

STATISTICS, B.SC. MAJOR

Statistics Major Entrance, Continuation, and Graduation Requirements

To enter the Major Degree program in Statistics, a student must have completed at least 24 credit hours with a minimum DGPA of 2.00, and also obtained a minimum grade of "C+" in STAT 2150.

STAT 1150, MATH 1220, MATH 1230, MATH 1232 and MATH 1240 are all requirements of the Statistics Major degree program and students are strongly encouraged to take these courses in Year 1.

To continue in the four year Major program a student must maintain a minimum DGPA of 2.00.

To graduate from the four year Major program a student must obtain a minimum DGPA of 2.00, and a minimum grade of "C" in the Major Program Specific courses, which include all program required courses (see program grid (p. 1)) and optional courses selected from lists A, B and C.

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 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 are required to complete STAT 2300, STAT 3150 and STAT 3450 before beginning their first co-op work term.

Degree Requirements

Four Year Major (Including Co-operative Option if Selected) ¹

| Course | Title | Hours |
|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-----------|
| Year 1 | | |
| STAT 1150 | Introduction to Statistics and Computing ² | 3 |
| MATH 1220 | Linear Algebra 1 ² | 3 |
| MATH 1230 | Differential Calculus ² | 3 |
| MATH 1232 | Integral Calculus ² | 3 |
| MATH 1240 | Elementary Discrete Mathematics | 3 |
| Hours | | 15 |
| Years 1-2 | | |
| The following must be completed in Year 1 or Year 2: | | |
| COMP 1010 | Introductory Computer Science 1 ² | 3 |
| COMP 1020 | Introductory Computer Science 2 | 3 |
| STAT 2150 | Statistics and Computing (C+) | 3 |
| STAT 2300 | Principles of Data Collection | 3 |
| 6 credit hours from the Faculty of Arts, which should include the required "W" course | | 6 |
| 6 credit hours from the lists of Mathematics and Computer Science options for the Major program (Lists B and C below) | | 6 |

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|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------------|
| 12 credit hours of elective courses ^{3,4} | | 12 |
| Hours | | 36 |
| Year 2 | | |
| STAT 2400 | Introduction to Probability 1 | 3 |
| STAT 2800 | Introduction to Probability 2 | 3 |
| MATH 2720 | Multivariable Calculus ² | 3 |
| Hours | | 9 |
| Year 3 | | |
| STAT 3100 | Introduction to Statistical Inference | 3 |
| STAT 3150 | Statistical Computing | 3 |
| STAT 3450 | Linear Models | 3 |
| STAT 3690 | Multivariate Analysis | 3 |
| Hours | | 12 |
| Years 3-4 | | |
| 24 credit hours from the list of Statistics options for the Major program (List A below), with at least 15 credit hours at the 4000 level | | 24 |
| 9 credit hours from the lists of Statistics, Mathematics and Computer Science options for the Major program (Lists A, B and C below) | | 9 |
| 15 credit hours of elective courses ^{3,4} | | 15 |
| Co-op Requirements (if selected): ⁵ | | |
| 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 | | 48 |
| Total Hours | | 120 |

¹ IMPORTANT: The four year Major program need not be completed in the manner prescribed in the grid above. The grid indicates one possible arrangement of the required courses and is meant to be a guide around which students can plan their program.

² The following substitutes are allowed:

- COMP 1012 in place of COMP 1010;
- 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;
- MATH 2150 in place of MATH 2720;
- STAT 1000 and STAT 2000 (B) in place of STAT 1150.

³ Although not required, students are encouraged to select some of their electives from traditional fields of application in Statistics such as Biological Sciences, Microbiology, Actuarial Mathematics, Economics, Psychology, or Sociology.

⁴ The following courses are not to be used for credit in this program: STAT 3000, STAT 4000.

⁵ Students in the Co-operative Option are required to complete STAT 2300, STAT 3150, and STAT 3450 before their first employment term.

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

Optional Courses for the Major Program

| Course | Title | Hours |
|---------------------------------------------------------------|---------------------------------------------------|-------|
| List A: Statistics Options for the Major Program | | |
| STAT 3030 | Introduction to Stochastic Processes | 3 |
| STAT 3170 | Statistical Quality Control | 3 |
| STAT 3380 | Introduction to Nonparametric Statistics | 3 |
| STAT 3490 | Time Series Analysis | 3 |
| STAT 3550 | Nonlinear Regression Models | 3 |
| STAT 3900 | Intermediate Topics in Statistics | 3 |
| STAT 3910 | Intermediate Topics in Statistics with Laboratory | 3 |
| STAT 4100 | Statistical Inference | 3 |
| STAT 4150 | Bayesian Analysis and Computing | 3 |
| STAT 4170 | Lifetime Data Analysis | 3 |
| STAT 4250 | Statistical Learning | 3 |
| STAT 4520 | Sampling Techniques | 3 |
| STAT 4530 | Design of Experiments | 3 |
| STAT 4630 | Stochastic Processes | 3 |
| STAT 4700 | Statistical Consulting | 3 |
| STAT 4900 | Advanced Topics in Statistics | 3 |
| STAT 4910 | Advanced Topics in Statistics with Laboratory | 3 |
| List B: Mathematics Options for the Major Program | | |
| MATH 2030 | Combinatorics 1 | 3 |
| MATH 2070 | Graph Theory 1 | 3 |
| MATH 2080 | Introduction to Analysis | 3 |
| MATH 2090 | Linear Algebra 2 | 3 |
| MATH 2160 | Numerical Analysis 1 | 3 |
| MATH 2180 | Real Analysis 1 | 3 |
| MATH 2740 | Mathematics of Data Science | 3 |
| MATH 3330 | Computational Algebra | 3 |
| MATH 3340 | Complex Analysis 1 | 3 |
| MATH 3360 | Combinatorics 2 | 3 |
| MATH 3440 | Ordinary Differential Equations | 3 |
| MATH 3460 | Partial Differential Equations | 3 |
| MATH 3470 | Real Analysis 2 | 3 |
| MATH 3610 | Introduction to Mathematical Modelling | 3 |
| MATH 4370 | Linear Algebra and Matrix Analysis | 3 |
| MATH 4390 | Numerical Approximation Theory | 3 |
| MATH 4490 | Optimization | 3 |
| List C: Computer Science Options for the Major Program | | |
| COMP 2080 | Analysis of Algorithms | 3 |
| COMP 2140 | Data Structures and Algorithms | 3 |
| COMP 2150 | Object Orientation | 3 |
| COMP 3170 | Analysis of Algorithms and Data Structures | 3 |
| COMP 3190 | Introduction to Artificial Intelligence | 3 |
| COMP 3380 | Databases Concepts and Usage | 3 |
| COMP 4140 | Introduction to Cryptography and Cryptosystems | 3 |
| COMP 4190 | Artificial Intelligence | 3 |
| COMP 4360 | Machine Learning | 3 |
| COMP 4380 | Database Implementation | 3 |
| COMP 4420 | Advanced Design and Analysis of Algorithms | 3 |

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| COMP 4710 | Introduction to Data Mining | 3 |
| COMP 4820 | Bioinformatics | 3 |

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.