UNIVERSITY OF TORONTO SCARBOROUGH

OFFICE OF THE CAMPUS COUNCIL

FOR APPROVAL **PUBLIC** **OPEN SESSION**

TO: UTSC Academic Affairs Committee

SPONSOR: William Gough, Vice-Principal, Academic and Dean
CONTACT INFO: 416-208-7027, vpdean@utsc.utoronto.ca

PRESENTER: Mark Schmuckler, Vice-Dean, Undergraduate
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DATE: March 22, 2018 for March 29, 2018

AGENDA ITEM: 3

ITEM IDENTIFICATION:

Undergraduate Major Modifications-- Specialist/Specialist Co-op programs in Mathematics, Major/Major Co-op programs in Mathematics, and Major/Major Co-op Programs in Statistics

JURISDICTIONAL INFORMATION:

University of Toronto Scarborough Academic Affairs Committee (AAC) "is concerned with matters affecting the teaching, learning and research functions of the Campus" (*AAC Terms of Reference, Section 4*). Under section 5.6 of its terms of reference, the Committee is responsible for approval of "Major and minor modifications to existing degree programs." The AAC has responsibility for the approval of Major and Minor modifications to existing programs as defined by the University of Toronto Quality Assurance Process (*UTQAP, Section 3.1*).

GOVERNANCE PATH:

1. **UTSC Academic Affairs Committee [For Approval] (March 29, 2018)**

PREVIOUS ACTION TAKEN:

No previous action in governance has been taken on this item.

HIGHLIGHTS:

The Department of Computer and Mathematical Sciences (CMS) at the University of Toronto Scarborough (UTSC) is proposing to add CGPA enrolment requirements for the first time to the following programs:

1a. Specialist Program in Mathematics (BSc) – all streams
1b. Major Program in Mathematics (BSc)
1c. Major Program in Statistics (BSc)

In addition, the existing enrolment requirements for the following programs are being updated to include the completion of specific courses:

2a. Specialist (Co-operative) Program in Mathematics (BSc) – all streams
2b. Major (Co-operative) Program in Mathematics (BSc)
2c. Major (Co-operative) Program in Statistics (BSc)

The Department of Computer and Mathematical Sciences (CMS) offers Specialist/Specialist Co-op and Major/Major Co-op programs in Computer Science (CS), Mathematics, and Statistics. The Specialist/Specialist Co-op in Computer Science, Major/Major Co-op programs in Computer Science, and Specialist/Specialist Co-op programs in Statistics currently have enrolment requirements. The Specialist in Mathematics, Major in Mathematics, and Major programs in Statistics currently do not have enrolment requirements and enrolment is unlimited. The Specialist (Co-operative) in Mathematics, Major (Co-operative) in Mathematics and Major (Co-operative) in Statistics currently have an enrolment requirement of a minimum CGPA of 2.5, which is the norm for all Co-op programs at UTSC. This asymmetry in CMS programs has miss-guided students into programs they are not interested in or academically prepared for.

To address this problem, CMS is introducing enrolment requirements for all of its remaining unlimited enrolment non Co-op Specialist and Major programs, as listed above. For all programs, this change will ensure students have the minimum background needed to pursue the program by requiring them to have completed their A-level core courses, and also ensure they have the minimum academic aptitude needed to succeed in the program by requiring them to achieve a minimum CGPA across the core A-level courses. In addition, for the analog Co-op programs, as listed above, a requirement to complete the A-level core courses is being added to an existing CGPA requirement, again to ensure students have the minimum background needed to pursue the program.

There are no changes to the program learning outcomes.

Students who have already selected the identified programs as a Subject POSt will be grandfathered. Students applying to the identified programs after the changes take effect will be made aware of the changes through information sessions offered by CMS, through the UTSC Academic Affairs & Career Centre, and through the undergraduate Academic Calendar.

We anticipate that only a small number of students will not meet the requirements for admission to the program. Some of these students may be redirected to the Major Program in Mathematics or the Major Program in Statistics, both of which will have a CGPA requirement of 2.0, rather than 2.5.

The proposed changes are in line with program admissions practices at the wider University of Toronto. The proposed changes have been broadly discussed within the Department of Computer and Mathematical Sciences, and presented to first-year CMS students. The changes have been reviewed by the Arts and Science Co-op Office.

FINANCIAL IMPLICATIONS:

There are no net financial implications to the campus operating budget.

RECOMMENDATION:

Be It Resolved,

THAT the major modifications to Specialist/Specialist (Co-operative) in Mathematics (BSc), Major/Major (Co-operative) in Mathematics (BSc), and Major/Major (Co-operative) in Statistics (BSc), as described in the proposal dated February 22, 2018, and recommended by the Vice-Principal, Academic and Dean, Professor William Gough, be approved for the academic year 2018-19.

DOCUMENTATION PROVIDED:

1. Major Modification to the Specialist/Specialist (Co-operative) in Mathematics (BSc), Major/Major (Co-operative) in Mathematics (BSc), and Major/Major (Co-operative) in Statistics (BSc), dated February 22, 2018.

