

OFFICE OF THE ASSOCIATE VICE-PRESIDENT, ACADEMIC

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Undergraduate Studies

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MEMORANDUM ATTENTION Senate FROM Gordon Myers, Chair Senate Committee on

DATE PAGES March 6, 2015 1/1

For information:

RE:

Acting under delegated authority at its meeting of March 5, 2015 SCUS approved the following curriculum revisions effective Fall 2015.

Faculty of Applied Sciences (SCUS 15-10)

1. School of Computing Science (SCUS 15-10a)

(i) Description change for CMPT 165

- (ii) New Course Proposal: CMPT 295-3, Introduction to Computer Systems
- (iii) Lower Division requirement changes to the Computing Science Major Program
- (iv) Lower Division requirement changes to the Computing Science Honours Program
- (v) Lower Division requirement changes to the Software Systems Major Program
- (vi) Upper and Lower Division requirement changes to the Computing Science and Linguistics Joint Major Program
- (vii) Upper and Lower Division requirement changes to the Molecular Biology and Biochemistry and Computing Science Joint Major
- (viii) Upper and Lower Division requirement changes to the Molecular Biology and Biochemistry and Computing Science Joint Honours Program



FACULTY OF APPLIED SCIENCES

| | OFFICE OF THE DEAN 8888 University Drive, Burnaby, BC Canada V5A 1S6 | TEL: 778.782.47 FAX: 778.782.58 | 24 802 | www.fas.sfu.ca |
|-----------|--|------------------------------------|-----------|-------------------|
| MEMORANDU | Μ | | | |
| ATTENTION | Senate Committee on Undergraduate | Studies | DATE | February 20, 2015 |
| FROM | Ed Park, Associate Dean | | PAGES | |
| RE: | Curriculum Changes | | | |

The following changes have been approved by the FAS Undergraduate Curriculum Committee and are appended here for approval by SCUS and recommendation to Senate.

- 1.) School of Computing Science
 - a. Course Description Changes
 - CMPT 165
 - a. New Course Proposal
 - CMPT 295

b. Calendar Changes

- Computing Science Major
 - 1. Replace CMPT 275 with CMPT 276.
 - 2. Replace CMPT 150 with CMPT 295
- Computing Honours Program
 - 1. Replace CMPT 275 with 276
 - 2. Replace CMPT 150 and 250 with CMPT 295
- Software Systems Major
 - 1. Replace CMPT 150 and 250 with CMPT 295
- · Computing Science and Linguistics Joint Major
 - 1. Add CMPT 127-3 as a required class
 - 2. Remove CMPT 126-3 as an alternative to the CMPT 120, (125 + 127) sequence
 - Add CMPT 130 and CMPT 135 as an alternate sequence of introductory classes
 - 4. Replace CMPT 275 with CMPT 276
 - 5. Change language in Computing Science upper division requirements to clarify
 - 6. Replace CMPT 150 with CMPT 295
- Computing Science and Molecular Biology and Biochemistry Joint Major
 - 1. Add CMPT 127-3 as a required class
 - 2. Remove CMPT 126-3 as an alternative to the CMPT 120, (125 + 127) sequence

1

- 3. Add CMPT 130 and CMPT 135 as an alternate sequence of introductory classes
- 4. Replace CMPT 275 with CMPT 276
- 5. Add MATH 232 or MATH 240 as a lower division requirement
- 6. Replace CMPT 150 with CMPT 295
- 7. Replace MBB 442 with MBB 463
- Computing Science and Molecular Biology and Biochemistry Joint Honours
 - 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
 - 4. Replace CMPT 275 with CMPT 276
 - 5. Add MATH 232 or MATH 240 as a lower division requirement
 - 6. Replace CMPT 150 with CMPT 295
 - 7. Replace MBB 442 with MBB 463

Thank you,

Edward Park Associate Dean

(EP/mt)

| SFU | SENATE COMMITTEE UNDERGRADUATE ST | ON ON ODIES | | COURSE | CHANGE/DELETION |
|---|--|--|--|--|--|
| EXISTING COURSE, CHANGES | RECOMMENDED | | | | |
| Please check appropriate revision(s |): | | | | |
| Course number Credit | Title Descript | tion Pr | rerequisite | Course deletion | Learning Outcomes |
| Indicate number of hours for: Lec | ture Se | eminar | | Tutorial | Lab |
| FROM Course Subject/Number | Г 165 | | TO Course Subje | ect/Number | |
| Credits | | | Credits | | |
| TITLE (1) LONG title for calendar and so FROM: | chedule, no more than 100 c | characters incl | uding spaces TO: | and punctuation. | |
| (2) SHORT title for enrollment ar FROM: | nd transcript, no more than . | 30 characters | including spa TO: | ices and punctuation. | |
| DESCRIPTION FROM: | | | DESCRIPTI TO: | ON | |
| In this course, we shall examine the World Wide Web as well as design who have obtained credit for, or a course at the 200 division or high 267 may not take CMPT 165 for the course of | the structure of the Internet on and create web sites. Stu are currently enrolled in a C ler, CMPT 118 or 170, or IA further credit. Breadth-Scier | and the udents MPT T 265 or nce. | World Wide with credit f 200 divisior may not tak | We shall examine the Web as well as design or, or who are currently or higher, CMPT 125 as CMPT 165 for further | he structure of the Internet and the n and create web sites. Students y enrolled in a CMPT course at the , 135 or 170, or IAT 265 or 267 er credit. Breadth-Science. |
| PREREQUISITE | | | PREREQUIS | SITE | |
| Does this course replicate the cont If so, this should be noted in the | tent of a previously approved prerequisite. | d course to su | ch an extent | that students should no | t receive credit for both courses? |
| FROM: | F1 | | то: | | |
| LEARNING OUTCOMES | | | | | |

RATIONALE

CMPT 165 is an introductory course with some programming. It is not considered appropriate for students who have completed the second course in one of the two streams of first year programming courses (i.e. CMPT 125 or CMPT 135) to take CMPT 165 for further credit. CMPT 118 removed since it is no longer offered.

