Lakehead University
Faculty of Science and Environmental Studies

REQUEST REPORT

Request Tracking Number: 2015-SCI-4688
Request Title: Programs Major Modification UG Computer Science IQAP response

[DeAcTerm[EffectiveDate]] [DeAc[RequestEffectiveDate]]
Request Status: In Working Folder
Request can be split

Request Contents

Type		Title
1.	New Version of a Degree	BSc (Computer Science Major)
2.	New Version of a Degree	HBSc (Computer Science Major)
3.	New Version of a Degree	Honours BSc (Computer Science) Co-operative Program

Request History

Workflow Step	Workflow Action	User	Change Made	Comments	Date

Supporting Documents

File Name	Uploaded By	Upload Date	Size

Supporting Documents Audit Trail

File Name	User	Date	Action

Notes

Date	User	Note

Printed: 01/06/2015

1.	New Version of a Degree	BSC.COMP - BSc (Computer Science Major)

Degree Details

CURRENT VERSION	PROPOSED VERSION
BSC.COMP - BSc (Computer Science Major) **Start Term:** Fall 1999 **End Term:** No Specified End Date	BSC.COMP - BSc (Computer Science Major) **Start Term:** ~~Fall 1999~~*2015-16* **End Term:** No Specified End Date

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Required Information

CURRENT VERSION	PROPOSED VERSION
Institution Unit Faculty of Science and Environmental Studies	**Institution Unit** Faculty of Science and Environmental Studies
Degree Type BSC	**Degree Type** BSC
Major COMP	**Major** COMP
Minor	**Minor**
Specialization	**Specialization**
Rationale	**Rationale** *Updating curriculum following recommendation of IQAP process. Reducing mathematics content to better match Computer Science programs at other institutions, and deleting hardware option which had too little demand. (See IQAP document for full details)*
Requirements Three year program This program consists of the courses listed in the Fall and Winter terms of years one and two and the Fall term of year three of any of three options (Business, Science or Hardware) of the Honours BSc (Computer Science) Co-operative Program plus a final winter term composed of: (a) Two Computer Science half courses at the third or fourth year level (b) One half course elective from the List of Program Electives above (c) Two half course electives Year-to-year continuation requires an average of at least 60% in all Computer Science courses.	**Requirements** ~~Three year programThis program consists of the courses listed in the Fall and Winter terms of years one and two and the Fall term of year three of any of three options (Business, Science or Hardware) of the Honours BSc (Computer Science) Co-operative Program plus a final winter term composed of:(a) Two Computer Science half courses at the third or fourth year level(b) One half course elective from the List of Program Electives above(c) Two half course electivesYear-to-year continuation requires an average of at least 60% in all Computer Science courses.~~ *Notes:*

(1) There are two areas in this program: Business and Science. Students must choose one at the time of initial registration. For help in making this choice, contact the Chair of the Department.

(2) Year-to-year continuation in the program requires an average of at least 60% in all Computer Science courses.

(3) Of the electives, One-half FCE must be completed from the list of approved aboriginal content courses, and at least one FCE must be from the list of program electives

(4) In the science focus at least one FCE elective from the Faculty of Science and Environmental Studies must be at level two or higher, and specified electives from the Faculty of Science and Environmental Studies Faculty must not include zero level courses.

(5) Students following either the science or business focus and wishing to pursue the area of scientific computing should choose Mathematics 3351 and/or 3371 and should choose the necessary prerequisites from Mathematics as part of their electives.

First Year (Fall and Winter):
(a) Mathematics 1171, 1271; Computer Science 1411, 1431
(b) One FCE elective chosen from: History 1100, Philosophy 1110, 1111, 1117, 1118, 1119, 1571, 1573, English 1011, 1031, 1111, 1112

(c) One FCE Elective

Business Focus: Business 1511, 1512

Science Focus: One FCE elective from the Faculty of Science and Environmental Studies

Second Year (Fall and Winter):
(a) Mathematics 2310, 2255
(b) Computer Science 2412, 2453, 2476 and 2477, 2430
(c) One half-course elective

Business Focus: Business 2514, 2538

Science Focus: One-half FCE elective from the Faculty of Science and Environmental Studies, Sociology 2455

Third Year (Fall and winter):
(a) Computer Science 3413, 3415, 3473,

(b) Four from Computer Science 4475, 4453, 4478, or list of program electives
(c) One FCE elective
Business Focus: Sociology 2455

Science Focus: One-half FCE elective from the Faculty of Science and Environmental Studies

