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MEMORANDUM

ATTENTION	Senate	**DATE**	March 7, 2014
FROM	Gordon Myers, Chair Senate Committee on Undergraduate Studies	**PAGES**	1/1
RE:	Faculty of Applied Sciences (SCUS 14-11)		

For information:

Acting under delegated authority at its meeting of March 6, 2014 SCUS approved the following curriculum revisions effective Fall 2014.

1. School of Engineering Science (SCUS 14-11a)

(i) New Course Proposals:

- ENSC 251-4, Software Design and Analysis for Engineers
- ENSC 252-4, Fundamentals in Digital Logic & Design
- ENSC 254-4, Introduction to Computer Organization effective Spring 2015

(ii) Core Course Requirement changes to the:

- Engineering Science Major, Computer Engineering Option
- Engineering Science Major, Electronics Engineering Option
- Engineering Science Major, Systems Option
- Engineering Science Honours, Biomedical Engineering Option
- Engineering Science Honours, Computer Engineering Option
- Engineering Science Honours, Electronics Engineering Option
- Engineering Science Honours, Engineering Physics Option
- Engineering Science Honours, Systems Option

(iii) Prerequisite and/or description and/or credit and/or title change to ENSC 100/100W, 220, 225, 320, 350, 351

2. School of Computing Science (SCUS 14-11b)

(i) Lower Division Requirement changes to the:

- Computing Science Major and Honours Programs
- Geographic Information Systems Major and Honours Programs

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SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL

COURSE SUBJECT/NUMBER ENSC 251

COURSE TITLE

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

Software Design and Analysis for Engineers

AND

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

SW Design & Analysis for Engs

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.

~~Teaches engineers the~~ Fundamentals for designing and implementing modular programs using a modern object-oriented programming language with a focus on understanding the performance implications of design choices on non-traditional computing platforms. Lecture topics include: classes; objects; debugging, testing & verification; design analysis & abstraction; error handling; fundamental data structures such as lists, trees, and graphs; and big-O complexity analysis.

REPEAT FOR CREDIT ◉ NO ○ YES How many times? Within a term? ○ YES ○ NO

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

This course will reinforce the fundamentals introduced in CMPT 128 and expand students skills in the areas of program design, debugging and comprehension of object-oriented programming and fundamental data structures with a strong emphasis on the implications of the execution platform on software performance. This course is being introduced as the required skills in software design for Engineering Science cannot be met in a single course and the 2 year time lag between CMPT 128 and ENSC 351 means that their skills are not sufficiently reinforced. It will be a core course and a pre-requisite for Introduction to Computer Organization (ENSC 254) and Embedded and Real Time System Software (ENSC 351), starting Fall 2014.

SCHEDULING AND ENROLLMENT INFORMATION

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

Annually, starting in Fall 2014

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

What is the probable enrollment when offered? Estimate: 160

CREDITS
Indicate number of credits (units): 4

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

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

Partial list: Lesley Shannon, Craig Scratchley (lecturer), Fabio Campi(lecturer)

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 128 or CMPT 135 or (CMPT 125 and CMPT 127)

COREQUISITE

None

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

A. Given a computing problem, students should be able to: 1) analyze the problem, 2) develop a computing solution that includes the selection of appropriate data types and algorithms, 3) develop a test plan that will successfully verify their proposed solution, 4) implement the computing solution with a cohesive system metaphor , and 5) provide a quantitative verification that their solution is functional.
B. Understand that the execution speed of an application is tied to both their compute platform and the data types they use. They will know how to profile software execution to detect bottlenecks and be able to recommend design changes to improve performance.
C. Students will be comfortable using object-oriented programming models.
D. Able to manage and manipulate data stored in dynamically/statically allocated structures, while properly selecting the appropriate data structure(s) for their application.

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:

Students will need access to software licenses for C++ as well as a computer lab for in-lab tutorials.

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.**

[signature] Feb 20, 2014

Chair, Department/School **Date**

[signature] Feb. 21, 2014

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.**

[signature] Feb. 21, 2014

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.

School of Computing Science's UCC chair, Richard Vaughan, has been extensively consulted with regards to this course proposal and we expect the support and approval of the School of Computing Science in our offering of this course.

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 _____

COURSE SUBJECT/NUMBER ENSC 252

COURSE TITLE

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

Fundamentals in Digital Logic & Design

AND

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

Fund. Digital Logic & Design

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.

~~Introduces the~~ design of digital systems. In particular, students will learn basic digital design concepts including the implementation of synthesizable combinational and sequential logic using HDL and computer based design tools to implement their designs on a FPGA.

REPEAT FOR CREDIT ◉ NO ○ YES How many times? Within a term? ○ YES ○ NO

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

This course introduces students to fudamental to digital logic system design and synthesizable HDL. This course will replace ENSC 150 and incorporate a lab, covering the Hardware Design Language material previously covered in ENSC 250. It will be a prequisite for ENSC 254, Intro to Computer Organization and ENSC 350, Digital System Design.

SCHEDULING AND ENROLLMENT INFORMATION

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

Annually, starting in Fall 2014

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

What is the probable enrollment when offered? Estimate: 160

CREDITS

Indicate number of credits (units): 4

Indicate number of hours for:	Lecture	Seminar	Tutorial	Lab	Other
	3		1	1.5	

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

Partial list: Lesley Shannon, Fabio Campi (lecturer), Atousa Hajshirmohammadi (lecturer)

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 128 or CMPT 125 or CMPT 126 or CMPT 135. Students with credit for ENSC/CMPT 150 or ENSC 329/MSE 350 cannot take this course for further credit.

COREQUISITE

None

STUDENT LEARNING OUTCOMES

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

- Describe a combinational circuit using a truth table and then optimize the Sum of Products/Product of Sums using Shannon's Expansion or Karnaugh Maps.
-Create a sequential circuit (state machine) that can be used to control a datapath without race conditions
- Create an appropriate set of test vectors and use a simulation tool to debug the behaviour of their design.
-Understand how to add additional logic to a design to be able to debug it on a FPGA.
-Take a basic design problem and create a synthesizable HDL solution

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:

Students will need access to computers with FPGA CAD tools and FPGA boards.

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.**

Feb 20, 2014

Chair, Department/School **Date**

Feb. 21, 2014

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.**

Feb. 21, 2014

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 _____

COURSE SUBJECT/NUMBER ENSC 254

COURSE TITLE

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

Introduction to Computer Organization

AND

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

Intro to Computer Org

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.

~~An introduction to the~~ Fundamentals of microprocessor architecture and operation; this includes instruction formats, assembly language programming (procedures and parameter passing, interrupts, etc), and memory and I/O port interfaces.

REPEAT FOR CREDIT ◉ NO ○ YES How many times? Within a term? ○ YES ○ NO

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

This course will replace ENSC 250 and ENSC 215 and will provide a more cohesive and coherent learning flow for the underlying structure and operation of computer systems. Unlike ENSC 250, it will have a lab component. The Hardware Description Language material will be moved to the Fundamentals in Digital Logic & Design, ENSC 252.