NOVEMBER 2012



SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL

1 OF 4 PAGES

| COURSE SUBJECT | Computing Science | NUMBER | CMPT 295 | | |
|---|---|---|---|----------------|---------------------|
| | | | | | |
| COURSE TITLE LONG — for Calenda | r/schedule, no more than 100 characters includi | ng spaces and p | unctuation | | |
| Introduction to Com | puter Systems | | | | |
| AND SHORT — for enrolln | nent/transcript, no more than 30 characters inclu | iding spaces and | d punctuation | | |
| Intro. to Computer | Systems | | | | |
| CAMPUS where cours | e will be normally taught: Burnaby | Surrey | Vancouver | Great North | ern Way Off campus |
| The curriculum intro digital systems unde | duces students to topics in computer architer prinnings of computer systems. | ecture that an | e considered fundame | ental to an u | nderstanding of the |
| REPEAT FOR CREDI | T YES NO How many times? | Wi | thin a term? YES | NO | |
| LIBRARY RESOURCE NOTE: Senate has app committed for necessar if appropriate, confirm | ES roved (S.93-11) that no new course should be ap y library materials. Each new course proposal m ation that funding arrangements have been addre | oproved by Sen ust be accompa ssed. | ate until funding has bee nied by a library report | en and, | |
| Library report status, se | ee lib.sfu.ca/collections/course-assessments con | npleted - no a | dditional resources re | equired | |
| RATIONALE FOR IN If more space is needed | RODUCTION OF THIS COURSE I, please use the provided text box on page 4 of t | his document | | | |
| This course is intended to replace CMPT 150 in the Computing Science curriculum with a more contemporary course that addresses deficiencies in the existing CMPT 150 curriculum and provides some of the content previously included in the CMPT 250 curriculum now that the latter course is no longer required. | | | | | |
| Identified Deficiencies with the existing course: 1. Because the present course (CMPT 150) has no pre-requisites, most students are not sufficiently prepared to address the topics of digital design and assembly language programming. | | | | | |
| 2. Digital design and computer architecture are subjects that can better be addressed in a single semester in the second year of studies when students have accumulated some prior university background in mathematics and computer science. | | | | | |
| 3. Some topics currently in CMPT 250 provide insights into later systems and database courses. With the elimination of CMPT 250 as a requirement, these topics still need to be introduced but are not found in the current CMPT 150 curriculum. | | | | | |
| SCHEDULING AND I Term and year cours | ENROLLMENT INFORMATION e would first be offered (e.g. FALL 2014) and pl | anned frequen | cy (e.g. each semester) o | of offering th | ereafter: |
| Fall 2015, to be offe | ered every semester thereafter. | | | | |
| Will this be a required | or elective course in the curriculum? | quired 🗌 I | lective | | |
| What is the probable e | nrollment when offered? Estimate: 150 stud | lents / sectior | 1 | | |



SENATE COMMITTEE ON UNDERGRADUATE STUDIES

2 OF 4 PAGES

| NITS ndicate number of units: 3 | |
|---|-------|
| ndicate no. of contact hours for: 3 Lecture 0 Seminar 0 Tutorial 1 Lab 0 Other – please exp | olain |
| THER | |
| | |

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

Greg Baker, Diana Cukierman, Tony Dixon, Harinder Khangura, Brian Fraser, Ramesh Krishnamurti

WQB DESIGNATION (attach approval from Curriculum Office)

none

PREREQUISITE AND / OR COREQUISITE

MACM 101 - Discrete Mathematics I and CMPT 125 - Introduction to Computing Science and Programming II and CMPT 127 - Computing Laboratory or CMPT 135 - Introduction to Computer Programming II

EQUIVALENT COURSES

Does this course replicate the content of a previously-approved course to such an extent that students should not receive credit for both courses?

Students with credit for CMPT 150 or 250 may not take this course for further credit.

COURSE - LEVEL EDUCATIONAL GOALS (OPTIONAL)

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



SENATE COMMITTEE ON UNDERGRADUATE STUDIES

RESOURCES

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

Resource needs can be met with those used for CMPT 150 and CMPT 250, which the new course replaces.

OTHER IMPLICATIONS

| Final Exam required: | YES | NO |
|---------------------------------|-----|----|
| Criminal Record Check required: | YES | NO |

OVERLAP CHECK

Checking for overlap is the responsibility of the Associate Dean.

Each new course proposal must have confirmation of an overlap check completed prior to submission to the Faculty Curriculum Committee.

Name of Originator

New Course Proposal: CMPT 295 - Introduction to Computer Systems

Preamble :

This course is intended to replace CMPT 150 in the Computing Science Curriculum with a more contemporary course that addresses deficiencies in the existing CMPT 150 curriculum and provides some of the content previously included in the CMPT 250 curriculum now that the latter course is no longer required

Identified Deficiencies with the existing course :

- 1. Because the present course (CMPT 150) has no pre-requisites, most students are not sufficiently prepared to address the topics of digital design and assembly language programming.
- 2. Digital design and computer architecture are subjects that can better be addressed in a single semester in the second year of studies when students have accumulated some prior university background in mathematics and computer science.
- 3. Some topics currently in computer architecture (CMPT 250) provide insights into later systems and database courses. With the elimination of CMPT 250 as a requirement, these topics still need to be introduced but are not found in the current CMPT 150 curriculum.

Proposed Prerequisites :

- CMPT 125 or CMPT 135 (Basic programming experience. C preferred. Students need to be familiar with the basic high-level programming constructs: assignment statements, control (if and case), functions, structured data types).
- MACM 101 (Elementary Boolean algebra: Huntington postulates, Deriving equivalencies, truth tables.)
- Conversion between base 10, base 2 and base 16 (MACM 101?)
- Finite state machines (MACM 101?)

Course Outline :

- 1. Representation of data (3 lectures)
 - Character encoding (ASCII, Unicode) ($\frac{1}{2}$ lecture)
 - Signed integer representation. (1 lecture)
 - Floating point representation. $(1\frac{1}{2} \text{ lectures})$
- 2. Representation of instructions (Instruction Set Architecture) (3 lectures)
 - Components of an instruction (operation, operands)
 - Role of instructions (data transfer, computation, testing, branching)
 - Encoding instructions (machine language, instruction length)
 - Instruction design (von Neumann bottleneck, instruction format)

- 3. Assembly language programs (8 lectures)
 - Implementing control structures (2 lectures)
 - Implementing arrays (pointers, static arrays, dynamic arrays) (2 lectures)
 - implementing subprograms (stack frames) (4 lectures)
- 4. Basic Digital Systems (6 lectures)
 - Implementing Boolean functions with gates (2 lectures)
 - Digital switching (multiplexers and decoders) (1 lecture)
 - Storage (registers, RAM memory, ROM, register files) (2 lectures)
 - Functional units (Adder, ALU, Comparator) (1 lecture)
- 5. CPU organization (9 lectures)
 - Instruction Execution (Fetch/execute cycle) (2 lectures)
 - one-cycle machine (3 lectures)
 - Multi-cycle machine. (2 lectures)
 - Pipelining (Organization, hazards) (2 lectures)
- 6. Memory organization (6 lectures)
 - RAM technologies (SRAM, DRAM) (1 lecture)
 - Block structured memory (1 lecture)
 - Locality of reference (1 lecture)
 - Hierarchical memory systems (3 lectures)
- 7. Threads and synchronization (4 lectures)
 - Processes and threads (1.5 lectures)
 - Synchronization using semaphores (2 lectures)
 - Introduction to deadlock (1/2 lecture)

Recommended Textbook :

"Computer Systems: A Programmer's Perspective, 2nd ed", Randal E. Bryant, David R. O'Hallaron, Prentice Hall, 2011.

Comments :

- 1. The textbook is too comprehensive to be delivered as an introductory course over 13 weeks. The authors provide several alternative curricula that can be supported by the book. The "ORG" option (page xxvii) best meets the curriculum proposed above, although instructors may wish to draw from other chapters as well.
- 2. The proposed curriculum attempts to merge those topics from the existing CMPT 150 and CMPT 250 curriculum descriptions that are considered fundamental to having an an understanding of the digital systems underpinnings of computer systems. The textbook provides a contemporary perspective of these topics.
- 3. The proposed textbook covers most of the material in Part 1, excluding chapter 5. I would therefore propose that a custom edition of the text be used that includes only Part I of the text, to reduce textbook cost.

Revision to Computing Science Major Program

Faculty of Applied Sciences Curriculum Committee

John Edgar

February 2015

Description and Rationale

We propose two amendments to the Lower Division Requirement of the CS Major program.

1. Replace CMPT 275 with CMPT 276. CMPT 275 is a 4 credit course with a workload that is considered very difficult to manage for both students and instructors. CMPT 276 covers less material and has a smaller project and has been offered successfully at the Surrey campus since 2010. Students who wish to pursue farther studies in this area have a number of upper division options.