Budgetary Considerations

CURRENT VERSION	PROPOSED VERSION
Student Enrolment	**Student Enrolment** *Only if students use it to exit from a 4 year program*
Student Enrolment Other Units	**Student Enrolment Other Units** *At the course level: A small change in enrolment in physics courses no longer needed by our students (from the hardware option). A larger change in mathematics courses no longer required by our students.*
Additional Resources	**Additional Resources** *Not for this updated program.*
Teaching Loads	**Teaching Loads** *No. The addition of mobile computing (computer science 2430) is offset by alternating upper level courses (4413, 4433, 4451).*
TeachingSupport Services	**TeachingSupport Services** *No*
Outside Support	**Outside Support** *No*

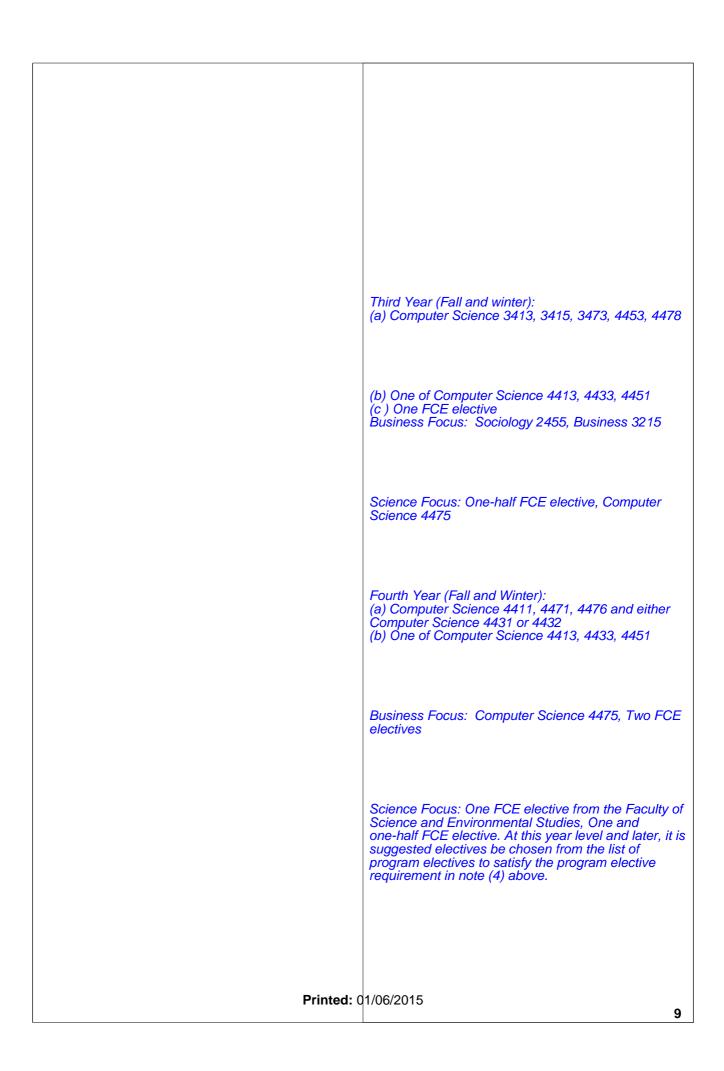| 2.	New Version of a Degree	HBSC.COMP - HBSc (Computer Science Major)

Degree Details

CURRENT VERSION	PROPOSED VERSION
HBSC.COMP - HBSc (Computer Science Major) **Start Term:** Fall 1999 **End Term:** No Specified End Date	HBSC.COMP - HBSc (Computer Science Major) **Start Term:** ~~Fall 1999~~*2015-16* **End Term:** No Specified End Date

Required Information	
CURRENT VERSION	**PROPOSED VERSION**
Institution Unit Faculty of Science and Environmental Studies	**Institution Unit** Faculty of Science and Environmental Studies
Degree Type HBSC	**Degree Type** HBSC
Major COMP	**Major** COMP
Minor	**Minor**
Specialization	**Specialization**
Rationale	**Rationale** *Updating curriculum following recommendation of IQAP process. Reducing mathematics content to better match Computer Science programs at other institutions, and deleting hardware option which had too little demand. (See IQAP document for full details)*
Requirements Four Year program This program consists of the courses listed in the Honours Co-operative Computer Science program, except for the work terms. Year-to-year continuation requires an average of at least 70% in all Computer Science courses. The Hardware Option of this program consists of the courses listed in the Honours BSc (Computer Science Major) Co-operative Program (Hardware Option), except for the work terms. Its third year consists of Third Year (Fall) and Fourth Year (Winter), while its fourth year is Fourth Year (Fall) and Fifth Year (Winter). Year-to-year continuation requires an average of at least 70% in all Computer Science and Physics courses.	**Requirements** ~~Four Year programThis program consists of the courses listed in the Honours Co-operative Computer Science program, except for the work terms.~~ *Notes:* *(1) There are two areas in this program: Business and Science. Students must choose one at the time of initial registration. For help in making this choice, contact the Chair of the Department.*