SCHEDULING AND ENROLLMENT INFORMATION

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

Annually, starting in Spring 2015

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

What is the probable enrollment when offered? Estimate: 160

CREDITS
Indicate number of credits (units): 4

Indicate number of hours for:	Lecture	Seminar	Tutorial	Lab	Other
	3		1	1.5	

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

Partial list: Lesley Shannon, Craig Scratchley, Fabio Campi

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.**

ENSC 251, ENSC 252. Students with credit for ENSC/CMPT 250 or ENSC 329/MSE 350 cannot take this course for further credit.

COREQUISITE

None

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

-Students will be able to write assembly subroutines.
-Students will be able to design memory interfaces.
-Students will be able to configure, and read and write to both serial and parallel data peripherals
-Students will be able to access peripherals through polling and interrupts
-Students will be able to both interpret and create block diagrams for different RISC and CISC processor architectures, understanding basic optimizations.

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:

Students will need access to computers with the appropriate design tools for the assembly flow and lab kits (boards) with a processor system that they can program.

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.**

Feb 20, 2014

Chair, Department/School **Date**

Feb. 21, 2014

Chair, Faculty Curriculum Committee **Date**

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Feb. 21, 2014

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 _____

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MEMORANDUM

ATTENTION	Senate Committee on Undergraduate Studies	**DATE**	February 24, 2014
FROM	Ed Park, Associate Dean	**PAGES**	
RE:	Curriculum Changes for ENSC		

The School of Engineering Science (ENSC) proposes a new common second-year curriculum (Phase II) for Fall 2014 for all the engineering science options:

Engineering Science Major, Computer Engineering Option
Engineering Science Major, Electronics Engineering Option
Engineering Science Major, Systems Option
Engineering Science Honours, Biomedical Engineering Option
Engineering Science Honours, Computer Engineering Option
Engineering Science Honours, Electronics Engineering Option
Engineering Science Honours, Engineering Physics Option
Engineering Science Honours, Systems Option

The rationale behind this is to (i) reinforce a stronger cohort experience resulting from the common first year curriculum (Phase I) that was implemented in Fall 2013, (ii) delay the need for students to choose which option they will pursue until the third-year, and (iii) modernize the core computer engineering curriculum presented to all the options. In order to support this, a new second year sequence is being proposed for the computer engineering courses by adding the following new courses:

ENSC 251-4: Software Design & Analysis for Engineers
ENSC 252-4: Fundamentals in Digital Logic & Design
ENSC 254-4: Introduction to Computer Organization

Also included in the package are related course changes to: ENSC 100/100W, ENSC 220, ENSC 225, ENSC 320, ENSC 350, and ENSC 351.

Thank you,

Edward Park
Associate Dean

Engineering Science Curriculum Revision: Year 2

Faculty of Applied Sciences Curriculum Committee

Lesley Shannon
February 4, 2014

Introduction

The School of Engineering Science proposes a new common second-year curriculum for all the engineering science options, with the exclusion of one course in the second semester of second year. The essence of the proposal is to reinforce the stronger cohort experience resulting from the common first year curriculum, delay the need for students to choose which option they will pursue, and modernize the core computer engineering curriculum presented to all of the options. To this end, we have introduced a new second year sequence for our computer engineering courses: ENSC 251 on software analysis & design for engineers to reinforce the learning outcomes from CMPT 128; and ENSC 252 as an introduction to the fundamentals of digital logic & design followed by ENSC 254, which provides an introduction to computer organization. ENSC 252 & ENSC 254 will replace the previous ENSC 150, ENSC 215, and ENSC 250 sequence.

Furthermore, the necessary material has been added to ENSC 251 and ENSC 252 to ensure that all of the MACM 101 learning outcomes have been covered by the end of this sequence. This will enable all of our students to take CMPT 225 and any other course with MACM 101 as a pre-requisite. This is of particular value to our Biomedical Option students as they currently receive a MACM 101 waiver for CMPT 225 without having achieved all of MACM 101's learning outcomes. This proposed change in sequence has been developed in consultation with CMPT UPC chair. We have worked with instructors of MACM 101 to obtain a list of all the learning outcomes for MACM 101 to ensure that all of them have been incorporated into the proposed course sequence and we have provided all of the materials regarding the request for a MACM 101 waiver to the CMPT UPC. We have also consulted Math regarding a MACM 101 waiver for MACM 201, providing a detailed breakdown of how the learning outcomes necessary for MACM 201 will be provided in the new curriculum. Please note that this proposal only covers the second year of the School of Engineering Science's curriculum revision and is to be viewed in combination with the new first year curriculum presented last year. The revision of the third and fourth year portion of the curriculum will be provided at the end of this year. Both the future third year portion of the curriculum revision and the existing third and fourth year calendar descriptions will easily integrate with the material proposed herein, ensuring that students are able to easily follow either last year's calendar or the new calendar to complete their degree.

1. New course proposals:
   a) ENSC 251-4 Software Design & Analysis for Engineers
   b) ENSC 252-4 Fundamentals in Digital Logic & Design
   c) ENSC 254-4 Introduction to Computer Organization
2. The new course proposals and outlines are attached.
3. Course prerequisite changes: ENSC100/100W, ENSC 220, ENSC 225, and ENSC 351
4. Course credit hour count: ENSC 320 and ENSC 350
5. Revisions to each of the ENSC options as shown below.
   a) Changes to the Engineering Science Major, Computer Engineering Option
   b) Changes to the Engineering Science Major, Electronics Engineering Option

c) Changes to the Engineering Science Major, Systems Option
d) Changes to Engineering Science Honours, Biomedical Engineering Option
e) Changes to Engineering Science Honours, Computer Engineering Option
f) Changes to Engineering Science Honours, Electronics Engineering Option
g) Changes to Engineering Science Honours, Engineering Physics Option
h) Changes to Engineering Science Honours, Systems Option

Summary of changes to ***each*** option (with and without honours)

For all options, the updates to the calendar text reflect the addition of the new core courses ENSC 251, ENSC 252, and ENSC 254, along with the removal of ENSC 150, ENSC 215, and ENSC 250. The final offerings of the removed courses are, respectively: ENSC 150- Spring 2013; ENSC 215- Summer 2014; and ENSC- 250 Summer 2014. For each option, the change in credit hours for ENSC 320 has also been indicated. Finally, for all of the options, ENSC 280 has been added to the curriculum while STATS 270 is deleted from the curriculum.

Changes to the Engineering Science Major, Computer Engineering Option

The additional changes to the calendar specific to this option reflect: the changes in credit hours for ENSC 350; the name change for ENSC 351; and the deletion of MACM 101 from the curriculum.