UNIVERSITY OF TORONTO

University of Toronto
Major Modification Proposal: Significant Modifications to Existing Graduate and Undergraduate Programs

Programs being modified:	1. a. Specialist Program in Mathematics (BSc) b. Major Program in Mathematics (BSc) c. Major Program in Statistics (BSc) 2. a. Specialist (Co-operative) Program in Mathematics (BSc) b. Major (Co-operative) Program in Mathematics (BSc) c. Major (Co-operative) Program in Statistics
Type of Major Modification:	1. Introduce CGPA enrolment requirements for the first time. 2. Modify the existing enrolment requirements to add the completion of specific courses.
Effective Date of Change:	April 1, 2018
Department / Unit where the program resides:	Computer and Mathematical Sciences
Discipline Area/Calendar Section:	Mathematics Statistics
Faculty / Academic Division:	University of Toronto Scarborough
Faculty / Academic Division contact:	Annette Knott, Academic Programs Officer; aknott@utsc.utoronto.ca
Department / Unit contact:	Raymond Grinnell, Associate Chair, CMS grinnell@utsc.utoronto.ca
Date of this version of the proposal:	February 22, 2018

1 Summary

The Department of Computer and Mathematical Sciences (CMS) at the University of Toronto Scarborough (UTSC) is proposing to add CGPA enrolment requirements for the first time to the following programs:

1a. Specialist Program in Mathematics (BSc) – all streams
The Specialist in Mathematics (BSc) is currently a program with three streams: (i) Comprehensive Stream; (ii) Statistics Stream; and (iii) Teaching Stream. Enrolment into the program is unlimited, and the program has no enrolment requirements.

With the approval of this proposal, enrolment into the program will be limited, and the following enrolment requirements will apply to all three streams:

Students may apply to enter the program after completing 4.0 credits, and must have passed all of the A-level MAT and CSC courses required in the program ([CSCA08H3 or CSCA20H3], CSCA67H3/MATA67H3, MATA22H3, MATA31H3, MATA37H3). Students with a CGPA of at least 2.5 across the core A-level courses are guaranteed admission.

1b. Major Program in Mathematics (BSc)
The Major in Mathematics (BSc) is currently an undifferentiated program with no streams. Enrolment into the program is unlimited, and the program has no enrolment requirements.

With the approval of this proposal, enrolment into the program will be limited, and the following enrolment requirements will apply:

Students may apply to enter the program after completing 4.0 credits, and must have passed all of the A-level MAT and CSC courses required in the program (CSCA08H3, CSCA67H3/MATA67H3, MATA22H3, [MATA30H3 or MATA31H3], and [MATA36H3 or MATA37H3]). Students with a CGPA of at least 2.0 across the core A-level courses are guaranteed admission.

1c. Major Program in Statistics (BSc)
The Major in Statistics (BSc) is currently an undifferentiated program with no streams. Enrolment into the program is unlimited, and the program has no enrolment requirements.

With the approval of this proposal, enrolment into the program will be limited, and the following enrolment requirements will apply:

Students may apply to enter the program after completing 4.0 credits, and must have passed all of the A-level CSC and MAT courses required for the program ([CSCA08H3 or CSCA20H3], MATA22H3, [MATA30H3 or MATA31H3] and [MATA36H3 or MATA37H3]). Students with a CGPA of 2.0 or greater across the core A-level courses are guaranteed admission.

In addition, the existing enrolment requirements for the following programs are being revised to include the completion of specific courses:

2a. Specialist (Co-operative) Program in Mathematics (BSc) – all streams
Currently, the enrolment requirements for the program are: 4.0 credits, plus a cumulative GPA of at

least 2.5. These will be revised to:

Current Co-op Students (i.e., students that have been admitted to the general Co-op Subject POSt, but not yet admitted to the specific program Subject POSt)

4.0 credits and must have passed all of the A-level CSC and MAT courses required in the program ([CSCA08H3 or CSCA20H3], CSCA67H3/MATA67H3, MATA22H3, MATA31H3, and MATA37H3). Students with a CGPA of 2.5 across the core A-level courses required in the program, as well as a CGPA of at least 2.5 across all attempted courses are guaranteed admission.

Prospective Co-op Students (i.e., students have not yet been admitted to either the general Co-op Subject POSt, or to the specific program Subject POSt)

4.0 credits, and must have passed all of the A-level CSC and MAT courses required in the program ([CSCA08H3 or CSCA20H3], CSCA67H3/MATA67H3, MATA22H3, MATA31H3, and MATA37H3). Only students with a CGPA of at least 2.5 across the core A-level courses, as well as a CGPA of at least 2.5 across all attempted courses, will be considered for admission to the Co-op Program.

