MATHEMATICS, B.SC. MAJOR

Mathematics Major Entrance, Continuation, and Graduation Requirements

To enter the four year Major in Mathematics, a student must have a minimum grade of "C+" in MATH 1232 or a minimum grade of "B" in MATH 1700, and have satisfied all Faculty requirements for entry to the program.

To continue in the Mathematics Major degree program students must maintain a minimum DGPA of 2.00.

To graduate with the B.Sc. Major degree, a student must achieve a minimum DGPA of 2.00, and a minimum grade of "C" in each of the Major Program Specific Courses.

Major Program Specific Courses

Course	Title	Hours
MATH 1220	Linear Algebra 1	3
MATH 1230	Differential Calculus	3
MATH 1232	Integral Calculus	3
MATH 1240	Elementary Discrete Mathematics	3
MATH 2020	Algebra 1	3
MATH 2030	Combinatorics 1	3
MATH 2080	Introduction to Analysis	3
MATH 2090	Linear Algebra 2	3
MATH 2150	Multivariable Calculus	3
MATH 2160	Numerical Analysis 1	3
MATH 2180	Real Analysis 1	3
MATH 3320	Algebra 2	3
MATH 3340	Complex Analysis 1	3
MATH 3360	Combinatorics 2	3
MATH 3390	Introduction to Topology	3
MATH 3440	Ordinary Differential Equations	3
MATH 3460	Partial Differential Equations	3
and 6 credit hours from the Year 2 Mathematics electives:		
MATH 2040	Curves and Surfaces	3
MATH 2070	Graph Theory 1	3
MATH 2170	Number Theory 1	3
A student may substitute any 3000/4000 level MATH course for either of the above two electives.		

Major Co-operative Option

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

The course and minimum grade requirements for entry and continuation in the Co-operative Option are the same as those required for the regular Major program. However, the entry and continuation DGPA requirement is set at a minimum of 2.5.

Students will need to have completed MATH 2020, MATH 2080, MATH 2090, MATH 2150 and MATH 2180 (or their equivalents as approved by the department of Mathematics) before entrance into the Co-op Program. Students who plan on, or are required to, take MATH 3470 and MATH 3472 are recommended to take these in the Fall and Winter (respectively) of Year 3 (similarly with MATH 3320 and MATH 3322).

Degree Requirements

Four Year Major (Including Co-operative Option if Selected)

Course	Title	Hours
Year 1		
MATH 1220	Linear Algebra 1 [1]	3
MATH 1230	Differential Calculus [1]	3
MATH 1232	Integral Calculus (C+) [1]	3
MATH 1240	Elementary Discrete Mathematics	3
	Hours	**12**
Years 1-2		
STAT 1150	Introduction to Statistics and Computing [1]	3
COMP 1010	Introductory Computer Science 1 [1]	3
15 credit hours of approved electives [2]		15
The following must be completed in Year 1 or Year 2:		
6 credit hours from the Faculty of Arts, which should include the required "W" course		6
	Hours	**27**
Year 2		
MATH 2020	Algebra 1	3
MATH 2080	Introduction to Analysis	3
MATH 2090	Linear Algebra 2	3
MATH 2150	Multivariable Calculus	3
MATH 2180	Real Analysis 1	3
	Hours	**15**
Years 2-4		
MATH 2030	Combinatorics 1	3
MATH 2160	Numerical Analysis 1	3
MATH 3320	Algebra 2	3
MATH 3340	Complex Analysis 1	3
MATH 3360	Combinatorics 2	3
MATH 3390	Introduction to Topology	3
MATH 3440	Ordinary Differential Equations	3
MATH 3460	Partial Differential Equations	3
30 credit hours from the following:		30
MATH 2040	Curves and Surfaces	
MATH 2070	Graph Theory 1	
MATH 2170	Number Theory 1	
and any 3000/4000 level Mathematics courses.		
12 credit hours of approved electives [2]		12
	Hours	**66**
Years 3-4		
Co-op Requirements (if selected):		
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
	Hours	**0**
	Total Hours	**120**

1 Students are strongly advised to take MATH 1220, MATH 1230 and MATH 1232.
The following substitutions are allowed (but not advised), provided the grades indicated in brackets are achieved:
- MATH 1210 (B) or MATH 1300 (C+) in place of MATH 1220,
- MATH 1500 (B) or MATH 1510 (B) in place of MATH 1230,
- MATH 1700 (B) or MATH 1710 (B) in place of MATH 1232.

With permission from the department, students may be able to substitute STAT 1000 and STAT 2000 in place of STAT 1150.
COMP 1012 may be used in lieu of COMP 1010.

2 These courses may not be used for credit in this program: MATH 1010, MATH 1018, MATH 1020, FA 1020, MATH 1080, MATH 1090.

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

Co-operative Education

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 fulfill all academic requirements of that degree.