Current

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- CMPT 225 Data Structures and Programming (3)
- CMPT 275 Software Engineering I (4)
- CMPT 300 Operating Systems I (3)
- ECON 103 Principles of Microeconomics (4)
- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments and Measurement Techniques (2)
- ~~ENSC 150 Introduction to Computer Design (3)~~
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)

Proposed

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- CMPT 225 Data Structures and Programming (3)
- CMPT 275 Software Engineering I (4)
- CMPT 300 Operating Systems I (3)
- ECON 103 Principles of Microeconomics (4)
- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments and Measurement Techniques(2)
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)

- ENSC 204 Graphical Communication for Engineering (1)
- ~~ENSC 215 Microcontroller Interfacing and Assembly Language Programming (3)~~
- ENSC 220 Electric Circuits I (3)
- ENSC 224 Electronic Devices (3)
- ENSC 225 Microelectronics I (4)
- ~~ENSC 250 Introduction to Computer Architecture (3)~~
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II ~~(3)~~
- ENSC 325 Microelectronics II (4)
- ENSC 327 Communication Systems (4)
- ENSC 350 Digital Systems Design ~~(3)~~
- ENSC 351 Real Time and Embedded Systems (4)
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)
- ENSC 450 VLSI Systems Design (4)
- ~~MACM 101 Discrete Mathematics I (3)~~
- MACM 201 Discrete Mathematics II (3)
- MACM 316 Numerical Analysis I (3)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics * (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism * (4)
- ~~STAT 270 Introduction to Probability and Statistics (3)~~

- ENSC 220 Electric Circuits I (3)
- ENSC 224 Electronic Devices (3)
- ENSC 225 Microelectronics I (4)
- **ENSC 251 Software Design & Analysis for Engineers (4)**
- **ENSC 252 Fundamentals in Digital Logic & Design (4)**
- **ENSC 254 Introduction to Computer Organization (4)**
- **ENSC 280 Engineering Measurement and Data Analysis (3)**
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II **(4)**
- ENSC 325 Microelectronics II (4)
- ENSC 327 Communication Systems (4)
- ENSC 350 Digital Systems Design **(4)**
- ENSC 351 **Embedded and Real Time System Software (4)**
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)
- ENSC 450 VLSI Systems Design (4)
- MACM 201 Discrete Mathematics II (3)
- MACM 316 Numerical Analysis I (3)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism (4)

Changes to the Engineering Science Major, Electronics Engineering Option

The additional changes to the calendar specific to this option reflect: the changes in credit hours for ENSC 350; and the name change for ENSC 351.

Current

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- ECON 103 Principles of Microeconomics (4)
- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments and Measurement Techniques (2)
- ~~ENSC 150 Introduction to Computer Design (3)~~
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ~~ENSC 215 Microcontroller Interfacing and Assembly Language Programming (3)~~
- ENSC 220 Electric Circuits I (3)
- ENSC 224 Electronic Devices (3)
- ENSC 225 Microelectronics I (4)
- ~~ENSC 250 Introduction to Computer Architecture (3)~~
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II ~~(3)~~
- ENSC 325 Microelectronics II (4)
- ENSC 327 Communication Systems (4)
- ENSC 330 Engineering Materials (4)
- ENSC 350 Digital Systems Design ~~(3)~~
- ENSC 351 Real Time and Embedded Systems (4)
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 406 Engineering Ethics, Law, and

Proposed

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- ECON 103 Principles of Microeconomics (4)
- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments and Measurement Techniques (2)
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ENSC 220 Electric Circuits I (3)
- ENSC 224 Electronic Devices (3)
- ENSC 225 Microelectronics I (4)
- **ENSC 251 Software Design & Analysis for Engineers (4)**
- **ENSC 252 Fundamentals in Digital Logic & Design (4)**
- **ENSC 254 Introduction to Computer Organization (4)**
- **ENSC 280 Engineering Measurement and Data Analysis (3)**
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II **(4)**
- ENSC 325 Microelectronics II (4)
- ENSC 327 Communication Systems (4)
- ENSC 330 Engineering Materials (4)
- ENSC 350 Digital Systems Design **(4)**
- ENSC 351 **Embedded and Real Time System Software** (4)
- ENSC 380 Linear Systems (3)

Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)
- MACM 316 Numerical Analysis I (3)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)
- MATH 254 Vector and Complex Analysis for Applied Sciences (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics * (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism * (4)
- PHYS 321 Intermediate Electricity and Magnetism (3)
- PHYS 421 Electromagnetic Waves (3)
- ~~STAT 270 Introduction to Probability and Statistics (3)~~

- ENSC 383 Feedback Control Systems (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)
- MACM 316 Numerical Analysis I (3)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)
- MATH 254 Vector and Complex Analysis for Applied Sciences (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism (4)
- PHYS 321 Intermediate Electricity and Magnetism (3)
- PHYS 421 Electromagnetic Waves (3)

Changes to the Engineering Science Major, Systems Option

The additional changes to the calendar specific to this option reflect: the name change for ENSC 351; and the deletion of MACM 101 from the curriculum.

Current

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- CMPT 225 Data Structures and Programming (3)
- ECON 103 Principles of Microeconomics

Proposed

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- CMPT 225 Data Structures and Programming (3)
- ECON 103 Principles of Microeconomics

(4)

- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments and Measurement Techniques (2)
- ~~ENSC 150 Introduction to Computer Design (3)~~
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ~~ENSC 215 Microcontroller Interfacing and Assembly Language Programming (3)~~
- ENSC 220 Electric Circuits I (3)
- ENSC 225 Microelectronics I (4)
- ENSC 230 Introduction to Mechanical Design (4)
- ~~ENSC 250 Introduction to Computer Architecture (3)~~
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II ~~(3)~~
- ENSC 325 Microelectronics II (4)
- ENSC 330 Engineering Materials (4)
- ENSC 351 Real Time and Embedded Systems (4)
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 387 Introduction to Electro-Mechanical Sensors and Actuators (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)
- ENSC 483 Modern Control Systems (4)
- ENSC 488 Introduction to Robotics (4)
- ENSC 489 Computer Aided Design and Manufacturing (4)
- ~~MACM 101 Discrete Mathematics I (3)~~
- MACM 316 Numerical Analysis I (3)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)

(4)

- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments and Measurement Techniques (2)
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ENSC 220 Electric Circuits I (3)
- ENSC 225 Microelectronics I (4)
- ENSC 230 Introduction to Mechanical Design (4)
- **ENSC 251 Software Design & Analysis for Engineers (4)**
- **ENSC 252 Fundamentals in Digital Logic & Design (4)**
- **ENSC 254 Introduction to Computer Organization (4)**
- **ENSC 280 Engineering Measurement and Data Analysis (3)**
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II **(4)**
- ENSC 325 Microelectronics II (4)
- ENSC 330 Engineering Materials (4)
- ENSC 351 **Embedded and Real Time System Software** (4)
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 387 Introduction to Electro-Mechanical Sensors and Actuators (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)
- ENSC 483 Modern Control Systems (4)
- ENSC 488 Introduction to Robotics (4)
- ENSC 489 Computer Aided Design and Manufacturing (4)
- MACM 316 Numerical Analysis I (3)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)

- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics * (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism * (4)
- PHYS 221 Electromagnetics (3)
- ~~STAT 270 Introduction to Probability and Statistics (3)~~

- MATH 251 Calculus III (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism (4)
- PHYS 221 Electromagnetics (3)

Changes to Engineering Science Honours, Biomedical Engineering Option

The additional changes to the calendar specific to this option reflect: the changes in credit hours for ENSC 350.