2b. Major (Co-operative) Program in Mathematics (BSc)
Currently, the enrolment requirements for the program are: 4.0 credits, plus a cumulative GPA of at least 2.5. These will be revised to:

Current Co-op Students (i.e., students that have been admitted to the general Co-op Subject POSt, but not yet admitted to the specific program Subject POSt)

4.0 credits and must have passed all of the A-level CSC and MAT courses required in the program (CSCA08H3, CSCA67H3/MATA67H3, MATA22H3, [MATA30H3 or MATA31H3], and [MATA36H3 or MATA37H3]). Students with a CGPA of 2.5 across the core A-level courses required in the program, as well as a CGPA of at least 2.5 across all attempted courses are guaranteed admission.

Prospective Co-op Students (i.e., students have not yet been admitted to either the general Co-op Subject POSt, or to the specific program Subject POSt)

4.0 credits, and must have passed all of the A-level CSC and MAT courses required in the program (CSCA08H3, CSCA67H3/MATA67H3, MATA22H3, [MATA30H3 or MATA31H3], and [MATA36H3 or MATA37H3]). Only students with a CGPA of at least 2.5 across the core A-level courses, as well as a CGPA of at least 2.5 across all attempted courses, will be considered for admission to the Co-op Program.

2c. Major (Co-operative) Program in Statistics (BSc)
Currently, the enrolment requirements for the program are: 4.0 credits, plus a cumulative GPA of at least 2.5. These will be revised to:

Current Co-op Students (i.e., students that have been admitted to the general Co-op Subject POSt, but not yet admitted to the specific program Subject POSt)

4.0 credits and must have passed all of the A-level CSC and MAT courses required in the program ([CSCA08H3 or CSCA20H3], MATA22H3, [MATA30H3 or MATA31H3], and [MATA36H3 or MATA37H3]). Students with a CGPA of 2.5 across the core A-level courses required in the program, as well as a CGPA of at least 2.5 across all attempted courses are guaranteed admission.

Prospective Co-op Students (i.e., students have not yet been admitted to either the general Co-op Subject POSt, or to the specific program Subject POSt)

4.0 credits, and must have passed all of the A-level CSC and MAT courses required in the program ([CSCA08H3 or CSCA20H3], MATA22H3, [MATA30H3 or MATA31H3], and [MATA36H3 or MATA37H3]). Only students with a CGPA of at least 2.5 across the core A-level courses, as well as a CGPA of at least 2.5 across all attempted courses, will be considered for admission to the Co-op Program.

The proposed changes are designed to guarantee a minimum level of student maturity and aptitude in mathematics, sufficient for the identified programs. They will help to ensure that students admitted to these programs have the preparation necessary to complete them in a reasonable time frame; we have found that some students struggle in upper years in these programs because they have not developed necessary basic skills, such as understanding and constructing mathematical proofs.

2 Academic Rationale

The Department of Computer and Mathematical Sciences (CMS) offers Specialist/Specialist Co-op and Major/Major Co-op programs in Computer Science (CS), Mathematics, and Statistics. The Specialist/Specialist Co-op in Computer Science, Major/Major Co-op programs in Computer Science, and Specialist/Specialist Co-op programs in Statistics currently have enrolment requirements. The Specialist in Mathematics, Major in Mathematics, and Major programs in Statistics currently do not have enrolment requirements and enrolment is unlimited. The Specialist (Co-operative) in Mathematics, Major (Co-operative) in Mathematics and Major (Co-operative) in Statistics currently have an enrolment requirement of a minimum CGPA of 2.5, which is the norm for all Co-op programs at UTSC. This asymmetry in CMS programs has miss-guided students into programs they are not interested in or academically prepared for.

To address this problem, CMS is introducing enrolment requirements for all of its remaining unlimited enrolment non Co-op Specialist and Major programs, as listed above. For all programs, this change will ensure students have the minimum background needed to pursue the program by requiring them to have completed their A-level core courses, and also ensure they have the minimum academic aptitude needed to succeed in the program by requiring them to achieve a minimum CGPA across the core A-level courses. In addition, for the analog Co-op programs, as listed above, a requirement to complete the A-level core courses is being added to an existing CGPA requirement, again to ensure students have the minimum background needed to pursue the program.

Program Enrolments

Program	2015-16	2016-17	2017-18
Specialist in Mathematics	60	83	155
Specialist Co-op in	11	10	12

Mathematics			
Major in Mathematics	244	291	336
Major Co-op in Mathematics	3	1	9
Major in Statistics	289	373	605
Major Co-op in Statistics	0	3	6

The Department does not anticipate the proposed changes will result in a reduction in program enrolments. The number of students interested in these programs is, in fact, increasing. The addition of enrolment requirements will ensure that students selecting these programs as Subject POSts will have the necessary mathematical skills needed to complete them, and complete them in a timely manner.

The proposed changes are in line with program admissions practices at the wider University of Toronto. Specifically, the Specialist Program in Mathematics (BSc), the Major Program in Mathematics (BSc), and the Major Program in Applied Statistics (BSc), offered at the University of Toronto Mississauga have enrolment requirements based on minimum marks in specific courses, as well as a minimum CGPA, which is determined annually.