Printed: 01/06/2015

Note:

Students in the Honours BSc (Computer Science Major) Program are required to take at least 10 half courses outside the Departments of Computer Science and Mathematical Sciences.

(2) Year-to-year continuation *in the program* requires an average of at least 70% in all Computer Science courses.

~~The Hardware Option of this program consists of the courses listed in the Honours BSc (Computer Science Major) Co-operative Program (Hardware Option), except for the work terms. Its third year consists of Third Year (Fall) and Fourth Year (Winter), while its fourth year is Fourth Year (Fall) and Fifth Year (Winter). Year-to-year continuation requires an average of at least 70% in all Computer Science and Physics courses.~~

~~Note: Students in the Honours BSc (Computer Science Major) Program are required to take at least 10 half courses outside the Departments of Computer Science and Mathematical Sciences.~~ *(3) Students in this program are required to take at least five FCEs outside the Departments of Computer Science and Mathematical Sciences.*

(4) Of the electives, One half FCE must be completed from the list of approved aboriginal content courses, and at least one FCE must be from the list of program electives

(5) Students completing the Business Focus program requirements and wishing to qualify for the entrepreneurship certificate in the Faculty of Business must, instead of Business 1013,   take as an elective a course from the following list : Business 2033, 3013, 3213, 3413, 4253 or an alternate approved by the Faculty of Business Administration

(6) In the science focus at least one FCE elective from the Faculty of Science and Environmental Studies must be at level two or higher, and specified electives from the Faculty of Science and Environmental Studies Faculty must not include zero level courses.

	(7) Students following either the science or business focus and wishing to pursue the area of scientific computing should choose Mathematics 3351 and/or 3371 and should choose the necessary prerequisites from Mathematics as part of their electives (with attention paid to note (3))
	First Year (Fall and Winter): *(a) Mathematics 1171, 1271; Computer Science 1411, 1431* *(b) One FCE elective chosen from: History 1100, Philosophy 1110, 1111, 1117, 1118, 1119, 1571, 1573, English 1011, 1031, 1111, 1112*
	(c) One FCE Elective
	Business Focus: Business 1511, 1512
	Science Focus: One FCE elective from the Faculty of Science and Environmental Studies
	Second Year (Fall and Winter): *(a) Mathematics 2310, 2255* *(b) Computer Science 2412, 2453, 2476 and 2477, 2430* *(c) One half-course elective*
	Business Focus: Business 2514,2538
	Science Focus: One -half FCE elective from the Facultuy of Science and Environmental Studies, Sociology 2455

Third Year (Fall and winter):
(a) Computer Science 3413, 3415, 3473, 4453, 4478

(b) One of Computer Science 4413, 4433, 4451
(c) One FCE elective
Business Focus: Sociology 2455, Business 3215

Science Focus: One-half FCE elective, Computer Science 4475

Fourth Year (Fall and Winter):
(a) Computer Science 4411, 4471, 4476 and either Computer Science 4431 or 4432
(b) One of Computer Science 4413, 4433, 4451

Business Focus: Computer Science 4475, Two FCE electives

Science Focus: One FCE elective from the Faculty of Science and Environmental Studies, One and one-half FCE elective. At this year level and later, it is suggested electives be chosen from the list of program electives to satisfy the program elective requirement in note (4) above.

