGE/DELETION**

**EXISTING COURSE, CHANGES RECOMMENDED**

Please check appropriate revision(s):

☐ Course number ☐ Credit ☐ Title ☐ Description ☒ Prerequisite ☐ Course deletion ☐ Learning Outcomes

Indicate number of hours for: Lecture 3 Seminar___ Tutorial 1 Lab 3

**FROM**
Course Subject/Number MSE 320
Credits 3

**TO**
Course Subject/Number ___
Credits ___

**TITLE**

(1) LONG title for calendar and schedule, no more than 100 characters including spaces and punctuation.

**FROM:**

**TO:**

(2) SHORT title for enrollment and transcript, no more than 30 characters including spaces and punctuation.

**FROM:**

**TO:**

**DESCRIPTION**
**FROM:**

**DESCRIPTION**
**TO:**

**PREREQUISITE**

**PREREQUISITE**

Does this course replicate the content of a previously approved course to such an extent that students should not receive credit for both courses? If so, this should be **noted in the prerequisite.**

**FROM:** MSE 221 or ENSC 281 and MSE 222 or ENSC 282

**TO:** MSE 100 or ENSC 104, MSE 220 or ENSC 231, MSE 221 or ENSC 281

**LEARNING OUTCOMES**

**RATIONALE**

MSE 100 or ENSC 104 covers engineering graphics; MSE 220 or ENSC 231 covers engineering materials. Both engineering drawing and materials are essential prerequisites for machine design, which is the topic of MSE 320 or ENSC 382. MSE 222/ENSC 282 is not a critical prerequisite for the course.

Effective term and year May 2014

SFU

SENATE COMMITTEE ON
UNDERGRADUATE STUDIES

**COURSE CHANGE/DELETION**

**EXISTING COURSE, CHANGES RECOMMENDED**

Please check appropriate revision(s):

☐ Course number ☐ Credit ☐ Title ☐ Description ☒ Prerequisite ☐ Course deletion ☐ Learning Outcomes

Indicate number of hours for: Lecture ______ Seminar ______ Tutorial ______ Lab ______

| **FROM** | **TO** |
|---|---|
| Course Subject/Number MSE 450 | Course Subject/Number ______ |
| Credits ______ | Credits ______ |

**TITLE**

(1) LONG title for calendar and schedule, no more than 100 characters including spaces and punctuation.

**FROM:** **TO:**

(2) SHORT title for enrollment and transcript, no more than 30 characters including spaces and punctuation.

**FROM:** **TO:**

**DESCRIPTION FROM:** **DESCRIPTION TO:**

**PREREQUISITE** **PREREQUISITE**

Does this course replicate the content of a previously approved course to such an extent that students should not receive credit for both courses? If so, this should be **noted in the prerequisite.**

**FROM:** MSE 351 (or ENSC 332), MSE 381 (or ENSC 383), and completion of 90 units.

**TO:** MSE 352, MSE 381 (or ENSC 383), and completion of 90 units.

**LEARNING OUTCOMES**

**RATIONALE**

MSE 351 is phased out and is to be replaced with MSE 352.

Effective term and year Spring 2015