3 Description of the Proposed Major Modification(s)

Description of Changes:

Enrolment requirements, as described in Section 1, are being added for the first time to:
1a. Specialist Program in Mathematics (BSc) – all streams
1b. Major Program in Mathematics (BSc)
1c. Major Program in Statistics (BSc)

The existing enrolment requirements for the following programs are being updated, as described in Section 1, to include the completion of specific courses:
2a. Specialist (Co-operative) Program in Mathematics (BSc) – all streams
2b. Major (Co-operative) Program in Mathematics (BSc)
2c. Major (Co-operative) Program in Statistics (BSc)

See Appendix A for Calendar copy showing all changes for each program.

Impact on Learning Outcomes:
No impact. There are no changes to the learning outcomes for any of the identified programs; instead, the proposed changes will better position students to achieve the existing program learning outcomes in all cases.

4 Impact of the Change(s) on Students

Students who have already selected the identified programs as a Subject POSt:
Students who have already selected the identified programs as a Subject POSt will be grandfathered, and the proposed changes will have no impact on them. Moreover, there is essentially no change for

Co-op students, since they already need a minimum CGPA of 2.5 in order to maintain good standing in the program.

Students who have not yet selected the identified programs as a Subject POSt:
Students applying to the identified programs after the changes take effect will be subject to the proposed enrolment requirements. Students will be made aware of the changes through information sessions offered by CMS, through the UTSC Academic Affairs & Career Centre, and through the undergraduate Academic Calendar.

We anticipate that only a small number of students will not meet the requirements for admission to the program. Some of these students may be redirected to the Major Program in Mathematics or the Major Program in Statistics, both of which will have a CGPA requirement of 2.0, rather than 2.5.

5 Consultation

The proposed changes have been discussed broadly within the Department of Computer and Mathematical Sciences during several departmental meetings, and have received the unanimous approval of the entire faculty via electronic vote (deadline September 29, 2017). They have also been presented to the first-year CMS students in a one-hour information session hosted by the department chair and the program supervisors on September 25, 2017.

The proposed changes have been reviewed by the Arts and Science Co-op Office, and no concerns were raised.

6 Resources

The proposed changes will not require any additional resources. The Program Supervisors for each program will be responsible for checking the requirements and admitting students into the program during the limited enrolment application cycles at the end of the Winter and Summer academic periods.

7 UTQAP/Governance Process

Levels of Approval Required	**Date**
Departmental Curriculum Committee	September 29, 2017
• **Decanal Sign-Off** • **Provost Office Sign-Off**	• February 14, 2018 • February 20, 2018
Campus Curriculum Committee	March 2, 2018
UTSC Academic Affairs Committee	March 2, 2018
Submission to Provost's Office	
AP&P – reported annually	
Ontario Quality Council – reported annually	

Appendix A: *Calendar* Copy [showing changes]

Current Calendar Copy can be copied and pasted from the online *Calendar*. Check the copy carefully to ensure it is complete. Show deletions using the ~~strikethrough~~ function and show all additions in red.

1a. SPECIALIST PROGRAM IN MATHEMATICS (SCIENCE)

Supervisor of Studies: E. Moore (416-287-7267) *Email*: emoore@utsc.utoronto.ca

Program Objectives

This program provides the student with a sound foundation in the main areas of mathematics, and some exposure to computer programming and statistics. It comprises three streams: Comprehensive, Statistics, and Teaching, each serving a more specific goal.

The **Comprehensive Stream** provides a broad and deep knowledge of mathematics at the undergraduate level. It is the recommended program for students who plan to pursue graduate study in mathematics, but it is also suitable for other career paths.

The **Statistics Stream** provides greater exposure to statistics, and the areas of mathematics most closely associated with it. This stream prepares students for careers in industry, or for graduate study in certain mathematically-oriented subjects, including statistics and financial mathematics.

The **Teaching Stream** is intended for students with a serious interest in mathematics but whose career objectives lie in mathematics education at the elementary or secondary level.

Enrolment Requirements

Enrolment in the Specialist Program in Mathematics (all streams) is limited.

Students may apply to enter the program after completing 4.0 credits, and must have passed all of the A-level MAT and CSC courses required in the program ([CSCA08H3 or CSCA20H3], CSCA67H3/MATA67H3, MATA22H3, MATA31H3, and MATA37H3). Students with a CGPA of at least 2.5 across the core A-level courses are guaranteed admission.

Program Requirements
The Program requirements consist of a core 15 courses (7.5 credits), common to all streams, and additional requirements that depend on the stream, for a total of 26-27 courses (13.0-13.5 credits).

The structure of the programs allows for easy switching between streams until relatively late. Consequently, these programs should not be viewed as rigidly separated channels feeding students to different career paths, but as a flexible structure that provides guidance to students in their course selection based on their broad (but possibly fluid) interests.