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Budgetary Considerations	
CURRENT VERSION	**PROPOSED VERSION**
Student Enrolment	**Student Enrolment** *No*
Student Enrolment Other Units	**Student Enrolment Other Units** *At the course level: A small change in enrolment in Physics courses no longer needed by our students (from the deleted hardware option). A larger change in mathematics courses no longer required in our programs*
Additional Resources	**Additional Resources** *The new courses in our list of program electives are based on the additional resources from our strategic hire.*
Teaching Loads	**Teaching Loads** *The addition of mobile computing (Computer Science 2430) is offset by alternating upper level courses (4413, 4433, 4451). The other required computer science courses in the new program have been given for years under the program electives list (4476, 4478, 4475, 4471)*
TeachingSupport Services	**TeachingSupport Services** *No*
Outside Support	**Outside Support** *No*

3.	New Version of a Degree	HBSC.COMP.CP - Honours BSc (Computer Science) Co-operative Program

Degree Details

CURRENT VERSION	PROPOSED VERSION
HBSC.COMP.CP - Honours BSc (Computer Science) Co-operative Program **Start Term:** 2014-15 **End Term:** No Specified End Date	HBSC.COMP.CP - Honours BSc (Computer Science) Co-operative Program **Start Term:** ~~2014~~*2015*-~~15~~*16* **End Term:** No Specified End Date

**Required Information**	
CURRENT VERSION	**PROPOSED VERSION**
Institution Unit Faculty of Science and Environmental Studies	**Institution Unit** Faculty of Science and Environmental Studies
Degree Type HBSC	**Degree Type** HBSC
Major COMP	**Major** COMP
Minor	**Minor**
Specialization	**Specialization**
Rationale Revised First Year wording associated with changes to Philosophy first-year courses.Delete Apprenticeship/Internship Options as proposed in request #2013-SCI-2719, approved at February 10, 2014 Senate meeting.	**Rationale** ~~Revised First Year wording associated with changes to Philosophy first-year courses.Delete Apprenticeship/Internship Options as proposed in request #2013-SCI-2719, approved at February 10, 2014 Senate meeting.~~*Updating curriculum following recommendation of IQAP process. Reducing mathematics content to better match Computer Science programs at other institutions, and deleting hardware option which had too little demand. (See IQAP document for full details)*
Requirements There are three options in this program, Business, Scientific and Hardware. Students must choose one at the time of initial registration. For help in making this choice, contact the Chair of the Department. **Note:** Students in this program are required to take at least 5 FCEs outside the Departments of Computer Science and Mathematical Sciences.	**Requirements**

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(a) Business Option

Year-to-year continuation in the program requires an average of at least 70% in all Computer Science courses, and satisfactory completion of the work period assignments.

First Year (Fall and Winter):
(a) Mathematics 1171, 1172, 1271 and 1272; Computer Science 1411, 1431
(b) One FCE elective chosen from: History 1100, Philosophy 1110, 1111, 1117, 1118, 1119, 1571, 1573, English 1011, 1031, 1111, 1112
(c) Business 1511, 1512

First Year (Spring/Summer):
At the discretion of the Chair of the Department, some students may have the opportunity of a formal work period assignment (Computer Science 1990).

Second Year (Fall and Winter):
(a) Mathematics 2255, 2275
(b) Computer Science 2412, 2453, 2476 and 2477
(c) Business 2012 and 2033
(d) Sociology 2455
(e) One half-course elective

Note:
Students interested in the Physics selections from the list of electives should take Mathematics 2131 and Physics 2211.

Second Year (Spring/Summer):
Optional formal work period assignment (Computer Science 2990)

Third Year (Fall):
(a) Computer Science 3413, 3415, 3473
(b) Business 3213
(c) Mathematics 3332

Third Year (Winter):
Formal work period assignment (Computer Science 3990)

Third Year (Spring/Summer):
Formal work period assignment (Computer Science 3992)

Departmental approval must be obtained at the time of registration (co-operative) by all students at or beyond the third year level.

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Notes:

(1) There are ~~three options~~ *two areas* in this program~~, Business, Scientific and Hardware~~*: Business and Science*. Students must choose one at the time of initial registration. For help in making this choice, contact the Chair of the Department.~~Note: Students in this program are required to take at least 5 FCEs outside the Departments of Computer Science and Mathematical Sciences.~~

