

# COMPUTER SCIENCE, B.SC. MAJOR

## Computer Science Major Entrance, Continuation, and Graduation Requirements

To **enter** the Major Degree program in Computer Science, a student must have completed at least 24 credit hours with a minimum DGPA of 2.50, and obtained a minimum grade of "C+" in COMP 1020, "C+" in both MATH 1300<sup>1</sup> and MATH 1240 and "C" in MATH 1700<sup>1</sup>.

To **continue** in the Major program a student must maintain a minimum DGPA of 2.50.

To **graduate** with the Computer Science Major degree, a student must present a minimum grade of "C+" in: MATH 1240, MATH 1300<sup>1</sup>, and a minimum grade of "C" in MATH 1500<sup>1</sup>, MATH 1700<sup>1</sup>, STAT 1150<sup>1</sup>, COMP 2080, COMP 2140, COMP 2150, COMP 2160, COMP 2280, COMP 3350, (COMP 3010 or COMP 3430), COMP 4620 and in each of the 18 credit hours of 3000 and 4000 level Computer Science courses that apply to the Computer Science component of their degree program. Additionally, students must achieve a minimum DGPA of 2.50.

<sup>1</sup>The following substitutions are allowed:

- STAT 1000 and STAT 2000 (B) may be taken in place of STAT 1150;
- MATH 1230 or MATH 1510 may be taken in place of MATH 1500;
- MATH 1220 or MATH 1210 (B) may be taken in place of MATH 1300;
- MATH 1232 or MATH 1710 may be taken in place of MATH 1700.

This program is suitable for those students interested in combining a fairly extensive program in Computer Science with broad coverage of another subject or subjects of their choice (Science or non-Science). The program offers greater scheduling flexibility, more relaxed entrance requirements, and a wider range for the inclusion of electives from other disciplines than the Honours program, but it is not considered to offer the same professional training as the Honours program. Admission to graduate programs may be conditional upon completion of additional courses. Students intending to proceed to a master's degree from the four year Major program should consult with the department at the beginning of their second year of undergraduate study and in each subsequent year.

The student will be able to transfer to the Honours program, provided that departmental and faculty requirements for the Honours program are satisfied.

Outside of computer science and mathematics courses, students are encouraged to select courses such that their programs include at least 15 credit hours of study in science, engineering, or business, and at least nine (9) credit hours of study in the humanities or social sciences. In addition to the faculty maximum, students may be allowed to take up to an additional 12 credit hours of courses outside of the Faculty of Science, with departmental permission. The permission would typically be granted if a student is completing a minor outside of Science and may have completed a variety of electives outside the Faculty prior to declaring a minor in one department.

## Major Co-operative Option

A co-operative education option is available for Major students. Students should refer to the Co-operative Education (p. 2) section for further information on the Co-op programs.

The course, minimum grade, and DGPA requirements for entry, continuation, and graduation in the Co-operative Option are the same as those required for the regular B.Sc. Major in Computer Science.

Students are required to complete all the first and second year courses in the program grid and COMP 3380 before their first co-op work term.

## Degree Requirements

### Four Year Major (Including Co-operative Option if Selected)<sup>1,2,3</sup>

| Course  | Title   | Hours     |
|---|---|-----------|
| <b>Year 1</b>   |   |           |
| COMP 1010   | Introductory Computer Science 1 <sup>4</sup>                        | 3         |
| COMP 1020   | Introductory Computer Science 2 (C+)                                | 3         |
| MATH 1240   | Elementary Discrete Mathematics (C+) <sup>4</sup>                   | 3         |
| MATH 1300   | Vector Geometry and Linear Algebra (C+) <sup>4</sup>                | 3         |
| MATH 1500   | Introduction to Calculus <sup>4</sup>                               | 3         |
| MATH 1700   | Calculus 2 <sup>4</sup>   | 3         |
| <b>Hours</b>  |   | <b>18</b> |
| <b>Years 1-2</b>  |   |           |
| STAT 1150   | Introduction to Statistics and Computing <sup>4</sup>               | 3         |
| 6 credit hours from the Faculty of Arts, which should include the required 3 credit hour "W" course |   | 6         |
| 18 credit hours of electives <sup>2,3</sup>   |   | 18        |
| <b>Hours</b>  |   | <b>27</b> |
| <b>Year 2</b>   |   |           |
| COMP 2080   | Analysis of Algorithms  | 3         |
| COMP 2140   | Data Structures and Algorithms                                      | 3         |
| COMP 2150   | Object Orientation  | 3         |
| COMP 2160   | Programming Practices   | 3         |
| COMP 2280   | Introduction to Computer Systems                                    | 3         |
| <b>Hours</b>  |   | <b>15</b> |
| <b>Year 3</b>   |   |           |
| COMP 3350   | Software Engineering 1  | 3         |
| One of:   |   | 3         |
| COMP 3010   | Distributed Computing   |           |
| COMP 3430   | Operating Systems   |           |
| 6 credit hours of 3000 level Computer Science <sup>5</sup>  |   | 6         |
| <b>Hours</b>  |   | <b>12</b> |
| <b>Years 3-4</b>  |   |           |
| 6 credit hours of 3000 or 4000 level Computer Science   |   | 6         |
| 33 credit hours of electives <sup>2</sup>   |   | 33        |
| <b>Co-op Requirements (if selected):<sup>1</sup></b>  |   |           |
| SCI 3980  | Co-operative Education Work Term 1                                  | 0         |
| SCI 3990  | Co-operative Education Work Term 2                                  | 0         |
| SCI 4980  | Co-operative Education Work Term 3                                  | 0         |
| SCI 4990  | Co-operative Education Work Term 4 (if a 4th work term is selected) | 0         |
| <b>Hours</b>  |   | <b>39</b> |