Core (7.5 credits)

1. Writing Requirement (0.5 credit)(*)
One of: ANTA01H3, ANTA02H3, (CLAA02H3), (CTLA19H3), CTLA01H3, ENGA10H3, ENGA11H3, ENGB06H3, ENGB07H3, ENGB08H3, ENGB09H3, ENGB17H3, ENGB19H3, ENGB50H3, (ENGB51H3), GGRA02H3, GGRA03H3, GGRB05H3, (GGRB06H3), (HISA01H3), (HLTA01H3), ACMA01H3, (HUMA01H3), (HUMA11H3), (HUMA17H3), (LGGA99H3), LINA01H3, PHLA10H3, WSTA01H3.
(*) It is recommended that this requirement be satisfied by the end of the second year.

2. **A-level courses** (2.5 credits)
[CSCA08H3 Introduction to Computer Science I or CSCA20H3 Introduction to Programming]
MATA22H3 Linear Algebra I for Mathematical Sciences
MATA31H3 Calculus I for Mathematical Sciences
MATA37H3 Calculus II for Mathematical Sciences
[MATA67H3 or CSCA67H3 Discrete Mathematics]

3. **B-level courses** (3.5 credits)
MATB24H3 Linear Algebra II
MATB41H3 Techniques of the Calculus of Several Variables I
MATB42H3 Techniques of the Calculus of Several Variables II
MATB43H3 Introduction to Analysis
MATB44H3 Differential Equations I
STAB52H3 Introduction to Probablity (**)
STAB57H3 Introduction to Statistics (**)
(**) This course may be taken after second year, except for the Statistics stream.

4. **C-level courses** (1 credit)
MATC01H3 Groups and Symmetry
MATC34H3 Complex Variables

A. Comprehensive Stream
This stream requires a total of 27 courses (13.5 credits) In addition to the core requirements 1-4 common to all streams, 12 other distinct courses must be chosen satisfying all of the following requirements:

5. **Additional courses in analysis and algebra** (1.5 credits):
MATC37H3 Introduction to Real Analysis
MATC46H3 Differential Equations II
MATD01H3 Fields and Groups

6. **Courses in key areas of mathematics** (1.0 credits):
Two of:
MATC15H3 Introduction to Number Theory
MATC27H3 Introduction to Topology
MATC63H3 Differential Geometry

MATD02H3 Classical Plane Geometries and their Transformations
MATD34H3 Complex Variables II

7. **Mathematics of computation** (1.0 credit):
Two of: CSCC37H3 Introduction to Numerical Algorithms for Computational Mathematics
CSCC63H3 Computability and Computational Complexity
CSCC73H3 Algorithm Design and Analysis
MATC09H3 Introduction to Mathematical Logic
~~MATC16H3~~ MATD16H3 Coding Theory and Cryptography
MATC32H3 Graph Theory and Algorithms for its Applications
MATC44H3 Introduction to Combinatorics

8. **Electives** (2.5 credits):
Five courses from CSC/MAT/STA/PHY of which at least 3 must be C- or D-level MAT courses (excluding MATC90H3).

B. Statistics Stream
This stream requires a total of 26 courses (13.0 credits). In addition to the core requirements 1-4 common to all streams, 11 other distinct courses must be chosen, satisfying all of the following requirements (in choosing courses to satisfy requirements 7-9, students must select at least one D-level course).

5. **Algebra and Analysis** (1.5 credits):
MATB61H3 Linear Programming and Optimization
MATC46H3 Differential Equations II
MATD01H3 Fields and Groups

6. **Regression Analysis** (0.5 credit):
STAC67H3 Regression Analysis

7. **Discrete mathematics and geometry** (0.5 credit):
One of:
MATC32H3 Graph Theory and Algorithms for its Applications
MATC44H3 Introduction to Combinatorics
MATD02H3 Classical Plane Geometries and their Transformations

8. **Upper-level MAT electives** (1 credit):
Two of:
Any C- or D-level MAT courses (*)
(*) For students wishing to pursue graduate studies in Mathematics or Statistics it is recommended that MATC37H3 be chosen as one of these two courses.

9. **Upper-level STA electives** (2 credits):
Four of:
(ACTB47H3) Introductory Life Contingencies
Any C- or D-level STA course, excluding STAD29H3

C. Teaching Stream
This stream requires a total of 26 courses (13.0 credits). In addition to the core requirements 1-4 common to all streams, 11 other distinct courses must be chosen, satisfying all of the following requirements:

5. **Algebra, analysis, and geometry** (1.5 credits):
MATC15H3 Introduction to Number Theory
MATD01H3 Fields and Groups
MATD02H3 Classical Plane Geometries and their Transformations

6. **Discrete mathematics** (0.5 credit):
One of:
MATC32H3 Graph Theory and Algorithms for its Applications
MATC44H3 Introduction to Combinatorics

7. **MAT electives** (1.5 credits):
Three of:
C- or D-level MAT courses

8. **MAT/STA/CSC electives** (2.0 credits):
Four of:
C- or D-level MAT, STA, CSC courses, excluding STAD29H3

It is recommended that students obtain a TA-ship within the Department of Computer and Mathematical Sciences.