2. CMPT 150 has no pre-requisites and most students are not sufficiently prepared to address the topics of digital design and assembly language programming. We believe that digital design and computer architecture are subjects that can better be addressed in the second year of studies. CMPT 295 merges topics from CMPT 150 and CMPT 250 that are considered fundamental to an understanding of the digital systems underpinnings of computer systems and updates coverage of these topics.

| Current | Proposed |
|--|--|
| Lower Division Requirements | Lower Division Requirements |
| Students must complete the courses listed below. It is suggested that students complete a recommended schedule of courses within the first two years. | Students must complete the courses listed below. It is suggested that students complete a recommended schedule of courses within the first two years. |
| Students complete all of | Students complete all of |
| CMPT 120 - Introduction to Computing Science and Programming I (3) CMPT 125 - Introduction to Computing Science | CMPT 120 - Introduction to Computing Science and Programming I (3) CMPT 125 - Introduction to Computing Science |
| and Programming II (3) | and Programming II (3) |

CMPT 127 - Computing Laboratory (3) CMPT 127 - Computing Laboratory (3) CMPT 150 - Introduction to Computer CMPT 150 - Introduction to Computer Design (3) Design (3) CMPT 225 - Data Structures and CMPT 225 - Data Structures and Programming (3) Programming (3) CMPT 276 - Introduction to Software CMPT 275 - Software Engineering I (4) MACM 101 - Discrete Mathematics I (3) Engineering I (3) CMPT 295 – Introduction to Computer MACM 201 - Discrete Mathematics II (3) Systems (3) and one of MACM 101 - Discrete Mathematics I (3) MACM 201 - Discrete Mathematics II (3) MATH 150 - Calculus I with Review (4) MATH 151 - Calculus I (3) and one of MATH 154 - Calculus I for the Biological MATH 150 - Calculus I with Review (4) Sciences (3) ** MATH 157 - Calculus I for the Social MATH 151 - Calculus I (3) MATH 154 - Calculus I for the Biological Sciences (3) ** Sciences (3) ** and one of MATH 157 - Calculus I for the Social Sciences (3) ** MATH 152 - Calculus II (3) MATH 155 - Calculus II for the Biological and one of Sciences (3) ** MATH 158 - Calculus II for the Social MATH 152 - Calculus II (3) MATH 155 - Calculus II for the Biological Sciences (3) ** Sciences (3) ** and one of MATH 158 - Calculus II for the Social Sciences (3) ** MATH 232 - Applied Linear Algebra (3) MATH 240 - Algebra I: Linear Algebra (3) and one of and one of MATH 232 - Applied Linear Algebra (3) MATH 240 - Algebra I: Linear Algebra (3) STAT 270 - Introduction to Probability and Statistics (3) and one of BUEC 232 - Data and Decisions I (4) STAT 270 - Introduction to Probability and

| ** with a grade of at least B+, and with school | Statistics (3) BUEC 232 - Data and Decisions I (4) |
|---|---|
| permission. | ** with a grade of at least B+, and with school permission. |

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Revision to Computing Science Honours Program

Faculty of Applied Sciences Curriculum Committee

John Edgar

February 2015

Description and Rationale

We propose two amendments to the Lower Division Requirement of the CS Honours program. 1. Replace CMPT 275 with CMPT 276. CMPT 275 is a 4 credit course with a workload that is considered very difficult to manage for both students and instructors. CMPT 276 covers less material and has a smaller project and has been offered successfully at the Surrey campus since 2010. Students who wish to pursue farther studies in this area have a number of upper division options.

2. CMPT 150 has no pre-requisites and most students are not sufficiently prepared to address the topics of digital design and assembly language programming. We believe that digital design and computer architecture are subjects that can better be addressed in the second year of studies. CMPT 295 merges topics from CMPT 150 and CMPT 250 that are considered fundamental to an understanding of the digital systems underpinnings of computer systems and updates coverage of these topics.

| Current | Proposed |
|--|--|
| Lower Division Requirements | Lower Division Requirements |
| Students must complete the following curriculum. It is suggested that students complete a recommended schedule of courses within the first two years. | Students must complete the following curriculum. It is suggested that students complete a recommended schedule of courses within the first two years. |
| Students complete all of | Students complete all of |
| CMPT 120 - Introduction to Computing Science | CMPT 120 - Introduction to Computing Science |
| and Programming I (3) | and Programming I (3) |
| CMPT 125 - Introduction to Computing Science | CMPT 125 - Introduction to Computing Science |
| and Programming II (3) | and Programming II (3) |
| CMPT 127 - Computing Laboratory (3) | CMPT 127 - Computing Laboratory (3) |
| CMPT 150 - Introduction to Computer | CMPT 225 - Data Structures and |
| Design (3) | Programming (3) |

CMPT 225 - Data Structures and Programming (3) <u>CMPT 250 - Introduction to Computer</u> Architecture (3) <u>CMPT 275 - Software Engineering I (4)</u> MACM 101 - Discrete Mathematics I (3) MACM 201 - Discrete Mathematics II (3)

MATH 150 - Calculus I with Review (4) MATH 151 - Calculus I (3) MATH 154 - Calculus I for the Biological Sciences (3) ** MATH 157 - Calculus I for the Social Sciences (3) **

and one of

MATH 152 - Calculus II (3) MATH 155 - Calculus II for the Biological Sciences (3) ** MATH 158 - Calculus II for the Social Sciences (3) **

and one of

MATH 232 - Applied 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)

** with a grade of at least B+, and with

<u>CMPT 276 – Introduction to Software</u> <u>Engineering I (3)</u> <u>CMPT 295 – Introduction to Computer</u> <u>Systems (3)</u> MACM 101 - Discrete Mathematics I (3) MACM 201 - Discrete Mathematics II (3)

and one of

MATH 150 - Calculus I with Review (4) MATH 151 - Calculus I (3) MATH 154 - Calculus I for the Biological Sciences (3) ** MATH 157 - Calculus I for the Social Sciences (3) **

and one of

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MATH 152 - Calculus II (3)
MATH 155 - Calculus II for the Biological
Sciences (3) **
MATH 158 - Calculus II for the Social
Sciences (3) **
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and one of

MATH 232 - Applied 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)

** with a grade of at least B+, and with school permission.

| school permission. | |
|--------------------|--|
| | |

Revision to Software Systems Major Program

Faculty of Applied Sciences Curriculum Committee

John Edgar

February 2015

Description and Rationale

We propose an amendment to the Lower Division Requirement of the Software Systems Major program that would replace CMPT 150 and CMPT 250 with a single new course, CMPT 295.