**Year 4**

|   |   |            |
|---|---|------------|
| COMP 4620                                     | Professional Practice in Computer Science | 3          |
| 6 credit hours of 4000 level Computer Science |   | 6          |
| <b>Hours</b>                                  |   | <b>9</b>   |
| <b>Total Hours</b>                            |   | <b>120</b> |

<sup>1</sup> Entry to the four-year Major Co-operative Option is at the end of second year. Employment terms follow 3A (September-December), 3B (May-August) and 4A (January-April). Students in the Co-operative Option must complete three employment terms and receive a passing grade in SCI 3980, SCI 3990, SCI 4980, and SCI 4990 (if selected) prior to the last academic term. Students in the Co-operative Option are required to complete COMP 3380 before their first work term.

<sup>2</sup> Additional information on how students may select their courses can be found in the program Overview (p. 1).

<sup>3</sup> **IMPORTANT:** The program grid above is intended to provide students with the recommended order in which to satisfy degree requirements. Students in the Co-operative Option should be aware that while other arrangements are possible, they may jeopardize their chances of obtaining employment by selecting such arrangements. Students should discuss their planned sequence of courses with the department prior to making adjustments to the sequence above.

<sup>4</sup>

- COMP 1012 may be taken in place of COMP 1010;
- STAT 1000 and STAT 2000 (B) may be taken in place of STAT 1150;
- MATH 1230 or MATH 1510 may be taken in place of MATH 1500;
- MATH 1220 or MATH 1210 (B) may be taken in place of MATH 1300;
- MATH 1232 or MATH 1710 may be taken in place of MATH 1700.
- Students who have previously completed COMP 2130 may use it in lieu of MATH 1240.

<sup>5</sup> Students in the Co-operative Option must complete COMP 3380, as part of these 6 credit hours, prior to their first co-op work term.

(Letters in brackets indicate minimum prerequisite standing for further study.)

### Co-operative Education Option Academic Regulations: B.Sc. (Major) & B.Sc. and B.C.Sc. (Honours)

Co-operative education is a form of experiential learning which integrates the academic education (classroom-based learning) of interested and qualified students with relevant, supervised, and paid work experience (work-based learning) with employers. Co-op students gain valuable skills to guide them through their academic education and prepare them for future careers after graduation.

The Faculty of Science offers a Co-operative Education Option in the following Major programs:

- Biochemistry
- Biological Sciences
- Chemistry
- Computer Science
- Data Science
- Genetics
- Mathematics
- Microbiology
- Physics & Astronomy

- Psychology
- Statistics.

The Honours programs offering a Co-operative Education Option are:

- Biochemistry
- Biological Sciences
- Chemistry
- Computer Science
- Genetics
- Mathematics
- Microbiology
- Physics & Astronomy
- Statistics
- Joint Computer Science – Mathematics
- Joint Computer Science – Physics and Astronomy
- Joint Computer Science – Statistics
- Joint Mathematics – Physics and Astronomy
- Joint Statistics – Mathematics program.

Co-operative education is optional and supplementary to academic requirements of the chosen degree. All regulations governing regular Major and Honours programs apply to the Co-operative Education Option. In addition, the following variations apply:

#### Entrance

To enter the Co-operative Education Option a student must be eligible to enter the Major or Honours program offered by the department. At the time of application, students must have a minimum Degree Grade Point Average (DGPA) of 2.5 for the Major and 3.0 for the Honours Programs. For Psychology, students must have a minimum Degree Grade Point Average (DGPA) of 3.0 for the Major. Co-op is not available for students in the Honours Psychology Program.

The normal point of entry to the Co-operative Education Option is following the completion of second year in the Faculty of Science. Students seeking admission will submit an application during their second year and complete an intake process with the appropriate departmental Co-op Coordinator. Application deadlines are established by the Science Co-op Office.

Students are advised that satisfying the entrance requirements does not guarantee a place in the Co-operative Education Option. The Science Co-op Office reserves the right to determine and select the best-qualified applicants.

Students admitted into the Co-operative Education Option will complete pre-employment training, including workshops, prior to the start of their first co-op work term. The structure and content of this training is developed by the Science Co-op Office. Attendance and completion of this training is mandatory.

#### Structure and Sequencing

The Co-operative Education Option consists of both academic terms and co-op work terms.