1b. MAJOR PROGRAM IN MATHEMATICS (SCIENCE)

Supervisor of Studies: N. Breuss (416-287-7226)

Email: n.breuss@utoronto.ca

Program Objectives

This program provides a solid foundation in basic areas of mathematics, especially those with applications in other disciplines. This program is intended to be combined with other programs, typically a major program in another discipline.

Enrolment Requirements

Enrolment in the Major Program in Mathematics is limited.

Students may apply to enter the program after completing 4.0 credits, and must have passed all of the A-level MAT and CSC courses required in the program (CSCA08H3, CSCA67H3/MATA67H3, MATA22H3, [MATA30H3 or MATA31H3], and [MATA36H3 or

MATA37H3]). Students with a CGPA of at least 2.0 across the core A-level courses are guaranteed admission.

Program Requirements
This stream requires a total of 8.5 credits, chosen so as to satisfy all of the following requirements:

1. Foundational courses - 5.5 credits as follows:
[MATA67H3 or CSCA67H3 Discrete Mathematics]
MATA22H3 Linear Algebra I for Mathematical Sciences
[MATA30H3 Calculus I for Physical Sciences OR MATA31H3 Calculus I for Mathematical Sciences]
[MATA36H3 Calculus II for Physical Sciences OR MATA37H3 Calculus II for Mathematical Sciences (*)]
CSCA08H3 Introduction to Computer Science I
MATB24H3 Linear Algebra II
MATB41H3 Techniques of the Calculus of Several Variables I
MATB42H3 Techniques of the Calculus of Several Variables II
MATB44H3 Differential Equations I
STAB52H3 Introduction to Probability
[MATC01H3 Groups and Symmetry OR MATC15H3 Introduction to Number Theory]

(*) MATA31H3 is required for MATA37H3

2. Further analysis courses - 1.0 credit from the following:
MATB43H3 Introduction to Analysis
MATC27H3 Introduction to Topology
MATC34H3 Complex Variables
MATC37H3 Introduction to Real Analysis
MATC46H3 Differential Equations II
MATD34H3 Complex Variables II

3. Further algebra, geometry, and discrete mathematics courses - 1.0 credit from the following:
MATC01H3 Groups and Symmetry
MATC09H3 Introduction to Mathematical Logic
MATC15H3 Introduction to Number Theory
MATC32H3 Graph Theory and Algorithms for its Applications
MATC44H3 Introduction to Combinatorics
MATC63H3 Differential Geometry
MATD01H3 Fields and Groups
MATD02H3 Classical Plane Geometries and their Transformations

4. Elective courses - 1.0 credit from the following:
MATB61H3 Linear Programming and Optimization
STAB57H3 Introduction to Statistics
any C- or D-level MAT, STA, or CSC course, excluding STAD29H3

Recommended Writing Course: Students are urged to take a course from the following list of courses by the end of their second year.
ANTA01H3, ANTA02H3, (CLAA02H3), (CTLA19H3), CTLA01H3, ENGA10H3, ENGA11H3, ENGB06H3, ENGB07H3, ENGB08H3, ENGB09H3, ENGB17H3, ENGB19H3, ENGB50H3, (ENGB51H3), GGRA02H3, GGRA03H3, GGRB05H3, (GGRB06H3), (HISA01H3), (HLTA01H3), ACMA01H3, (HUMA01H3), (HUMA11H3), (HUMA17H3), (LGGA99H3), LINA01H3, PHLA10H3, PHLA11H3, WSTA01H3.

1c. MAJOR PROGRAM IN STATISTICS (SCIENCE)

Supervisor of Studies: M. Samarakoon
Email: mahinda@utsc.utoronto.ca

Recommended Writing Course: Students are urged to take a course from the following list of courses by the end of their second year. ANTA01H3, ANTA02H3, (CLAA02H3), (CTLA19H3), CTLA01H3, ENGA10H3, ENGA11H3, ENGB06H3, ENGB07H3, ENGB08H3, ENGB09H3, ENGB17H3, ENGB19H3, ENGB50H3, (ENGB51H3), GGRA02H3, GGRA03H3, GGRB05H3, (GGRB06H3), (HISA01H3), (HLTA01H3), ACMA01H3, (HUMA01H3), (HUMA11H3), (HUMA17H3), (LGGA99H3), LINA01H3, PHLA10H3, PHLA11H3, WSTA01H3.

Enrolment Requirements

Enrolment in the Major Program in Statistics is limited.

Students may apply to enter the program after completing 4.0 credits, and must have passed all of the A-level CSC and MAT courses required for the program ([CSCA08H3 or CSCA20H3], MATA22H3, [MATA30H3 or MATA31H3] and [MATA36H3 or MATA37H3]). Students with a CGPA of 2.0 or greater across the core A-level courses are guaranteed admission.