~~(a) Business Option~~

(2) Year-to-year continuation in the program requires an average of at least 70% in all Computer Science courses, and satisfactory completion of the work period assignments.~~First Year (Fall and Winter): (a) Mathematics 1171, 1172, 1271 and 1272; Computer Science 1411, 1431(b) One FCE elective chosen from: History 1100, Philosophy 1110, 1111, 1117, 1118, 1119, 1571, 1573, English 1011, 1031, 1111, 1112(c) Business 1511, 1512First Year (Spring/Summer): At the discretion of the Chair of the Department, some students may have the opportunity of a formal work period assignment (Computer Science 1990).Second Year (Fall and Winter): (a) Mathematics 2255, 2275(b) Computer Science 2412, 2453, 2476 and 2477(c) Business 2012 and 2033(d) Sociology 2455(e) One half-course electiveNote: Students interested in the Physics selections from the list of electives should take Mathematics 2131 and Physics 2211.Second Year (Spring/Summer): Optional formal work period assignment (Computer Science 2990)Third Year (Fall): (a) Computer Science 3413, 3415, 3473(b) Business 3213(c) Mathematics 3332Third Year (Winter):Formal work period assignment (Computer Science 3990)Third Year (Spring/Summer): Formal work period assignment (Computer Science 3992)Departmental approval must be obtained at the time of registration (co-operative) by all students at or beyond the third year level.Fourth Year (Fall and Winter): (a) Computer Science 4411, 4433 and 4453(b) Business 4253 or 4273(c) Mathematics 3334(d) One FCE from List of Program Electives below(e) Three half-course electivesFourth Year (Spring/Summer): Formal work period assignment (Computer Science 4990)Departmental approval must be obtained at the time of registration (co-operative) by all students at or beyond the third year level.Fifth Year (Fall): Formal work period assignment (Computer Science 4992)Fifth Year (Winter): (a) Computer Science 4413 and either Computer Science 4431 or 4432(b) One half-course elective from List of Mathematics Electives for Computer Science(c) One half-course elective from List of Program Electives below(d) One~~

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Fourth Year (Fall and Winter):
(a) Computer Science 4411, 4433 and 4453
(b) Business 4253 or 4273
(c) Mathematics 3334
(d) One FCE from List of Program Electives below
(e) Three half-course electives

Fourth Year (Spring/Summer):
Formal work period assignment (Computer Science 4990)

Departmental approval must be obtained at the time of registration (co-operative) by all students at or beyond the third year level.

Fifth Year (Fall):
Formal work period assignment (Computer Science 4992)

Fifth Year (Winter):
(a) Computer Science 4413 and either Computer Science 4431 or 4432
(b) One half-course elective from List of Mathematics Electives for Computer Science
(c) One half-course elective from List of Program Electives below
(d) One half-course elective

(b) Science Option

Year-to-year continuation in the program requires an average of at least 70% in all Computer Science courses, and satisfactory completion of the work period assignments.

First Year (Fall and Winter):
(a) Mathematics 1171, 1172, 1271 and 1272; Computer Science 1411, 1431
(b) One FCE elective chosen from: History 1100, Philosophy 1110, 1111, 1117, 1118, 1119, 1571, 1573, English 1011, 1031, 1111, 1112
(c) Physics 1211 and Physics 1212, or one FCE electives (not from Computer Science or Mathematics) approved by the Department

First Year (Spring/Summer):
At the discretion of the Chair of the Department, some students may have the opportunity of a formal work period assignment (Computer Science 1990).

Second Year (Fall and Winter):
(a) Mathematics 2111, 2255 and 2275
(b) Computer Science 2412, 2453, 2476 and 2477
(c) Sociology 2455

~~half-course elective~~

~~(b) Science Option~~

~~Year-to-year continuation in the program requires an average of at least 70% in all Computer Science courses, and satisfactory completion of the work period assignments.~~

(3) Students in this program are required to take at least five FCEs outside the Departments of Computer Science and Mathematical Sciences.

(4) Of the electives, One half FCE must be completed from the list of approved aboriginal content courses, and at least one FCE must be from the list of program electives

(5) Students completing the Business Focus program requirements and wishing to qualify for the entrepreneurship certificate in the Faculty of Business must, instead of Business 1013,   take as an elective a course from the following list : Business 2033, 3013, 3213, 3413, 4253 or an alternate approved by the Faculty of Business Administration

(6) In the science focus at least one FCE elective from the Faculty of Science and Environmental Studies must be at level two or higher, and specified electives from the Faculty of Science and Environmental Studies Faculty must not include zero level courses.

(7) Students following either the science or business focus and wishing to pursue the area of scientific computing should choose Mathematics 3351 and/or 3371 and should choose the necessary prerequisites from Mathematics as part of their electives (with attention paid to note (3))

First Year (Fall and Winter):