CMPT 150 has no pre-requisites and most students are not sufficiently prepared to address the topics of digital design and assembly language programming. We believe that digital design and computer architecture are subjects that can better be addressed in the second year of studies. CMPT 295 merges topics from CMPT 150 and CMPT 250 that are considered fundamental to an understanding of the digital systems underpinnings of computer systems and updates coverage of these topics.

| Current | Proposed |
|---|--|
| Systems Requirements | Systems Requirements |
| Students complete at least 18 units, including all of | <u>Students complete at least 15 units,</u> <u>including all of</u> |
| CMPT 150 - Introduction to Computer | <u>CMPT 295 – Introduction to Computer</u> |
| Design (3) | Systems (3) |
| CMPT 250 - Introduction to Computer | CMPT 300 - Operating Systems I (3) |
| Architecture (3) | MSE 110 - Mechatronics Design I (3) |
| CMPT 300 - Operating Systems I (3) MSE 110 - Mechatronics Design I (3) | and two of |
| and two of | CMPT 170 - Introduction to Web Application |
| CMPT 170 - Introduction to Web Application | CMPT 354 - Database Systems I (3) |
| Development (3) | CMPT 371 - Data Communications and |
| CMPT 354 - Database Systems I (3) | Networking (3) |
| CMPT 371 - Data Communications and | CMPT 433 - Embedded Systems (3) |

| Networking (3) | CMPT 454 - Database Systems II (3) |
|--|--|
| CMPT 433 - Embedded Systems (3) | CMPT 470 - Web-based Information Systems (3) |
| CMPT 454 - Database Systems II (3) | |
| CMPT 470 - Web-based Information Systems (3) | CMPT 471 - Networking II (3) |
| CMPT 471 - Networking II (3) | |

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Revision to Computing Science and Linguistics Joint Major John Edgar

February 2015

Description

Update Joint Major for changes to the Computing Science curriculum.

The substance of the changes are:

- 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
- 4. Replace CMPT 275 with CMPT 276
- 5. Change language in Computing Science upper division requirements to clarify
- 6. Replace CMPT 150 with CMPT 295

Rationale

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 requires CMPT 130 and CMPT 135.

4. CMPT 275 is a 4 credit course with a workload that is considered very difficult to manage for both students and instructors. CMPT 276 covers less material and has a smaller project and has been offered successfully at the Surrey campus since 2010. Students who wish to pursue farther studies in this area have a number of upper division options.

5. The Computing Science Upper Division requirements were amended in a previous calendar change to a version which we considered to be unclear.

6. CMPT 150 has no pre-requisites and most students are not sufficiently prepared to address the topics of digital design and assembly language programming. We believe that digital design and computer architecture are subjects that can better be addressed in the second year of studies. CMPT 295 merges topics from CMPT 150 and CMPT 250 that are considered fundamental to an understanding of the digital systems underpinnings of computer systems and updates coverage of these topics.

| Current | Proposed |
|----------------------|----------------------|
| Program Requirements | Program Requirements |

Lower Division Requirements

Students complete at least 46 units, including one of

MATH 150 - Calculus I with Review (4) MATH 151 - Calculus I (3) MATH 154 - Calculus I for the Biological Sciences (3) ** MATH 157 - Calculus I for the Social Sciences (3) **

and one of

MATH 152 - Calculus II (3) MATH 155 - Calculus II for the Biological Sciences (3) ** MATH 158 - Calculus II for the Social Sciences (3) **

and one of

MATH 232 - Applied Linear Algebra (3) MATH 240 - Algebra I: Linear Algebra (3)

and one of

BUEC 232 - Data and Decisions I (4) STAT 270 - Introduction to Probability and Statistics (3)

and one of

COGS 100 - Exploring the Mind (3)

or one course chosen from the social

sciences electives list in the computing

Lower Division Requirements

<u>Students complete at least 48 units,</u> <u>including one of</u>

MATH 150 - Calculus I with Review (4) MATH 151 - Calculus I (3) MATH 154 - Calculus I for the Biological Sciences (3) ** MATH 157 - Calculus I for the Social Sciences (3) **

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and one of
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MATH 152 - Calculus II (3)
MATH 155 - Calculus II for the Biological
Sciences (3) **
MATH 158 - Calculus II for the Social
Sciences (3) **
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and one of
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MATH 232 - Applied Linear Algebra (3)
MATH 240 - Algebra I: Linear Algebra (3)
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and one of

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BUEC 232 - Data and Decisions I (4)
STAT 270 - Introduction to Probability and
Statistics (3)
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and one of

COGS 100 - Exploring the Mind (3)

or one course chosen from the social sciences electives list in the computing

| science major program's lower division requirements | science major program's lower division requirements |
|--|---|
| ** with a grade of at least B+, and with school permission | ** with a grade of at least B+, and with school permission |
| Computing Science Requirements | Computing Science Requirements |
| Students complete at least 19 units, including either | <u>Students complete at least 21 units,</u> <u>including either all of</u> |
| CMPT 126 - Introduction to Computing Science and Programming (3) ** | <u>CMPT 120 - Introduction to Computing</u> <u>Science and Programming I (3)</u> |
| or both of | Science and Programming II (3) |
| CMPT 120 - Introduction to Computing Science | <u>CMPT 127 - Computing Laboratory (3)</u> |
| and Programming I (3) ** | <u>or both of</u> |
| CMPT 125 - Introduction to Computing Science | |
| and Programming II (3) ** | CMPT 130 - Introduction to Computer |
| and all of | Programming I (3) CMPT 135 - Introduction to Computer |
| CMPT 150 - Introduction to Computer | Programming II [3] |
| Design (3) | and all of |
| CMPT 225 - Data Structures and | |
| Programming (3) | CMPT 225 - Data Structures and |
| CMPT 275 - Software Engineering I (4) | Programming (3) |
| MACM 101 - Discrete Mathematics I (3) | <u>CMPT 276 – Introduction to Software</u> |
| MACM 201 - Discrete Mathematics II (3) | Engineering I (3) |
| ** to aid your choice, prior to enrolment, consult an Applied Sciences Advisor. | <u>CMPT 295 – Introduction to Computer</u> <u>Systems (3)</u> MACM 101 - Discrete Mathematics I (3) |
| Linguistics Requirements | MACM 201 - Discrete Mathematics II (3) |
| Students complete at least nine units, | Linguistics Requirements |

| including all of | Students complete at least nine units, |
|---|---|
| | including all of |
| LING 220 - Introduction to Linguistics (3) | |
| LING 221 - Introduction to Phonetics and | LING 220 - Introduction to Linguistics (3) |
| Phonology (3) | LING 221 - Introduction to Phonetics and |
| LING 222 - Introduction to Syntax (3) | Phonology (3) |
| | LING 222 - Introduction to Syntax (3) |
| Upper Division Requirements | |
| | |
| Computing Science Requirements | Upper Division Requirements |
| | |
| Students complete a t least 24 units, | Computing Science Requirements |
| including all of | |
| CMPT 200 Operating Systems I (2) | Students complete a t least 24 units, |
| CMPT 300 - Operating Systems 1 (3) | including all of |
| CMPT 220 Conicil Implications Computering | |
| CMP1 320 - Social Implications - Computerized | CMPT 300 - Operating Systems I (3) |
| Society (3) | CMPT 307 - Data Structures and Algorithms (3) |
| CMP1 413 - Computational Linguistics (3) | CMPT 320 - Social Implications - Computerized |
| and four courses chosen from the | Society (3) |
| corresponding area as listed in Table I | CMPT 413 - Computational Linguistics (3) |
| CMPT 308 and 379 are recommended | and four courses chosen from four |
| | distinct concentration areas as listed in |
| Table I - Computing Science | Table I CMPT 308 and 379 are |
| Concentrations | recommended |
| | recommended. |
| ARTIFICIAL INTELLIGENCE | Table I - Computing Science |
| CMPT 310 - Artificial Intelligence Survey (3) | Concentrations |
| CMPT 340 - Biomedical Computing (3) | |
| CMPT 411 - Knowledge Representation (3) | ARTIFICIAL INTELLIGENCE |
| CMPT 412 - Computational Vision (3) | CMPT 310 - Artificial Intelligence Survey (3) |
| CMPT 413 - Computational Linguistics (3) | CMPT 340 - Biomedical Computing (3) |
| CMPT 414 - Model-Based Computer Vision (3) | CMPT 411 - Knowledge Representation (3) |
| CMPT 417 - Intelligent Systems (3) | CMPT 412 - Computational Vision (3) |
| CMPT 418 - Computational Cognitive | CMPT 413 - Computational Linguistics (3) |
| Architecture (3) | CMPT 414 - Model-Based Computer Vision (3) |