Current

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CHEM 180 The Chemistry of Life (3)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- CMPT 225 Data Structures and Programming (3)
- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments and Measurement Techniques (2)
- ~~ENSC 150 Introduction to Computer Design (3)~~
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ~~ENSC 215 Microcontroller Interfacing and~~

Proposed

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CHEM 180 The Chemistry of Life (3)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- CMPT 225 Data Structures and Programming (3)
- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments (2)
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ENSC 220 Electric Circuits I (3)
- ENSC 225 Microelectronics I (4)
- **ENSC 251 Software Design & Analysis for Engineers (4)**

~~Assembly Language Programming (3)~~	**ENSC 252 Fundamentals in Digital Logic & Design (4)**
ENSC 220 Electric Circuits I (3)	**ENSC 254 Introduction to Computer Organization (4)**
ENSC 225 Microelectronics I (4)	**ENSC 280 Engineering Measurement and Data Analysis (3)**
~~ENSC 250 Introduction to Computer Architecture (3)~~	ENSC 304 Human Factors and Usability Engineering (1)
ENSC 304 Human Factors and Usability Engineering (1)	ENSC 305 Project Documentation and Team Dynamics (1)
ENSC 305 Project Documentation and Team Dynamics (1)	ENSC 320 Electric Circuits II **(4)**
ENSC 320 Electric Circuits II ~~(3)~~	ENSC 330 Engineering Materials (4)
ENSC 330 Engineering Materials (4)	ENSC 350 Digital Systems Design **(4)**
ENSC 350 Digital Systems Design ~~(3)~~	ENSC 370 Biomedical Engineering Directions (3)
ENSC 370 Biomedical Engineering Directions (3)	ENSC 372 Biomedical Instrumentation (4)
ENSC 372 Biomedical Instrumentation (4)	ENSC 380 Linear Systems (3)
ENSC 380 Linear Systems (3)	ENSC 383 Feedback Control Systems (4)
ENSC 383 Feedback Control Systems (4)	ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
ENSC 406 Engineering Ethics, Law, and Professional Practice (2)	ENSC 440 Capstone Engineering Science Project (4)
ENSC 440 Capstone Engineering Science Project (4)	ENSC 498 Engineering Science Thesis Proposal (3)
ENSC 498 Engineering Science Thesis Proposal (3)	ENSC 499 Engineering Science Undergraduate Thesis (9)
ENSC 499 Engineering Science Undergraduate Thesis (9)	GERO 300 Introduction to Gerontology * (3)
GERO 300 Introduction to Gerontology * (3)	BPK 201 Biomechanics (3)
BPK 201 Biomechanics (3)	BPK 208 Introduction to Physiological Systems (3)
BPK 208 Introduction to Physiological Systems (3)	BPK 308 Experiments and Models in Systems Physiology (3)
BPK 308 Experiments and Models in Systems Physiology (3)	MACM 316 Numerical Analysis I (3)
MACM 316 Numerical Analysis I (3)	MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)	MATH 152 Calculus II (3)
MATH 152 Calculus II (3)	MATH 232 Applied Linear Algebra (3)
MATH 232 Applied Linear Algebra (3)	MATH 251 Calculus III (3)
MATH 251 Calculus III (3)	MATH 254 Vector and Complex Analysis for Applied Sciences (3)
MATH 254 Vector and Complex Analysis for Applied Sciences (3)	MATH 310 Introduction to Ordinary Differential Equations (3)
MATH 310 Introduction to Ordinary Differential Equations (3)	PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics (4)
PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics ** (4)	PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and
PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism ** (4)	

- PHYS 321 Intermediate Electricity and Magnetism (3)
- ~~STAT 270 Introduction to Probability and Statistics (3)~~

*or any B-Soc course

- Magnetism (4)
- PHYS 321 Intermediate Electricity and Magnetism (3)

*or any B-Soc course

Changes to Engineering Science Honours, Computer Engineering Option

The additional changes to the calendar specific to this option reflect: the changes in credit hours for ENSC 350; the name change for ENSC 351; and the deletion of MACM 101 from the curriculum.

Current

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- CMPT 225 Data Structures and Programming (3)
- CMPT 275 Software Engineering I (4)
- CMPT 300 Operating Systems I (3)
- ECON 103 Principles of Microeconomics (4)
- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments and Measurement Techniques (2)
- ~~ENSC 150 Introduction to Computer Design (3)~~
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ~~ENSC 215 Microcontroller Interfacing and Assembly Language Programming (3)~~
- ENSC 220 Electric Circuits I (3)
- ENSC 224 Electronic Devices (3)
- ENSC 225 Microelectronics I (4)

Proposed

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- CMPT 225 Data Structures and Programming (3)
- CMPT 275 Software Engineering I (4)
- CMPT 300 Operating Systems I (3)
- ECON 103 Principles of Microeconomics (4)
- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments (2)
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ENSC 220 Electric Circuits I (3)
- ENSC 224 Electronic Devices (3)
- ENSC 225 Microelectronics I (4)
- **ENSC 251 Software Design & Analysis for Engineers (4)**
- **ENSC 252 Fundamentals in Digital Logic & Design (4)**
- **ENSC 254 Introduction to Computer**

- ~~ENSC 250 Introduction to Computer Architecture (3)~~
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II ~~(3)~~
- ENSC 325 Microelectronics II (4)
- ENSC 327 Communication Systems (4)
- ENSC 350 Digital Systems Design ~~(3)~~
- ENSC 351 Real Time and Embedded Systems (4)
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)
- ENSC 450 VLSI Systems Design (4)
- ENSC 498 Engineering Science Thesis Proposal (3)
- ENSC 499 Engineering Science Undergraduate Thesis (9)
- ~~MACM 101 Discrete Mathematics I (3)~~
- MACM 201 Discrete Mathematics II (3)
- MACM 316 Numerical Analysis I (3)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics * (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism * (4)
- ~~STAT 270 Introduction to Probability and Statistics (3)~~

Organization (4)

- **ENSC 280 Engineering Measurement and Data Analysis (3)**
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II **(4)**
- ENSC 325 Microelectronics II (4)
- ENSC 327 Communication Systems (4)
- ENSC 350 Digital Systems Design **(4)**
- ENSC 351 **Embedded and Real Time System Software** (4)
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)
- ENSC 450 VLSI Systems Design (4)
- ENSC 498 Engineering Science Thesis Proposal (3)
- ENSC 499 Engineering Science Undergraduate Thesis (9)
- MACM 201 Discrete Mathematics II (3)
- MACM 316 Numerical Analysis I (3)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism (4)

Changes to Engineering Science Honours, Electronics Engineering Option

The additional changes to the calendar specific to this option reflect: the changes in credit hours

for ENSC 350; the name change for ENSC 351.