Program Requirements

This program requires 8.0 credits.

1. A-level courses
MATA22H3 Linear Algebra I for Mathematical Sciences
[CSCA08H3 Introduction to Computer Science I or CSCA20H3 Computer Science for the Sciences]
[MATA30H3 Calculus I for Physical Sciences or MATA31H3 Calculus I for Mathematical Sciences*]
[MATA36H3 Calculus II for Physical Sciences or MATA37H3 Calculus II for Mathematical Sciences*]
*The sequence MATA31H3 and MATA37H3 is recommended. MATA31H3 is the pre-requisite for MATA37H3.
2. B-level courses
MATB24H3 Linear Algebra II

MATB41H3 Techniques of the Calculus of Several Variables I
MATB42H3 Techniques of the Calculus of Several Variables II
STAB52H3 An Introduction to Probability*
STAB57H3 An Introduction to Statistics*

Upper-level courses
STAC67H3 Regression Analysis*
Four of:
any C- or D-level (or 300-400 on St. George) STA courses, except STAD29H3
Two of:
ACTB40H3, or any C- or D-level (or 300-400 on St. George) CSC, MAT or STA courses
* STAB52H3, STAB57H3, STAC67H3 - These courses must be taken at UTSC. No substitutes are permitted without permission of the program supervisor.

2a. SPECIALIST (CO-OPERATIVE) PROGRAM IN MATHEMATICS (SCIENCE)

Co-op Contact: askcoop@utsc.utoronto.ca

The Specialist (Co-operative) Program in Mathematics is a Work Integrated Learning (WIL) program that combines academic studies with paid work terms in the public, private, and/or non-profit sectors. The program provides students with the opportunity to develop the academic and professional skills required to pursue employment in these areas, or to continue on to graduate training in an academic field related to Mathematics upon graduation.

In addition to their academic course requirements, students must successfully complete the additive Arts & Science Co-op Work Term Preparation courses and a minimum of three Co-op work terms.

Enrolment Requirements

Enrolment in the Specialist (Co-operative) Program in Mathematics is limited.

~~The minimum qualifications for entry are 4.0 credits, plus a cumulative GPA of at least 2.5.~~

Current Co-op Students:

Students admitted to a Co-op Degree POSt in their first year of study must request a Co-op Subject POSt on ACORN upon completion of 4.0 credits and must ~~meet the minimum qualifications for entry as noted above.~~ have passed all of the A-level CSC and MAT courses required in the program ([CSCA08H3 or CSCA20H3], CSCA67H3/MATA67H3, MATA22H3, MATA31H3, and MATA37H3). Students with a CGPA of 2.5 or greater across the core A-level courses required in the program, as well as a CGPA of at least 2.5 across all attempted courses are guaranteed admission.

~~must meet the minimum qualifications for entry as noted above.~~

Prospective Co-op Students:

Prospective students (i.e., those not already admitted to a Co-op Degree POSt) may apply to the Co-op Program after completing 4.0 credits, and must have passed all of the A-level CSC and MAT courses required in the program ([CSCA08H3 or CSCA20H3], CSCA67H3/MATA67H3, MATA22H3, MATA31H3, and MATA37H3). Only students with a CGPA of at least 2.5 across the core A-level courses, as well as a CGPA of at least 2.5 across all attempted courses, will be considered for admission to the Co-op Program.

In addition to requesting the program on ACORN, prospective Co-op students (i.e., those not yet admitted to a Co-op Degree POSt) must also submit a Co-op Supplementary Application Form, which is available from the Arts & Science Co-op Office (http://www.utsc.utoronto.ca/askcoop/future-co-op-students). Submission deadlines follow the Limited Enrolment Program Application Deadlines set by the Registrar's Office each year. Failure to submit both the Supplementary Application Form and the program request on ACORN will result in that student's application not being considered.

Program Requirements

Students must complete the program requirements as described in the Specialist Program in Mathematics.

Co-op Work Term Requirements

Students must satisfactorily complete three Co-op work terms, each of four-months duration. To be eligible for their first work term, students must be enrolled in the Specialist (Co-op) Program in Mathematics and have completed at least 10.0 credits.

In addition to their academic program requirements, Co-op students complete up to five Co-op specific courses. These courses are designed to prepare students for their job search and work term experience, and to maximize the benefits of their Co-op work terms. They cover a variety of topics intended to assist students in developing the skills and tools required to secure work terms that are appropriate to their program of study, and to perform professionally in the workplace. These courses must be completed in sequence, and are taken in addition to a full course load. They are recorded on transcripts as credit/no credit (CR/NCR) and are considered to be additive credit to the 20.0 required degree credits. No additional course fee is assessed as registration is included in the Co-op Program fee.