| CMPT 419 - Special Topics in Artificial | CMPT 417 - Intelligent Systems (3) |
|---|---|
| Intelligence (3) | CMPT 418 - Computational Cognitive |
| COMPLITER GRAPHICS AND | Architecture (3) |
| MULTIMEDIA | CMPT 419 - Special Topics in Artificial |
| CMPT 361 - Introduction to Computer | Intelligence (3) |
| Graphics (3) | COMPUTER GRAPHICS AND |
| CMPT 363 - User Interface Design (3) | MULTIMEDIA |
| CMPT 365 - Multimedia Systems (3) | CMPT 361 - Introduction to Computer |
| CMPT 461 - Image Synthesis (3) | Graphics (3) |
| CMPT 464 - Geometric Modelling in Computer | CMPT 363 - User Interface Design (3) |
| Graphics (3) | CMPT 365 - Multimedia Systems (3) |
| CMPT 466 - Animation (3) | CMPT 461 - Image Synthesis (3) |
| CMPT 467 - Visualization (3) | CMPT 464 - Geometric Modelling in Computer |
| CMPT 468 - Introduction to Computer Music and | Graphics (3) |
| Sound Synthesis (3) | CMPT 466 - Animation (3) |
| CMPT 469 - Special Topics in Computer | CMPT 467 - Visualization (3) |
| Graphics (3) | CMPT 468 - Introduction to Computer Music and |
| COMPUTING SYSTEMS | Sound Synthesis (3) |
| CMPT 300 - Operating Systems I (3) | CMPT 469 - Special Topics in Computer |
| CMPT 305 - Computer Simulation and | Graphics (3) |
| Modelling (3) | COMPUTING SYSTEMS |
| CMPT 371 - Data Communications and | CMPT 300 - Operating Systems I (3) |
| Networking (3) | CMPT 305 - Computer Simulation and |
| CMPT 379 - Principles of Compiler Design (3) | Modelling (3) |
| CMPT 431 - Distributed Systems (3) | CMPT 371 - Data Communications and |
| CMPT 433 - Embedded Systems (3) | Networking (3) |
| CMPT 471 - Networking II (3) | CMPT 379 - Principles of Compiler Design (3) |
| CMPT 479 - Special Topics in Computing | CMPT 431 - Distributed Systems (3) |
| Systems (3) | CMPT 433 - Embedded Systems (3) |
| CMPT 499 - Special Topics in Computer | CMPT 471 - Networking II (3) |
| Hardware (3) | CMPT 479 - Special Topics in Computing |
| INFORMATION SYSTEMS | Systems (3) |
| CMPT 301 - Information Systems | CMPT 499 - Special Topics in Computer |
| Management (3) | Hardware (3) |
| CMPT 354 - Database Systems I (3) | INFORMATION SYSTEMS |

| CMPT 370 - Information System Design (3) | CMPT 301 - Information Systems |
|---|---|
| CMPT 441 - Computational Biology (3) | Management (3) |
| CMPT 454 - Database Systems II (3) | CMPT 354 - Database Systems I (3) |
| CMPT 456 - Information Retrieval and Web | CMPT 370 - Information System Design (3) |
| Search (3) | CMPT 441 - Computational Biology (3) |
| CMPT 459 - Special Topics in Database | CMPT 454 - Database Systems II (3) |
| Systems (3) | CMPT 456 - Information Retrieval and Web |
| CMPT 470 - Web-based Information Systems (3) | Search (3) |
| CMPT 474 - Web Systems Architecture (3) | CMPT 459 - Special Topics in Database |
| PROGRAMMING LANGUAGES AND | Systems (3) |
| SOFTWARE | CMPT 470 - Web-based Information Systems (3) |
| CMPT 373 - Software Development Methods (3) | CMPT 474 - Web Systems Architecture (3) |
| CMPT 375 - Mathematical Foundations of | PROGRAMMING LANGUAGES AND |
| Software Technology (3) | SOFTWARE |
| CMPT 383 - Comparative Programming | CMPT 373 - Software Development Methods (3) |
| Languages (3) | CMPT 375 - Mathematical Foundations of |
| CMPT 384 - Symbolic Computing (3) | Software Technology (3) |
| CMPT 473 - Software Quality Assurance (3) | CMPT 383 - Comparative Programming |
| CMPT 475 - Software Engineering II (3) | Languages (3) |
| CMPT 477 - Introduction to Formal | CMPT 384 - Symbolic Computing (3) |
| Verification (3) | CMPT 473 - Software Quality Assurance (3) |
| CMPT 489 - Special Topics in Programming | CMPT 475 - Software Engineering II (3) |
| Language (3) | CMPT 477 - Introduction to Formal |
| THEORETICAL COMPUTING SCIENCE | Verification (3) |
| CMPT 307 - Data Structures and Algorithms (3) | CMPT 489 - Special Topics in Programming |
| CMPT 308 - Computability and Complexity (3) | Language (3) |
| CMPT 404 - Cryptography and Cryptographic | THEORETICAL COMPUTING SCIENCE |
| Protocols (3) | CMPT 307 - Data Structures and Algorithms (3) |
| CMPT 405 - Design and Analysis of Computing | CMPT 308 - Computability and Complexity (3) |
| Algorithms (3) | CMPT 404 - Cryptography and Cryptographic |
| CMPT 407 - Computational Complexity (3) | Protocols (3) |
| CMPT 408 - Theory of Computing | CMPT 405 - Design and Analysis of Computing |
| Networks/Communications (3) | Algorithms (3) |
| CMPT 409 - Special Topics in Theoretical | CMPT 407 - Computational Complexity (3) |
| Computing Science (3) | CMPT 408 - Theory of Computing |

| MACM 300 - Introduction to Formal Languages | Networks/Communications (3) CMPT 409 - Special Topics in Theoretical |
|---|---|
| | Computing Science (3) |
| Linguistics Requirements | MACM 300 - Introduction to Formal Languages |
| | and Automata with Applications (3) |
| Students complete at least 21 units, | |
| including both of | Linguistics Requirements |
| LING 321 - Phonology (3) | Students complete at least 21 units. |
| LING 322 - Syntax (3) | including both of |
| | |
| and one of | LING 321 - Phonology (3) |
| LING 400 Formal Linguistics (2) | LING 322 - Syntax (3) |
| LING 400 - FORMAL LINGUISTICS (3) | |
| and Automata with Applications (2) | and one of |
| | LING 400 - Formal Linguistics (3) |
| and 12 units chosen from | MACM 300 - Introduction to Formal Languages |
| | and Automata with Applications (3) |
| LING 323 - Morphology (3) | |
| LING 324 - Semantics (3) | and 12 units chosen from |
| LING 330 - Phonetics (3) | |
| LING 401 - Topics in Phonetics (3) | LING 323 - Morphology (3) |
| LING 480 - Topics in Linguistics I (3) * | LING 324 - Semantics (3) |
| LING 481 - Topics in Linguistics II (3) * | LING 330 - Phonetics (3) |
| * when offered with a switchle tonic | LING 401 - Topics in Phonetics (3) |
| when othered with a suitable topic | LING 480 - Topics in Linguistics I (3) * |
| Elective Courses | LING 481 - Topics in Linguistics II (3) * |
| | * when offered with a suitable tonic |
| In addition to the courses listed above, | when onered when a suitable topic |
| students should consult an academic | Elective Courses |
| advisor to plan the remaining required | |
| elective courses. | In addition to the courses listed above, |
| | students should consult an academic |
| Other Requirements | advisor to plan the remaining required |