Each academic term can be either four months in duration or eight months in duration, as designated by the Major or Honours department.

Each co-op work term can be either four months in duration or eight months in duration, as designated by the Science Co-op Office. An eight

month work term would be counted as the equivalent of two 4 month terms.

Each academic term and each co-op work term will commence in January, May or September.

The sequence of academic terms and co-op work terms is variable to suit the needs of each department, and is designated by the Science Co-op Office in conjunction with each Major or Honours department. All Faculty of Science Co-operative Education Options must end on an academic term.

Students are expected to follow the academic/co-op work term sequence defined by their Major or Honours department from admission through to graduation.

### Co-op Work Term Requirements

All Co-operative Education Options require participating students to complete at least three (3) 4-month co-op work terms for a total of a minimum of 12 months' work experience. Each co-op work term is completed with one employer.

Students are required to register in the appropriate co-op work term course and pay the work term fee prior to starting their co-op work term.

Co-operative Education Option students are required to submit a work term report at the end of each co-op work term. These reports are due at times designated by the Science Co-op Office. In order to remain in the Co-operative Education program, a student must obtain a grade of "Pass" for each work term report. The Science Co-op Office will provide students with instructions regarding the content and format requirements of the work term reports.

While on a co-op work term, students are not permitted to take more than six hours of academic credit, and may not take more than one course at a time.

### Academic Term Requirements

Coursework requirements of the Co-operative Education Option are equivalent to the coursework requirements of the four-year Major program. For students completing an Honours program, the coursework requirements of the Co-operative Education Option are equivalent to the coursework requirements of the Honours program with the exception of the Biochemistry, Genetics and Microbiology programs.

Co-operative Education Option students are required to maintain full-time study while registered for an academic term.

To continue in a four year Major Co-operative Education Option, students must maintain a minimum DGPA of 2.50 at each point of assessment; except for students in Psychology where a minimum DGPA of 3.00 must be maintained at each point of assessment. A student's performance will be evaluated following each academic term. In addition, the student must meet all individual course prerequisites for further study and departmental continuation and graduation requirements. Please see department entries for further information. Continuation in the Major Co-operative Education Option is also contingent upon satisfactory performance during co-op work terms.

To continue in an Honours Co-operative Education Option a student must maintain a minimum DGPA of 3.00 or higher at each point of assessment. A student's performance will be evaluated following each academic term. In addition, the student must meet all individual course prerequisites for further study and departmental continuation and graduation requirements. Please see department entries for further

information. Continuation in the Honours Co-operative Education Option is also contingent upon satisfactory performance during co-op work terms.

Students may be required to withdraw from the Co-operative Education Option for any of the following reasons:

- Failure to maintain the minimum academic requirements of the Faculty of Science and/or Major/Honours program.
- Failure to maintain the minimum credit hour requirements of the academic term in the co-op option.
- Unsatisfactory performance during a co-op work term.
- Failure to submit a co-op work term report or the submitted report does not achieve a "Pass" grade.
- Failure to observe the policies outlined in university governing documents related to Behavioural Policies and Academic Misconduct.
- Having consulted with the Co-op Director and/or Faculty Advisor, in the opinion of the Co-op Coordinator, the student does not possess sufficient ability, skills, aptitude, attitude, diligence or motivation to successfully complete the Co-operative Education Option.

Students who wish to voluntarily withdraw from the Co-operative Education Option must obtain the written approval from their Co-op Coordinator and the Science Co-op Director. Students must submit their withdrawal request to their Co-op Coordinator and receive approval by the withdrawal dates set by the Science Co-op Office for each co-op work term.

Students are not normally permitted to withdraw from the Co-operative Education Option once they have secured a position for their co-op work term; whether the position was obtained through the Science Co-op Office or through students' own self-directed job search. Enrollment in the applicable co-op course(s) will be maintained and students are responsible for all assessed fees for the duration of the co-op work term and for meeting all academic requirements.

Students who accumulate more than 18 credit hours of failed courses after entering the four-year Major program (regardless of the origin of the grade or if the course has been repeated) will be required to withdraw from the Major Co-op program. Students are also subject to the academic assessment policy found in the Faculty Academic Regulations (<https://catalog.umanitoba.ca/undergraduate-studies/science/#facultyacademicregulationstext>).

Students who accumulate more than 15 credit hours of failed courses after entering the Honours degree program (regardless of the origin of the grade or if the course has been repeated) will be required to withdraw from the Honours Co-op program. Students required to withdraw from the Honours program may be eligible to pursue the B.Sc. Major program or the B.Sc. General degree program. Students are also subject to the academic assessment policy found in the Faculty Academic Regulations (<https://catalog.umanitoba.ca/undergraduate-studies/science/#facultyacademicregulationstext>).

Four year Major Co-operative Education Option students who are required to withdraw, or voluntarily revert to an alternative degree program must fulfil all academic requirements of that degree.

Honours Co-operative Education Option students who are required to withdraw or voluntarily revert to an alternative degree program must fulfil all academic requirements of that degree.