(d) One FCE electives	(a) Mathematics 1171, ~~1172,~~ 1271 ~~and 1272~~; Computer Science 1411, 1431
	(b) One FCE elective chosen from: History 1100, Philosophy 1110, 1111, 1117, 1118, 1119, 1571, 1573, English 1011, 1031, 1111, 1112
Note: Students interested in the Physics selections from the list of electives should take Mathematics 2131 and Physics 2211. Science option students interested in expanding their business background may take Business 1511, 1512, or another Business course with permission of the Faculty of Business Administration.	(c) ~~Physics 1211 and Physics 1212, or one FCE electives (not from Computer Science or Mathematics) approved by the Department~~ *One FCE Elective*
Second Year (Spring/Summer): Optional formal work period assignment (Computer Science 2990)	
Third Year (Fall): (a) Computer Science 3413, 3415, 3473 (b) Mathematics 3332 (c) One half-course elective	*Business Focus: Business 1511, 1512*
Third Year (Winter): Formal work period assignment (Computer Science 3990)	*Science Focus:One FCE elective from the Faculty of Science and Environmental Studies*
Third Year (Spring/Summer): Formal work period assignment (Computer Science 3992) Departmental approval must be obtained at the time of registration (co-operative) by all students at or beyond the third year level.	First Year (Spring/Summer): At the discretion of the Chair of the Department, some students may have the opportunity of a formal work period assignment (Computer Science 1990).
Fourth Year (Fall and Winter): (a) Computer Science 4411, 4433 and 4453 (b) Mathematics 3334 (c) One half-course elective from List of Mathematics Electives for Computer Science (d) Three half-courses from List of Program Electives below (e) One FCE electives	Second Year (Fall and Winter): (a) Mathematics ~~2111~~*2310*, 2255 ~~and 2275~~ (b) Computer Science 2412, *2430,* 2453, 2476 and ~~2477~~*2477* (c) ~~Sociology 2455(d)~~ One ~~FCE electivesNote: Students interested in the Physics selections from the list of electives should take Mathematics 2131 and Physics 2211.Science option students interested in expanding their business background may take Business 1511, 1512, or another Business course with permission of the Faculty of Business Administration.~~*half FCE elective*
Fourth Year (Spring/Summer): Formal work period assignment (Computer Science 4990) Departmental approval must be obtained at the time of registration (co-operative) by all students at or beyond the third year level.	*Business Focus: Business 2514,2538*
Fifth Year (Fall): Formal work period assignment (Computer Science 4992)	*Science Focus:One-half FCE elective from the Faculty of Science and Environmental Studies, Sociology 2455*
Fifth Year (Winter):	

(a) Computer Science 4413, 4451 and either Computer Science 4431 or 4432
(b) One half-course from List of Program Electives below
(c) One half-course elective

(c) Hardware Option

Year-to-year continuation in the program requires an average of at least 70% in all Computer Science courses, and satisfactory completion of the work period assignments.

First Year (Fall and Winter):
(a) Mathematics 1171 and 1172; Computer Science 1411, 1431; Physics 1211, 1212
(b) Mathematics 1271, 1272 or Chemistry 1110, 1130
(c) One FCE elective chosen from: History 1100, Philosophy 1110, 1111, 1117, 1118, 1119, 1571, 1573, English 1011, 1031, 1111, 1112

First Year (Spring/Summer):
At the discretion of the Chair of the Department, some students may have the opportunity of a formal work period assignment (Computer Science 1990).

Second Year (Fall and Winter):
(a) Mathematics 2111 and 2131
(b) Computer Science 2412, 2453, 2476 and 2477
(c) Physics 2211, 2311, 2331, 2332

Second Year (Spring/Summer):
Optional formal work period assignment (Computer Science 2990)

Third Year (Fall):
(a) Mathematics 2255
(b) Computer Science 3415, 3473
(c) Physics 3231
(d) Sociology 2455

Third Year (Winter):
Formal work period assignment (Computer Science 3990)

Third Year (Spring/Summer):
Formal work period assignment (Computer Science 3992)

Departmental approval must be obtained at the time of registration (co-operative) by all students at or beyond the third year level.

Second Year (Spring/Summer):
Optional formal work period assignment (Computer Science 2990)

Third Year (Fall):
(a) Computer Science 3413, 3415, 3473~~(b) Mathematics 3332(c) One half-course elective~~

Business Focus: Sociology 2455, Business 3215

Science Focus: One-half FCE elective, Computer Science 4475

Third Year (Winter):
Formal work period assignment (Computer Science 3990)

Third Year (Spring/Summer):
Formal work period assignment (Computer Science 3992)

Departmental approval must be obtained at the time of registration (co-operative) by all students at or beyond the third year level.