| Depending on the student's choice, either a | elective courses. |
|---|--|
| bachelor of arts from the Faculty of Arts and Social Sciences (FASS), or a bachelor of science from the Faculty of Applied Sciences | Other Requirements |
| (FAS) will be awarded. Students must fulfil their chosen faculty's distinct requirements. | Depending on the student's choice, either a bachelor of arts from the Faculty of Arts and |
| | science from the Faculty of Applied Sciences (FAS) will be awarded. Students must fulfil |
| | their chosen faculty's distinct requirements. |

Revision to Molecular Biology and Biochemistry and Computing Science Joint Major

John Edgar and Ingrid Northwood

February 2015

Description

Update Joint Major for changes to the Computing Science and Molecular Biology and Biochemistry curricula.

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
- 4. Replace CMPT 275 with CMPT276
- 5. Add MATH 232 or MATH 240 as a lower division requirement
- 6. Replace CMPT 150 with CMPT 295
- 7. Replace MBB 442 with MBB 463

Rationale

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 requires CMPT 130 and CMPT 135.

4. CMPT 275 is a 4 credit course with a workload that is considered very difficult to manage for both students and instructors. CMPT 276 covers less material and has a smaller project and has been offered successfully at the Surrey campus since 2010. Students who wish to pursue farther studies in this area have a number of upper division options.

5. One of MATH 232 or MATH 240 is a required prerequisite for CMPT 307, which is a required course for the program. The MATH 232 or MATH 240 requirement was omitted by accident in a previous revision.

6. CMPT 150 has no pre-requisites and most students are not sufficiently prepared to address the topics of digital design and assembly language programming. We believe that digital design and computer architecture are subjects that can better be addressed in the second year of studies. CMPT 295 merges topics from CMPT 150 and CMPT 250 that are considered fundamental to an understanding of the digital systems underpinnings of computer systems and updates coverage of these topics.

7. MBB 442 will no longer be offered and will be replaced with a new course, MBB 463 Forensic Genomics. MBB 463 was approved by Senate (S.15-12)

7. MBB 442 will no longer be offered and will be replaced with a new course, MBB 463 Forensic Genomics. MBB 463 was approved by Senate (S.15-12)

| Current | Proposed |
|--|---|
| Lower Division Requirements | Lower Division Requirements |
| Students complete a total of 63-70 units | Students complete a minimum of 68 units |
| including either | including either all of |
| CMPT 126 - Introduction to Computing Science | CMPT 120 - Introduction to Computing |
| and Programming (3) | Science and Programming I (3) |
| | CMPT 125 - Introduction to Computing |
| or both of | Science and Programming II (3) |
| CMPT 120 - Introduction to Computing Science | <u>CMPT 127 - Computing Laboratory (3)</u> |
| and Programming I (3) | or both of |
| CMPT 125 - Introduction to Computing Science | <u>or both or</u> |
| and Programming II (3) | CMPT 130 - Introduction to Computer |
| | Programming I (3) |
| and one of | CMPT 135 - Introduction to Computer |
| | Programming II (3) |
| CHEM 282 - Organic Chemistry II (2) | |
| CHEM 283 - Organic Chemistry IIb (3) | and one of |
| and one of | CHEM 282 - Organic Chemistry II (2) |
| | CHEM 283 - Organic Chemistry IIb (3) |
| MATH 150 - Calculus I with Review (4) | |
| MATH 151 - Calculus I (3) | and one of |
| and all of | MATH 150 - Calculus I with Review (4) |
| | MATH 151 - Calculus I (3) |
| BISC 101 - General Biology (4) | |
| BISC 102 - General Biology (4) | and one of |
| BISC 202 - Genetics (3) | |
| CHEM 121 - General Chemistry and Laboratory | MATH 232 - Applied Linear Algebra (3) |
| 1(4) | <u>MATH 240 - Algebra I: Linear Algebra (3)</u> |

| CMPT 150 - Introduction to Computer | and all of |
|--|--|
| Design (3) | |
| CMPT 225 - Data Structures and | BISC 101 - General Biology (4) |
| Programming (3) | BISC 102 - Conoral Biology (4) |
| CMPT 275 - Software Engineering I (4) | BISC 202 - General Biology (4) |
| MACM 101 - Discrete Mathematics I (3) | BISC 202 - General Chamistan and Laboratomy |
| MACM 201 - Discrete Mathematics II (3) | L (4) |
| MATH 152 - Calculus II (3) | CHEM 122 - General Chemistry II (2) |
| MBB 222 - Molecular Biology and | CHEM 281 - Organic Chemistry I (4) |
| Biochemistry (3) | CMPT 225 - Data Structures and |
| MBB 231 - Cellular Biology and Biochemistry (3) | CMF1 223 - Data Structures and |
| STAT 270 - Introduction to Probability and | CMPT 276 – Introduction to Software |
| Statistics (3) | Engineering I (3) |
| and one of | <u>CMPT 295 – Introduction to Computer</u> |
| | Systems (3) |
| PHYS 101 - Physics for the Life Sciences I (3) | MACM 101 - Discrete Mathematics I (3) |
| PHYS 120 - Mechanics and Modern Physics (3) | MACM 201 - Discrete Mathematics II (3) |
| PHYS 125 - Mechanics and Special Relativity (3) | MATH 152 - Calculus II (3) |
| PHYS 140 - Studio Physics - Mechanics and | MBB 222 - Molecular Biology and |
| Modern Physics (4) | Biochemistry (3) |
| | MBB 231 - Cellular Biology and Biochemistry (3) |
| and one of | STAT 270 - Introduction to Probability and |
| PHYS 102 - Physics for the Life Sciences II (3) | Statistics (3) |
| PHYS 121 - Optics, Electricity and Magnetism (3) | and one of |
| PHYS 126 - Electricity, Magnetism and Light (3) | |
| PHYS 141 - Studio Physics - Optics, Electricity | PHYS 101 - Physics for the Life Sciences I (3) |
| and Magnetism (4) | PHYS 120 - Mechanics and Modern Physics (3) |
| | PHYS 125 - Mechanics and Special Relativity (3) |
| Upper Division Requirements | PHYS 140 - Studio Physics - Mechanics and |
| | Modern Physics (4) |
| Students complete 44-46 units, including all | |
| 10 | and one of |
| CMPT 307 - Data Structures and Algorithms (3) | PHYS 102 - Physics for the Life Sciences II (3) |
| CMPT 320 - Social Implications - Computerized | PHYS 121 - Optics, Electricity and Magnetism (3) |