Current

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- ECON 103 Principles of Microeconomics (4)
- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments and Measurement Techniques (2)
- ~~ENSC 150 Introduction to Computer Design (3)~~
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ~~ENSC 215 Microcontroller Interfacing and Assembly Language Programming (3)~~
- ENSC 220 Electric Circuits I (3)
- ENSC 224 Electronic Devices (3)
- ENSC 225 Microelectronics I (4)
- ~~ENSC 250 Introduction to Computer Architecture (3)~~
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II ~~(3)~~
- ENSC 325 Microelectronics II (4)
- ENSC 327 Communication Systems (4)
- ENSC 330 Engineering Materials (4)
- ENSC 350 Digital Systems Design ~~(3)~~
- ENSC 351 Real Time and Embedded Systems (4)
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)

Proposed

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- ECON 103 Principles of Microeconomics (4)
- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments (2)
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ENSC 220 Electric Circuits I (3)
- ENSC 224 Electronic Devices (3)
- ENSC 225 Microelectronics I (4)
- **ENSC 251 Software Design & Analysis for Engineers (4)**
- **ENSC 252 Fundamentals in Digital Logic & Design (4)**
- **ENSC 254 Introduction to Computer Organization (4)**
- **ENSC 280 Engineering Measurement and Data Analysis (3)**
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II **(4)**
- ENSC 325 Microelectronics II (4)
- ENSC 327 Communication Systems (4)
- ENSC 330 Engineering Materials (4)
- ENSC 350 Digital Systems Design **(4)**
- ENSC 351 **Embedded and Real Time System Software** (4)
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science

- ENSC 498 Engineering Science Thesis Proposal (3)
- ENSC 499 Engineering Science Undergraduate Thesis (9)
- MACM 316 Numerical Analysis I (3)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)
- MATH 254 Vector and Complex Analysis for Applied Sciences (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics * (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism * (4)
- PHYS 321 Intermediate Electricity and Magnetism (3)
- PHYS 421 Electromagnetic Waves (3)
- ~~STAT 270 Introduction to Probability and Statistics (3)~~

Project (4)

- ENSC 498 Engineering Science Thesis Proposal (3)
- ENSC 499 Engineering Science Undergraduate Thesis (9)
- MACM 316 Numerical Analysis I (3)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)
- MATH 254 Vector and Complex Analysis for Applied Sciences (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism (4)
- PHYS 321 Intermediate Electricity and Magnetism (3)
- PHYS 421 Electromagnetic Waves (3)

Changes to Engineering Science Honours, Engineering Physics Option

The additional changes to the calendar specific to this option reflect: the name change for ENSC 351.

Current

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- ECON 103 Principles of Microeconomics (4)
- ENSC 100 Engineering Technology and

Proposed

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- ECON 103 Principles of Microeconomics (4)
- ENSC 100 Engineering Technology and

Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments and Measurement Techniques (2)
- ~~ENSC 150 Introduction to Computer Design (3)~~
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ~~ENSC 215 Microcontroller Interfacing and Assembly Language Programming (3)~~
- ENSC 220 Electric Circuits I (3)
- ENSC 225 Microelectronics I (4)
- ~~ENSC 250 Introduction to Computer Architecture (3)~~
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II ~~(3)~~
- ENSC 325 Microelectronics II (4)
- ENSC 327 Communication Systems (4)
- ENSC 351 Real Time and Embedded Systems (4)
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)
- ENSC 498 Engineering Science Thesis Proposal (3)
- ENSC 499 Engineering Science Undergraduate Thesis (9)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)
- MATH 254 Vector and Complex Analysis for Applied Sciences (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics * (4)

Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments (2)
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ENSC 220 Electric Circuits I (3)
- ENSC 225 Microelectronics I (4)
- **ENSC 251 Software Design & Analysis for Engineers (4)**
- **ENSC 252 Fundamentals in Digital Logic & Design (4)**
- **ENSC 254 Introduction to Computer Organization (4)**
- **ENSC 280 Engineering Measurement and Data Analysis (3)**
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II **(4)**
- ENSC 325 Microelectronics II (4)
- ENSC 327 Communication Systems (4)
- ENSC 351 **Embedded and Real Time System Software** (4)
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)
- ENSC 498 Engineering Science Thesis Proposal (3)
- ENSC 499 Engineering Science Undergraduate Thesis (9)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)
- MATH 254 Vector and Complex Analysis for Applied Sciences (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics

- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism * (4)
- PHYS 211 Intermediate Mechanics (3)
- PHYS 233 Physics Laboratory III (2)
- PHYS 321 Intermediate Electricity and Magnetism (3)
- PHYS 332W Optics Laboratory (4)
- PHYS 344 Thermal Physics (3)
- PHYS 365 Semiconductor Device Physics (3)
- PHYS 384 Methods of Theoretical Physics I (3)
- PHYS 385 Quantum Mechanics I (3)
- PHYS 421 Electromagnetic Waves (3)
- PHYS 455 Modern Optics (3)
- ~~STAT 270 Introduction to Probability and Statistics (3)~~

- Mechanics and Modern Physics (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity, Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism (4)
- PHYS 211 Intermediate Mechanics (3)
- PHYS 233 Physics Laboratory III (2)
- PHYS 321 Intermediate Electricity and Magnetism (3)
- PHYS 332W Optics Laboratory (4)
- PHYS 344 Thermal Physics (3)
- PHYS 365 Semiconductor Device Physics (3)
- PHYS 384 Methods of Theoretical Physics I (3)
- PHYS 385 Quantum Mechanics I (3)
- PHYS 421 Electromagnetic Waves (3)
- PHYS 455 Modern Optics (3)

Changes to Engineering Science Honours, Systems Option

The additional changes to the calendar specific to this option reflect: the name change for ENSC 351: and the deletion of MACM 101 from the curriculum.

Current

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- CMPT 225 Data Structures and Programming (3)
- ECON 103 Principles of Microeconomics (4)
- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments and Measurement Techniques (2)

Proposed

Core Course Requirements

Students complete all of

- CHEM 121 General Chemistry and Laboratory I (4)
- CMPT 128 Introduction to Computing Science and Programming for Engineers (3)
- CMPT 225 Data Structures and Programming (3)
- ECON 103 Principles of Microeconomics (4)
- ENSC 100 Engineering Technology and Society (3)
- ENSC 105W Process, Form and Convention in Professional Genres (3)
- ENSC 120 Introduction to Electronics Laboratory Instruments (2)
- ENSC 180 Introduction to Engineering