Fourth Year (Fall and Winter):
(a) Computer Science 4411, ~~4433 and~~ 4453*, 4471, 4478*
(b) ~~Mathematics 3334(c)~~ One ~~half-course elective from List~~ of ~~Mathematics Electives for Computer~~

Fourth Year (Fall):
(a) Computer Science 4411 and a half-course Computer Science elective
(b) Physics 3211 and a half-course Physics elective
(c) One half-course elective

Fourth Year (Winter):
(a) Mathematics 2275
(b) Computer Science 4475 and a half-course Computer Science elective
(c) Physics 3611
(d) One half-course elective

Fourth Year (Spring/Summer):
Formal work period assignment (Computer Science 4990)

Departmental approval must be obtained at the time of registration (co-operative) by all students at or beyond the third year level.

Fifth Year (Fall):
Formal work period assignment (Computer Science 4992)

Fifth Year (Winter):
(a) Computer Science 4453 and one half-course Computer Science elective
(b) Physics 3311
(c) Two half-course electives

BSc (Physics)
Students wishing to complete the requirements for a BSc in Physics following the HBSc (Computer Science) Hardware Option program must complete Chemistry 1110/1130 and Physics 2111 and 3113 and have a total of at least 6 FCEs in Physics.

List of Program Electives

Applied Mathematics:
Mathematics 3331 - Optimization
Mathematics 3333 - Operations Research
Mathematics 3373 - Combinatorics and Graph Theory

Computer Science:
Computer Science 4451 - Theory of Computing
Computer Science 4471 - Computer Graphics
Computer Science 4475 - Topics in Artificial Intelligence
Computer Science 4476 - Cryptography and Network Security
Computer Science 4478 - Games Design Patterns

~~Science(d) Three half-courses from List of Program Electives below(e) One FCE electivesFourth Year (Spring/Summer):Formal work period assignment (Computer Science 4990)Departmental approval must be obtained at the time of registration (co-operative) by all students at or beyond the third year level.Fifth Year (Fall): Formal work period assignment (Computer Science 4992)Fifth Year (Winter): (a) Computer Science 4413, 4451 and either Computer Science 4431 or 4432(b) One half-course from List of Program Electives below(c) One half-course elective~~

~~(c) Hardware Option~~

~~Year-to-year continuation in the program requires an average of at least 70% in all Computer Science courses, and satisfactory completion of the work period assignments.~~

~~First Year (Fall and Winter): (a) Mathematics 1171 and 1172; Computer Science 1411, 1431; Physics 1211, 1212(b) Mathematics 1271, 1272 or Chemistry 1110, 1130(c) One FCE elective chosen from: History 1100, Philosophy 1110, 1111, 1117, 1118, 1119, 1571, 1573, English 1011, 1031, 1111, 1112First Year (Spring/Summer): At the discretion of the Chair of the Department, some students may have the opportunity of a formal work period assignment (Computer Science 1990).Second Year (Fall and Winter): (a) Mathematics 2111 and 2131(b) Computer Science 2412, 2453, 2476 and 2477(c) Physics 2211, 2311, 2331, 2332Second Year (Spring/Summer): Optional formal work period assignment (Computer Science 2990)Third Year (Fall): (a) Mathematics 2255(b) Computer Science 3415, 3473(c) Physics 3231(d) Sociology 2455Third Year (Winter):~~ *Computer Science 4413, 4433, 4451*

Business Focus: Computer Science 4475, Two FCE electives

Science Focus: One FCE elective from the Faculty of Science and Environmental Studies, one and one-half FCE elective. At this year level and later, it is suggested electives be chosen from the list of program electives to satisfy the program elective requirement in note (4) above.

Computer Science 4479 - Reading and Research in Computer Science

Numerical Analysis:
Mathematics 3351 - Applied Numerical Methods
Mathematics 3371 - Computational Linear Algebra and Numerical Approximation I

Physics:
Physics 2211 - Intermediate Electricity and Magnetism
Physics 3231 - Introductory Electronics
Physics 3611 - Computer Acquisition and Control

Engineering (with permission of the instructor):
Engineering 4559 - Signal Processing for Software Engineers

List of Mathematics Electives for Computer Science

Mathematics 2111 - Differential Equations
Mathematics 2131 - Vector Calculus
Mathematics 3331 - Linear Programming and Applications
Mathematics 3333 - Operations Research
Mathematics 3351 - Applied Numerical Methods
Mathematics 3371 - Computational Linear Algebra and Numerical Approximation I
Mathematics 3373 - Combinatorics and Graph Theory

Fourth Year (Spring/Summer):
Formal work period assignment (Computer Science 4990)

Fifth Year (Fall):
Formal work period assignment (Computer Science ~~3990)Third Year (Spring/Summer): Formal work period assignment (Computer Science 3992)~~ *4992)*

Departmental approval must be obtained at the time of registration (co-operative) by all students at or beyond the third year level.