| Society (3) | PHYS 126 - Electricity, Magnetism and Light (3) |
|---|---|
| CMPT 354 - Database Systems I (3) | PHYS 141 - Studio Physics - Optics, Electricity |
| CMPT 441 - Computational Biology (3) | and Magnetism (4) |
| MBB 308 - Molecular Biology Laboratory (3) | |
| MBB 331 - Molecular Biology (3) | |
| MBB 342 - Introductory Genomics and | Upper Division Requirements |
| Bioinformatics (3) | |
| STAT 302 - Analysis of Experimental and | Students complete 44-46 units, including all |
| Observational Data (3) | of |
| and one of | CMPT 307 - Data Structures and Algorithms (3) |
| | CMPT 320 - Social Implications - Computerized |
| CMPT 376W - Technical Writing and Group | Society (3) |
| Dynamics (3) | CMPT 354 - Database Systems I (3) |
| MBB 309W - Biochemistry Laboratory (4) | CMPT 441 - Computational Biology (3) |
| | MBB 308 - Molecular Biology Laboratory (3) |
| and at least two of | MBB 331 - Molecular Biology (3) |
| | MBB 342 - Introductory Genomics and |
| CMPT 305 - Computer Simulation and | Bioinformatics (3) |
| Modelling (3) | STAT 302 - Analysis of Experimental and |
| CMPT 310 - Artificial Intelligence Survey (3) | Observational Data (3) |
| CMPT 340 - Biomedical Computing (3) | |
| CMPT 361 - Introduction to Computer | and one of |
| Graphics (3) | |
| MACM 316 - Numerical Analysis I (3) | CMPT 376W - Technical Writing and Group |
| MBB 321 - Intermediary Metabolism (3) | Dynamics (3) |
| and at least three of | MBB 309W - Biochemistry Laboratory (4) |
| and at least till ee of | and at least two of |
| CMPT 405 - Design and Analysis of Computing | |
| Algorithms (3) | CMPT 305 - Computer Simulation and |
| CMPT 413 - Computational Linguistics (3) | Modelling (3) |
| CMPT 419 - Special Topics in Artificial | CMPT 310 - Artificial Intelligence Survey (3) |
| Intelligence (3) | CMPT 340 - Biomedical Computing (3) |
| CMPT 454 - Database Systems II (3) | CMPT 361 - Introduction to Computer |
| MBB 438 - Human Molecular Genetics (3) | Graphics (3) |
| MBB 441 - Bioinformatics (3) | MACM 316 - Numerical Analysis I (3) |

| MBB 461 - Comparative Genomics (3)and at least three ofMBB 462 - Human Genomics (3)and at least three ofStudents may be required to take an additional elective course to bring their upper division total to 45 unitsCMPT 405 - Design and Analysis of Computing Algorithms (3)CMPT 413 - Computational Linguistics (3) CMPT 419 - Special Topics in Artificial Intelligence (3) CMPT 454 - Database Systems II (3) MBB 438 - Human Molecular Genetics (3) MBB 441 - Bioinformatics (3) MBB 461 - Comparative Genomics (3) MBB 462 - Human Genomics (3) MBB 463 Forensic Genomic (3) Students may be required to take an additional elective course to bring their upper division total to 45 units | MBB-442 - Proteomics (3) | MBB 321 - Intermediary Metabolism (3) |
|--|--|--|
| Students may be required to take an additional elective course to bring their upper division total to 45 unitsCMPT 405 - Design and Analysis of Computing Algorithms (3) CMPT 413 - Computational Linguistics (3) CMPT 419 - Special Topics in Artificial Intelligence (3) CMPT 454 - Database Systems II (3) MBB 438 - Human Molecular Genetics (3) MBB 441 - Bioinformatics (3) MBB 461 - Comparative Genomics (3) MBB 462 - Human Genomics (3) MBB 463 Forensic Genomic (3) Students may be required to take an additional elective course to bring their upper division total to 45 units | MBB 461 - Comparative Genomics (3) MBB 462 - Human Genomics (3) | and at least three of |
| Students may be required to take an additional elective course to bring their upper division total to 45 units | Students may be required to take an additional elective course to bring their upper division total to 45 units | CMPT 405 - Design and Analysis of Computing Algorithms (3) CMPT 413 - Computational Linguistics (3) CMPT 419 - Special Topics in Artificial Intelligence (3) CMPT 454 - Database Systems II (3) MBB 438 - Human Molecular Genetics (3) MBB 441 - Bioinformatics (3) MBB 461 - Comparative Genomics (3) MBB 462 - Human Genomics (3) MBB 463 Forensic Genomic (3) |
| elective course to bring their upper division total to 45 units | | Students may be required to take an additional |
| total to 45 units | | elective course to bring their upper division |
| | | total to 45 units |

Revision to Molecular Biology and Biochemistry and Computing Science Joint Honours Program

John Edgar and Ingrid Northwood

February 2015

Description

Update Joint Major for changes to the Computing Science and Molecular Biology and Biochemistry curricula.

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
- 4. Replace CMPT 275 with CMPT276
- 5. Add MATH 232 or MATH 240 as a lower division requirement
- 6. Replace CMPT 150 with CMPT 295
- 7. Replace MBB 442 with MBB 463

Rationale

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 requires CMPT 130 and CMPT 135.

4. CMPT 275 is a 4 credit course with a workload that is considered very difficult to manage for both students and instructors. CMPT 276 covers less material and has a smaller project and has been offered successfully at the Surrey campus since 2010. Students who wish to pursue farther studies in this area have a number of upper division options.

5. One of MATH 232 or MATH 240 is a required prerequisite for CMPT 307, which is a required course for the program. The MATH 232 or MATH 240 requirement was omitted by accident in a previous revision.

6. CMPT 150 has no pre-requisites and most students are not sufficiently prepared to address the topics of digital design and assembly language programming. We believe that digital design and computer architecture are subjects that can better be addressed in the second year of studies. CMPT 295 merges topics from CMPT 150 and CMPT 250 that are considered fundamental to an understanding of the digital systems underpinnings of computer systems and updates coverage of these topics.

7. MBB 442 will no longer be offered and will be replaced with a new course, MBB 463 Forensic Genomics. MBB 463 was approved by Senate (S.15-12)

| Current | Proposed |
|---|--|
| Lower Division Requirements | Lower Division Requirements |
| Students complete a total of 63-70 units including either | <u>Students complete a total of 68-75 units</u> <u>including either all of</u> |
| CMPT 126 - Introduction to Computing Science and Programming (3) | <u>CMPT 120 - Introduction to Computing</u> <u>Science and Programming I (3)</u> |
| or both of | <u>CMPT 125 - Introduction to Computing</u> <u>Science and Programming II (3)</u> <u>CMPT 127 - Computing Laboratory (3)</u> |
| CMPT 120 - Introduction to Computing Science and Programming I (3) CMPT 125 - Introduction to Computing Science | <u>or both of</u> |
| and Programming II (3) | <u>CMPT 130 - Introduction to Computer</u> Programming I (3) |
| and one of | <u>CMPT 135 - Introduction to Computer</u> |
| CHEM 282 - Organic Chemistry II (2) CHEM 283 - Organic Chemistry IIb (3) | and one of |
| and one of | CHEM 282 - Organic Chemistry II (2) CHEM 283 - Organic Chemistry IIb (3) |
| MATH 150 - Calculus I with Review (4) MATH 151 - Calculus I (3) | and one of |
| and all of | MATH 150 - Calculus I with Review (4) |
| BISC 101 - General Biology (4) BISC 102 - General Biology (4) | and one of |
| BISC 202 - Genetics (3) CHEM 121 - General Chemistry and Laboratory | MATH 232 - Applied Linear Algebra (3) |
| I (4) | <u>MATH 240 - Algebra I: Linear Algebra (3)</u> |