- ~~ENSC 150 Introduction to Computer Design (3)~~
- ENSC 180 Introduction to Engineering Analysis (3)
- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ~~ENSC 215 Microcontroller Interfacing and Assembly Language Programming (3)~~
- ENSC 220 Electric Circuits I (3)
- ENSC 225 Microelectronics I (4)
- ENSC 230 Introduction to Mechanical Design (4)
- ~~ENSC 250 Introduction to Computer Architecture (3)~~
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II ~~(3)~~
- ENSC 325 Microelectronics II (4)
- ENSC 330 Engineering Materials (4)
- ENSC 351 Real Time and Embedded Systems (4)
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 387 Introduction to Electro-Mechanical Sensors and Actuators (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)
- ENSC 483 Modern Control Systems (4)
- ENSC 488 Introduction to Robotics (4)
- ENSC 489 Computer Aided Design and Manufacturing (4)
- ~~MACM 101 Discrete Mathematics I (3)~~
- MACM 316 Numerical Analysis I (3)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics * (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity,

Analysis (3)

- ENSC 201 The Business of Engineering (3)
- ENSC 204 Graphical Communication for Engineering (1)
- ENSC 220 Electric Circuits I (3)
- ENSC 225 Microelectronics I (4)
- ENSC 230 Introduction to Mechanical Design (4)
- **ENSC 251 Software Design & Analysis for Engineers (4)**
- **ENSC 252 Fundamentals in Digital Logic & Design (4)**
- **ENSC 254 Introduction to Computer Organization (4)**
- **ENSC 280 Engineering Measurement and Data Analysis (3)**
- ENSC 304 Human Factors and Usability Engineering (1)
- ENSC 305 Project Documentation and Team Dynamics (1)
- ENSC 320 Electric Circuits II **(4)**
- ENSC 325 Microelectronics II (4)
- ENSC 330 Engineering Materials (4)
- ENSC 351 **Embedded and Real Time System Software** (4)
- ENSC 380 Linear Systems (3)
- ENSC 383 Feedback Control Systems (4)
- ENSC 387 Introduction to Electro-Mechanical Sensors and Actuators (4)
- ENSC 406 Engineering Ethics, Law, and Professional Practice (2)
- ENSC 440 Capstone Engineering Science Project (4)
- ENSC 483 Modern Control Systems (4)
- ENSC 488 Introduction to Robotics (4)
- ENSC 489 Computer Aided Design and Manufacturing (4)
- MACM 316 Numerical Analysis I (3)
- MATH 151 Calculus I (3) or MATH 150 Calculus I with Review (4)
- MATH 152 Calculus II (3)
- MATH 232 Applied Linear Algebra (3)
- MATH 251 Calculus III (3)
- MATH 310 Introduction to Ordinary Differential Equations (3)
- PHYS 120 Mechanics and Modern Physics (3) or PHYS 125 Mechanics and Special Relativity (3) or PHYS 140 Studio Physics - Mechanics and Modern Physics (4)
- PHYS 121 Optics, Electricity and Magnetism (3) or PHYS 126 Electricity,

Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism * (4)

- PHYS 221 Electromagnetics (3)
- ~~STAT 270 Introduction to Probability and Statistics (3)~~

Magnetism and Light (3) or PHYS 141 Studio Physics - Optics, Electricity and Magnetism (4)

- PHYS 221 Electromagnetics (3)

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
Course Subject/Number ENSC 100/100W

Credits 3

TO
Course Subject/Number ENSC 100/100W

Credits 3

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

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: REQ-Corequisite: ENSC 101.

PREREQUISITE

TO: REQ-Corequisite: ENSC 105W.

LEARNING OUTCOMES

RATIONALE

ENSC 101 is no longer offered and has been replaced by ENSC 105W.

Effective term and year

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
Course Subject/Number ENSC 220

TO
Course Subject/Number ENSC 220

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:

This course will cover the following topics: fundamental electrical circuit quantities, and circuit elements; circuits laws such as Ohm law, Kirchoff's voltage and current laws, along with series and parallel circuits; operational amplifiers; network theorems; nodal and mesh methods; analysis of natural and step response of first (RC and RL), as well as second order (RLC) circuits; real, reactive and rms power concepts. In addition, the course will discuss the worker safety implications of both electricity and common laboratory practices such as soldering. Students with credit for ENSC 125 or MSE 250 cannot take this course for further credit.

DESCRIPTION

TO:

~~Covers the following: This course will cover the following topics:~~ Fundamental electrical circuit quantities and circuit elements; circuits laws such as Ohm law, Kirchoff's voltage and current laws, along with series and parallel circuits; operational amplifiers; network theorems; nodal and mesh methods; analysis of natural and step response of first (RC and RL), as well as second order (RLC) circuits; real, reactive and rms power concepts; introduction to three-phase circuits. This course has a significant laboratory component. Through weekly exercises students learn to build circuits, experiment with, and verify concepts covered in lectures. Safety precautions and health concerns of lead based solder are presented. Students with credit for MSE 250 cannot take this course for further credit.

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: PHYS 121 and 131, or PHYS 126 and PHYS 131, or PHYS 141, and MATH 232 and MATH 310. MATH 232 and/or MATH 310 may be taken concurrently.

PREREQUISITE

TO: (PHYS 121 or PHYS 126 or PHYS 141) and (ENSC 120 or PHYS 131), and MATH 232 and MATH 310. MATH 232 and/or MATH 310 may be taken concurrently.

LEARNING OUTCOMES

RATIONALE

Description Changes:
1- "introduction to three-phase circuits" has been added to the topics. Rationale: In 2007, It was approved by ENSC that this subject be covered in ENSC 220 but the changes were not officially reflected in the calendar.
2- "This course has a significant ... concerns of lead based solder are presented." is replacing "In addition, the course will ... such as soldering.". Rationale: The new sentence reflects the lab excersices more accurately.
3- "ENSC 125" removed from the overlap sentence in the prerequisites. Rationale: This course was eliminated more than 10 years ago.
Pre-requisite Changes:
4- ENSC 120 needs to be added to the pre-requisites since our students now take ENSC 120 in place of PHYS 131.

Effective term and year Fall 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
Course Subject/Number ENSC 220

TO
Course Subject/Number ENSC 220

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:

This course will cover the following topics: fundamental electrical circuit quantities, and circuit elements; circuits laws such as Ohm law, Kirchoff's voltage and current laws, along with series and parallel circuits; operational amplifiers; network theorems; nodal and mesh methods; analysis of natural and step response of first (RC and RL), as well as second order (RLC) circuits; real, reactive and rms power concepts. In addition, the course will discuss the worker safety implications of both electricity and common laboratory practices such as soldering.

DESCRIPTION

TO:

~~Covers the following: This course will cover the following topics:~~ fundamental electrical circuit quantities and circuit elements; circuits laws such as Ohm law, Kirchoff's voltage and current laws, along with series and parallel circuits; operational amplifiers; network theorems; nodal and mesh methods; analysis of natural and step response of first (RC and RL), as well as second order (RLC) circuits; real, reactive and rms power concepts; introduction to three-phase circuits. This course has a significant laboratory component. Through weekly exercises students learn to build circuits, experiment with, and verify concepts covered in lectures. Safety precautions and health concerns of lead based solder are presented.

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: Students with credit for ENSC 125 or MSE 250 cannot take this course for further credit.