~~Fourth~~ *Fifth* Year (~~Fall~~ *Winter*):
(a) ~~Computer~~ *Computer* Science ~~4411 and a half-course Computer Science elective~~ *4476 and either Computer Science 4431 or 4432*
(b) ~~Physics 3211 and a half-course Physics elective(c) One half-course electiveFourth Year (Winter): (a) Mathematics 2275(b) Computer Science 4475 and a half-course Computer Science elective(c) Physics 3611(d) One half-course electiveFourth Year (Spring/Summer): Formal work period assignment (Computer Science 4990)Departmental approval must be obtained at the time of registration (co-operative) by all students at or beyond the third year level.Fifth Year (Fall): Formal work period assignment (Computer Science 4992)Fifth Year (Winter): (a) Computer Science 4453 and one half-course Computer Science elective(b) Physics 3311(c) Two half-course electivesBSc (Physics) Students wishing to complete the requirements for a BSc in Physics following the HBSc (Computer Science) Hardware Option program must complete Chemistry 1110/1130 and Physics 2111 and 3113 and have a total of at least 6 FCEs in Physics.List of Program Electives Applied Mathematics:Mathematics 3331 - OptimizationMathematics 3333 - Operations ResearchMathematics 3373 - Combinatorics and Graph TheoryComputer Science:Computer Science~~ *One of Computer Science 4413, 4433, 4451*
(d) One FCE elective

List of Program Electives

Computer Science 4413 – Programming Language Processors

Computer Science 4433: - Algorithm Design and Analysis

Computer Science 4451 - Theory of Computing

 Computer Science ~~4471 - Computer GraphicsComputer Science 4475 - Topics in Artificial IntelligenceComputer Science 4476 - Cryptography and Network SecurityComputer Science 4478 - Games Design PatternsComputer Science 4479 - Reading and Research in Computer ScienceNumerical Analysis:Mathematics 3351 - Applied Numerical MethodsMathematics 3371 - Computational Linear Algebra and Numerical Approximation IPhysics:Physics 2211 - Intermediate Electricity and MagnetismPhysics 3231 - Introductory ElectronicsPhysics 3611 - Computer Acquisition and ControlEngineering (with permission of the instructor):Engineering 4559 - Signal Processing for Software EngineersList of Mathematics Electives for Computer Science~~ ~~Mathematics 2111 - Differential EquationsMathematics 2131 - Vector CalculusMathematics 3331 - Linear Programming and ApplicationsMathematics 3333 - Operations ResearchMathematics 3351 - Applied Numerical MethodsMathematics 3371 - Computational Linear Algebra and Numerical Approximation IMathematics 3373 - Combinatorics and Graph Theory~~*4479 - Reading and Research in Computer Science*

Computer Science 4210 - Special Topics

Computer Science 4310 - Web Health Informatics

Computer Science 4311 - Big Data

	Computer Science 4312 - Cloud Computing

Budgetary Considerations

CURRENT VERSION	PROPOSED VERSION
Student Enrolment No. It is just an update to reflect changes from Philosophy.	**Student Enrolment** No. ~~It is just an update to reflect changes from Philosophy.~~
Student Enrolment Other Units No. It is just an update to reflect changes from Philosophy.	**Student Enrolment Other Units** ~~No. It is just an update to reflect changes from Philosophy.~~ *At the course level: A small change in enrolment in physics courses no longer needed by our students (from the deleted hardware option). A larger change in mathematics courses no longer required in our programs.*
Additional Resources No. It is just an update to reflect changes from Philosophy.	**Additional Resources** ~~No. It is just an update to reflect changes from Philosophy~~ *Not for this update. The new courses in the list of program electives are based on the additional resources from our strategic hire.*
Teaching Loads No. It is just an update to reflect changes from Philosophy.	**Teaching Loads** No ~~. It is just an update to reflect changes from Philosophy~~ *change. The addition of mobile in second year is offset by alternating upper level courses (4413, 4433, 4452). The other required computer science courses added to the new program have been given fro years under the program electives list (4471, 4475, 4476, 4478).*
TeachingSupport Services No. It is just an update to reflect changes from Philosophy.	**TeachingSupport Services** No.~~It is just an update to reflect changes from Philosophy.~~
Outside Support No. It is just an update to reflect changes from Philosophy.	**Outside Support** No.~~It is just an update to reflect changes from Philosophy.~~