| CHEM 122 - General Chemistry II (2) | | |
|--|--|--|
| CHEM 281 - Organic Chemistry I (4) | and all of | |
| CMPT 150 - Introduction to Computer | | |
| Design (3) | BISC 101 - General Biology (4) | |
| CMPT 225 - Data Structures and | BISC 102 - General Biology (4) | |
| Programming (3) | BISC 202 - Genetics (3) | |
| CMPT 275 - Software Engineering I (4) | CHEM 121 - General Chemistry and Laboratory | |
| MACM 101 - Discrete Mathematics I (3) | | |
| MACM 201 - Discrete Mathematics II (3) | CHEM 122 - General Chemistry II (2) | |
| MATH 152 - Calculus II (3) | CHEM 281 - Organic Chemistry I (4) | |
| MBB 222 - Molecular Biology and | CMPT 225 - Data Structures and | |
| Biochemistry (3) | Programming (3) | |
| MBB 231 - Cellular Biology and Biochemistry (3) | <u>CMPT 276 – Introduction to Software</u> | |
| STAT 270 - Introduction to Probability and | Engineering I (3) | |
| Statistics (3) | <u>CMPT 295 – Introduction to Computer</u> | |
| | Systems (3) | |
| and one of | MACM 101 - Discrete Mathematics I (3) | |
| | MACM 201 - Discrete Mathematics II (3) | |
| PHYS 101 - Physics for the Life Sciences I (3) | MATH 152 - Calculus II (3) | |
| PHYS 120 - Mechanics and Modern Physics (3) | MBB 222 - Molecular Biology and | |
| PHYS 125 - Mechanics and Special Relativity (3) | Biochemistry (3) | |
| PHYS 140 - Studio Physics - Mechanics and | MBB 231 - Cellular Biology and Biochemistry (3) | |
| Modern Physics (4) | STAT 270 - Introduction to Probability and | |
| and one of | Statistics (3) | |
| and one of | and one of | |
| PHYS 102 - Physics for the Life Sciences II (3) | and one of | |
| PHYS 121 - Optics. Electricity and Magnetism (3) | PHYS 101 - Physics for the Life Sciences I (3) | |
| PHYS 126 - Electricity, Magnetism and Light (3) | PHYS 120 - Mechanics and Modern Physics (3) | |
| PHYS 141 - Studio Physics - Ontics, Electricity | PHYS 125 - Mechanics and Special Relativity (3) | |
| and Magnetism (4) | PHVS 140 - Studio Physics - Mechanics and | |
| | Modern Physics (4) | |
| Upper Division Requirements | | |
| | and one of | |
| Students complete a total of 54-55 units, | | |
| including all of | PHYS 102 - Physics for the Life Sciences II (3) | |
| | PHYS 121 - Optics, Electricity and Magnetism (3) | |

| CMPT 307 - Data Structures and Algorithms (3) | PHYS 126 - Electricity, Magnetism and Light (3) | | |
|---|---|--|--|
| CMPT 320 - Social Implications - Computerized | PHYS 141 - Studio Physics - Optics, Electricity | | |
| Society (3) | and Magnetism (4) | | |
| CMPT 354 - Database Systems I (3) | | | |
| CMPT 441 - Computational Biology (3) | Linner Division Requirements | | |
| MBB 308 - Molecular Biology Laboratory (3) | Opper Division Requirements | | |
| MBB 331 - Molecular Biology (3) | Students complete a total of 54-55 units | | |
| MBB 342 - Introductory Genomics and | including all of | | |
| Bioinformatics (3) | | | |
| STAT 302 - Analysis of Experimental and | CMPT 307 - Data Structures and Algorithms (3) | | |
| Observational Data (3) | CMPT 320 - Social Implications - Computerized | | |
| | Society (3) | | |
| and one of | CMPT 354 - Database Systems I (3) | | |
| | CMPT 441 - Computational Biology (3) | | |
| CMP1 376W - Technical Writing and Group | MBB 308 - Molecular Biology Laboratory (3) | | |
| Dynamics (3) | MBB 331 - Molecular Biology (3) | | |
| MBB 309W - Biochemistry Laboratory (4) | MBB 342 - Introductory Genomics and | | |
| and at least two of | Bioinformatics (3) | | |
| | STAT 302 - Analysis of Experimental and | | |
| CMPT 305 - Computer Simulation and | Observational Data (3) | | |
| Modelling (3) | | | |
| CMPT 310 - Artificial Intelligence Survey (3) | and one of | | |
| CMPT 340 - Biomedical Computing (3) | | | |
| CMPT 361 - Introduction to Computer | CMPT 376W - Technical Writing and Group | | |
| Graphics (3) | Dynamics (3) | | |
| MACM 316 - Numerical Analysis I (3) | MBB 309W - Biochemistry Laboratory (4) | | |
| MBB 321 - Intermediary Metabolism (3) | and at least two of | | |
| | | | |
| and at least three of | CMPT 305 - Computer Simulation and | | |
| CMPT 405 - Decim and Analysis of Computing | Modelling (3) | | |
| Algorithms (2) | CMPT 310 - Artificial Intelligence Survey (3) | | |
| CMPT 413 - Computational Linguistics (2) | CMPT 340 - Biomedical Computing (3) | | |
| CMPT 419 - Special Topics in Artificial | CMPT 361 - Introduction to Computer | | |
| Intelligence (3) | Graphics (3) | | |
| CMPT 454 - Database Systems II (3) | MACM 316 - Numerical Analysis I (3) | | |

| MBB 438 - Human Molecular Genetics (3) | MBB 321 - Intermediary Metabolism (3) | |
|---|--|--|
| MBB 441 - Bioinformatics (3) | | |
| MBB 442 - Proteomics (3) | and at least three of | |
| MBB 461 - Comparative Genomics (3) | CMPT 405 - Design and Analysis of Computing | |
| MBB 462 - Human Genomics (3) | Algorithms (3) | |
| and six additional 400 division computing science units | CMPT 413 - Computational Linguistics (3) | |
| | CMPT 419 - Special Topics in Artificial | |
| | Intelligence (3) | |
| and six research related MBB units which | CMPT 454 - Database Systems II (3) | |
| are fulfilled by completing MBB 496-6 | MBB 438 - Human Molecular Genetics (3) | |
| | MBB 441 - Bioinformatics (3) | |
| | MBB 461 - Comparative Genomics (3) | |
| | MBB 462 - Human Genomics (3) | |
| | MBB 463 Forensic Genomic (3) | |
| | | |
| | and six additional 400 division computing | |
| | science units | |
| | and six research related MBB units which are | |
| | fulfilled by completing MBB 496-6 | |
| | | |



FACULTY OF SCIENCE Dean of Science

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|------------|---|--------------------------------------|-------------------|
| MEMORANDUM | | | |
| ATTENTION | Senate Committee for Undergraduate Studies, SFL | DATE | February 23, 2015 |
| FROM | Carl Lowenberger, Chair, Sc UCC | ience | |
| RE: | Supporting documentation for removing MBB 442 and replacing with MBB 463 in both Joint Major and Joint Honours, MBB and Computing Science | | |

For the March 2015 SCUS meeting

The Faculty of Science UCC has passed the motion to support the calendar changes brought forward by Computing Science for removing MBB 442 and substituting with MBB 463 in both Joint Major and Joint Honours with MBB and Computing Science.