PREREQUISITE

TO: Students with credit for MSE 250 cannot take this course for further credit.

LEARNING OUTCOMES

RATIONALE

1- "introduction to three-phase circuits" has been added to the topics. RationaleRationale: In 2007, It was approved by ENSC that this subject be covered in ENSC 220 but the changes were not officially reflected in the calendar.
2- "This course has a significant ... concerns of lead based solder are presented." is replacing "In addition, the course will ... such as soldering.". Rationale: The new sentence reflects the lab excersices more accurately.
3- "ENSC 125" removed from the overlap sentence in the prerequisites. Rationale: This course was eliminated more than 10 years ago.

Effective term and year Fall 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
Course Subject/Number ENSC 225
Credits 4

TO
Course Subject/Number ENSC 225
Credits 4

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

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: ENSC 150 or CMPT 150, ENSC 220, MATH 232, and MATH 310. ~~Quantitative~~.

PREREQUISITE

TO: (ENSC 150 or CMPT 150 or ENSC 252), (ENSC 220 or MSE 250), MATH 232, and MATH 310. ~~Quantitative~~.

LEARNING OUTCOMES

RATIONALE

As of Spring 2013, ENSC 150 is no longer offered and has been replaced in our program by ENSC 252. MSE 250 has been added as an alternate prerequisite for ENSC 220 as it replaces ENSC 220 in the new MSE calendar numbering scheme.

Effective term and year FALL 2014

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
Course Subject/Number ENSC 320
Credits 3

TO
Course Subject/Number ENSC 320
Credits 4

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:

This course is a second course on electric circuits and the topics covered include: the use of Laplace transform in circuit analysis, including poles and zeros, the frequency response and impulse response; convolution as a method for computing circuit responses; resonant and bandpass circuits; magnetically coupled circuits; three-phase circuits; two port circuits; and filtering.

DESCRIPTION

TO:

~~A second course on electric circuits.~~ Topics covered include: use of Laplace transform in circuit analysis, including poles and zeros, frequency response and impulse response; convolution as a method for computing circuit responses; resonant and bandpass circuits; magnetically coupled circuits; two port circuits; and filtering. Also includes a laboratory component dealing with the design and implementation of active filters.

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: ENSC 220, MATH 232, and MATH 310

PREREQUISITE

TO: (ENSC 220 or MSE 250), MATH 232, and MATH 310

LEARNING OUTCOMES

RATIONALE

Credit change: The number of credit hours has been increased to reflect the course workload which includes 3 hours of lecture, one hour of tutorial and a lab component equivalent to 2 hours per week.
Description Change: "This course" has been removed for consistency with SFU course description format. A sentence has been added to the end of the description reflecting the lab component of the course. "three-phased circuits" removed from the course description. Rationale: In 2007 ENSC-UCC had approved that this subject be moved from ENSC 320 to ENSC 220. The change was implemented in practice but was not reflected in the Calendar.
Prerequisite change: MSE 250 has been added as an alternate prerequisite to ENSC 220 as the is the alternate version of the course under the new MSE calendar numbering.

Effective term and year Fall 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 3 Seminar _____ Tutorial 1 Lab 2

FROM
Course Subject/Number ENSC 350
Credits 3

TO
Course Subject/Number ENSC 350
Credits 4

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:

This course deals with advanced topics in digital design such as advanced state machine concepts, asynchronous design, hardware description languages, bus interfacing and DSP architecture. It also covers both the architecture and programming of field programmable logic devices. Some laboratory work is expected.

DESCRIPTION

TO:

Presents advanced topics in digital design such as advanced state machine concepts, asynchronous design, hardware description languages, bus interfacing and DSP architecture. It also covers both the architecture and programming of field programmable logic devices. Some laboratory work is expected.

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:

TO:

LEARNING OUTCOMES

RATIONALE

Credit hours: The number of credit hours has been increased to reflect the course workload which includes 3 hours of lecture, one hour of tutorial and a lab component equivalent to 2 hours/week, and to be consistent with SFU course credit assignment.
Course Description: The phrase "This course" has been removed for consistency with SFU course descriptions.

Effective term and year FALL 2014

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
Course Subject/Number ENSC 351

TO
Course Subject/Number ENSC 351

Credits _____

Credits _____

TITLE

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

FROM:
Real Time and Embedded Systems

TO:
Embedded and Real Time System Software

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

FROM:
Real Time - Embedded Systems

TO:
Embedded & RT System Software

DESCRIPTION

FROM:

This course concentrates on the problems encountered when attempting to use computers in real time (RT) and embedded applications where the computer system must discern the state of the real world and react to it within stringent response time constraints. Both design methodology and practical implementation techniques for RT systems are presented. Although some hardware will be involved, it should be noted that this course concentrates on real time software. Prerequisite: CMPT 128, and either CMPT 250 or ENSC 250, and a minimum of 60 units. ENSC 215 is highly recommended. Students who have taken ENSC 451 cannot take this course for further credit.

DESCRIPTION

TO:

Concentrates on the problems encountered when attempting to use computers in real time (RT) and embedded applications where the computer system must discern the state of the real world and react to it within stringent response time constraints. Both design methodology and practical implementation techniques for RT systems are presented. Although some hardware will be involved, it should be noted that this course concentrates on real time software. Prerequisite: CMPT 128, and either CMPT 250 or ENSC 250, and a minimum of 60 units. Students who have taken ENSC 451/MSE450 cannot take this course for further credit.

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: CMPT 128 and ENSC 250/CMPT 250 and a minimum of 60 credit units.

TO: (CMPT 128 and ENSC 215 and ENSC 250) or ENSC 254, and a minimum of 60 credit units.

LEARNING OUTCOMES

RATIONALE

Title:The course name has been changed to better reflect course content.
Removal of CMPT-250 from Pre-requisites: CMPT- 250 does not always cover the material covered in ENSC-250 and thus is removed from the list of pre-requisites.
Adding "or ENSC 254" to the list of Pre-requisites: A new course ENSC 254 has been proposed which will replace the combination of ENSC 215 and 250. Students with credit for either ENSC 215+ENSC 250 or ENSC 254 can take this course.
Description: "This course" has been removed for consistency with other SFU course descriptions. ENSC-215 is now a pre-requisite to this course and thus the sentence "ENSC-215 is highly recommended" has been removed. MSE 450 has been added as an alternate course which cannot be taken for further credit due to the new MSE calendar numbering scheme.

Effective term and year
FALL 2014

SFU FACULTY OF APPLIED SCIENCES

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MEMORANDUM

ATTENTION	Senate Committee on Undergraduate Studies	**DATE**	February 24, 2014
FROM	Ed Park, Associate Dean	**PAGES**	
RE:	Calendar Revisions for CMPT Programs		

With the proposed introduction of the new core course CMPT 127-3 Computing Laboratory, which was approved by SCUS in February 2014, the School of Computing Science (CMPT) proposes needed calendar revisions for the following programs:

Computing Science Major
Computing Science Honours

and

Geographic Information Systems Major
Geographic Information Systems Honours

For the latter two programs, the proposed changes have been approved by both CMPT and GEOG.

Thank you,

Edward Park
Associate Dean

SFU

School of Computing Science Memorandum

From: Richard Vaughan, Director of Undergraduate Programs
To: Ed Park, FAS Associate Dean
Subject: **Introduction of required laboratory class: calendar wording changes for Fall 2014.**
Date: 23 February, 2014

We submit calendar changes for these programs:

1. Computing Science Major
2. Computing Science Honours

The following pages implement the calendar change language.

These changes have been approved by the CMPT UPC.

Motivation:

In Fall 2014 we introduce the new course CMPT 127-3 Computing Laboratory as a required class for all Computing Science majors. The new class was approved by SCUS.

The substance of the changes is:

1. Add CMPT 127-3 as a required class
2. Remove CMPT 126-3 as an alternative to the CMPT 120, (125 + 127) sequence

Justification:

1. CMPT 127 was created to address students' lack of programming experience early in the program, which was preventing progress in other classes. With the increased popularity of Computing Science, students are entering the program with less experience than in the past.
2. CMPT 126 has been identical to 125 in practice for the last several years. This course will be refreshed and targeted at non-majors only, and disallowed for majors (except by appeal on transfer in to a CMPT program).

Similar changes are planned for our Joint Programs: discussions with partner units began in Fall 2013.

COMPUTING SCIENCE MAJOR
COMPUTING SCIENCE HONOURS

The same changes apply to the wording of both programs

In the section:

PROGRAM REQUIREMENTS
LOWER DIVISION REQUIREMENTS

CURRENT	PROPOSED
~~Students complete either~~	**Students complete all of**
~~CMPT 126 - Introduction to Computing Science and Programming (3) *~~	**CMPT 120 - Introduction to Computing Science and Programming I (3)**
~~or both of~~	**CMPT 125 - Introduction to Computing Science and Programming II (3)**
~~CMPT 120 - Introduction to Computing Science and Programming I (3) *~~	**CMPT 127 - Computing Laboratory**
~~CMPT 125 - Introduction to Computing Science and Programming II (3) *~~	**CMPT 150 - Introduction to Computer Design (3)**
~~and all of~~	**CMPT 225 - Data Structures and Programming (3)**
~~CMPT 150 - Introduction to Computer Design (3)~~	**CMPT 250 - Introduction to Computer Architecture (3)**
~~CMPT 225 - Data Structures and Programming (3)~~	**CMPT 275 - Software Engineering I (4)**
~~CMPT 250 - Introduction to Computer Architecture (3)~~	**MACM 101 - Discrete Mathematics I (3)**
~~CMPT 275 - Software Engineering I (4)~~	**MACM 201 - Discrete Mathematics II (3)**
~~MACM 101 - Discrete Mathematics I (3)~~	
~~MACM 201 - Discrete Mathematics II (3)~~	and one of
and one of	
	MATH 150 - Calculus I with Review (4)
MATH 150 - Calculus I with Review (4)	MATH 151 - Calculus I (3)
MATH 151 - Calculus I (3)	MATH 154 - Calculus I for the Biological Sciences (3) *
MATH 154 - Calculus I for the Biological Sciences (3) **	MATH 157 - Calculus I for the Social Sciences (3) *
MATH 157 - Calculus I for the Social Sciences (3) **	and one of
and one of	
	MATH 152 - Calculus II (3)
MATH 152 - Calculus II (3)	MATH 155 - Calculus II for the Biological Sciences (3) *
MATH 155 - Calculus II for the Biological Sciences (3) **	MATH 158 - Calculus II for the Social Sciences (3) *
MATH 158 - Calculus II for the Social Sciences (3) **	and one of
and one of	
	MATH 232 - Applied Linear Algebra (3)
MATH 232 - Applied Linear Algebra (3)	MATH 240 - Algebra I: Linear Algebra (3)
MATH 240 - Algebra I: Linear Algebra (3)	
	and one of
	STAT 270 - Introduction to Probability and Statistics (3)
	BUEC 232 - Data and Decisions I (4)

EXISTING TEXT CONTINUED	**NEW TEXT CONTINUED**
and one of STAT 270 - Introduction to Probability and Statistics (3) BUEC 232 - Data and Decisions I (4) ~~* to aid your choice, prior to enrolment, consult an Applied Sciences Advisor.~~ ~~*~~** with a grade of at least B+, and with school permission.	* with a grade of at least B+ and with school permission.

SFU

School of Computing Science Memorandum

From: Richard Vaughan, Director of Undergraduate Programs
To: Ed Park, FAS Associate Dean
Subject: **Introduction of required laboratory class: calendar wording changes for Fall 2014.**
Date: 23 February, 2014

We submit calendar changes for these programs:

1. Geographic Information Systems Major
2. Geographic Information Systems Honours

The following pages implement the calendar change language.

These changes have been approved by the CMPT and GEOG UPCs. See attached email from GEOG UPC Chair.

Motivation:

In Fall 2014 we introduce the new course CMPT 127-3 Computing Laboratory as a required class for all Computing Science majors and some Joint Majors and related programs. The new class was approved by SCUS.

CMPT and GEOG have also agreed that the GIS major should allow CMPT 130 and 135 as alternate introductory classes.

The substance of the changes is:

1. Add CMPT 127-3 as a required class
2. Remove CMPT 126-3 as an alternative to the CMPT 120, (125 + 127) sequence
3. Add CMPT 130 and CMPT 135 as an alternate sequence of introductory classes.

Justification:

1. CMPT 127 was created to address students' lack of programming experience early in the program, which was preventing progress in other classes. With the increased popularity of Computing Science, students are entering the program with less experience than in the past.
2. CMPT 126 has been identical to 125 in practice for the last several years. This course will be refreshed and targeted at non-majors only, and disallowed for majors (except by appeal on transfer in to a CMPT program).
3. to facilitate transfer from the Surrey-based Software Systems program, which has CMPT 130 and 135 as required classes.

GEOGRAPHIC INFORMATION SYSTEMS MAJOR
GEOGRAPHIC INFORMATION SYSTEMS HONOURS

<u>The same changes apply to the wording of both programs</u>

In the section:

PROGRAM REQUIREMENTS
LOWER DIVISION REQUIREMENTS

CURRENT	PROPOSED
(...)	(...)
~~and either both of~~	**and either all of**
~~CMPT 120 - Introduction to Computing Science and Programming I (3)~~ ~~CMPT 125 - Introduction to Computing Science and Programming II (3)~~	**CMPT 120 Introduction to Computing Science and Programming I (3)** **CMPT 125 Introduction to Computing Science and Programming II (3)** **CMPT 127 Computing Laboratory (3)**
~~or~~	**or both of**
~~CMPT 126 - Introduction to Computing Science and Programming (3)~~	**CMPT 130 Introduction to Computer Programming I (3)** **CMPT 135 Introduction to Computer Programming II (3)**
(...)	(...)