Co-op Preparation Course Requirements:

1. COPD01H3 - Navigating the World of Work
- Students entering Co-op from outside of UTSC (high school or other postsecondary) will complete this course in fall of their first year at UTSC
- Current UTSC students entering Co-op in April/May will complete this course in the summer term
- Current UTSC students entering Co-op in July/August will complete this course in the fall term

2. COPD03H3 - Job Search Preparation
- Prerequisite: COPD01H3
- This course will be completed eight months in advance of the first scheduled work term

3. COPD11H3 - Job Search Competition I
- Prerequisite: COPD03H3
- This course will be completed four months in advance of the first work scheduled work term

4. COPD12H3 - Job Search Competition II
- Prerequisite: COPD11H3 and one Co-op work term
- This course will be completed four months in advance of the second scheduled work term

5. COPD13H3 - Job Search Competition III
- Prerequisite: COPD12H3 and two Co-op work terms
- This course will be completed four months in advance of the third scheduled work term

Students must be available for work terms in each of the Fall, Winter and Summer sessions and must complete at least one of their required work terms in either a Fall or Winter session. This in turn requires that students take courses during at least one Summer session.

2b. MAJOR (CO-OPERATIVE) PROGRAM IN MATHEMATICS (SCIENCE)

Co-op Contact: askcoop@utsc.utoronto.ca

The Major (Co-op) Program in Mathematics is a Work Integrated Learning (WIL) program that combines academic studies with paid work terms in the public, private, and/or non-profit sectors. The program provides students with the opportunity to develop the academic and professional skills required to pursue employment in these areas, or to continue on to graduate training in an academic field related to Mathematics upon graduation.

In addition to their academic course requirements, students must successfully complete the additive Arts & Science Co-op Work Term Preparation courses and a minimum of three Co-op work terms.

Enrolment Requirements

Enrolment in the Major (Co-operative) Program in Mathematics is limited.

~~The minimum qualifications for entry are 4.0 credits, plus a cumulative GPA of at least 2.5.~~

Current Co-op Students:

Students admitted to a Co-op Degree POSt in their first year of study must request a Co-op Subject POSt on ACORN upon completion of 4.0 credits and must ~~meet the minimum qualifications for entry as noted above.~~ have passed all of the A-level CSC and MAT courses

required in the program (CSCA08H3, CSCA67H3/MATA67H3, MATA22H3, [MATA30H3 or MATA31H3], and [MATA36H3 or MATA37H3]). Students with a CGPA of at least 2.5 across the core A-level courses, as well as a CGPA of at least 2.5 across all attempted courses, are guaranteed admission.

~~must meet the minimum qualifications for entry as noted above.~~

Prospective Co-op Students:

Prospective students (i.e., those not already admitted to a Co-op Degree POSt) may apply to the Co-op Program after completing 4.0 credits, and must have passed all of the A-level CSC and MAT courses required in the program (CSCA08H3, CSCA67H3/MATA67H3, MATA22H3, [MATA30H3 or MATA31H3], and [MATA36H3 or MATA37H3]). Only students with a CGPA of at least 2.5 across the core A-level courses, as well as a CGPA of at least 2.5 across all attempted courses, will be considered for admission to the Co-op Program.

In addition to requesting the program on ACORN, prospective Co-op students (i.e., those not yet admitted to a Co-op Degree POSt) must also submit a Co-op Supplementary Application Form, which is available from the Arts & Science Co-op Office (http://www.utsc.utoronto.ca/askcoop/future-co-op-students). Submission deadlines follow the Limited Enrolment Program Application Deadlines set by the Registrar's Office each year. Failure to submit both the Supplementary Application Form and the program request on ACORN will result in that student's application not being considered.

Program Requirements

Students must complete the program requirements as described in the Major Program in Mathematics.

Co-op Work Term Requirements

Students must satisfactorily complete three Co-op work terms, each of four-months duration. To be eligible for their first work term, students must be enrolled in the Major (Co-op) Program in Mathematics and have completed at least 7.0 credits.

In addition to their academic program requirements, Co-op students complete up to five Co-op specific courses. These courses are designed to prepare students for their job search and work term experience, and to maximize the benefits of their Co-op work terms. They cover a variety of topics intended to assist students in developing the skills and tools required to secure work terms that are appropriate to their program of study, and to perform professionally in the workplace. These courses must be completed in sequence, and are taken in addition to a full course load. They are recorded on transcripts as credit/no credit (CR/NCR) and are considered to be additive credit to the 20.0 required degree credits. No additional course fee is assessed as registration is included in the Co-op Program fee.

Co-op Preparation Course Requirements:

1. COPD01H3 - Navigating the World of Work
- Students entering Co-op from outside of UTSC (high school or other postsecondary) will complete this course in fall of their first year at UTSC
- Current UTSC students entering Co-op in April/May will complete this course in the summer term
- Current UTSC students entering Co-op in July/August will complete this course in the fall term

2. COPD03H3 - Job Search Preparation
- Prerequisite: COPD01H3
- This course will be completed eight months in advance of the first scheduled work term

3. COPD11H3 - Job Search Competition I
- Prerequisite: COPD03H3
- This course will be completed four months in advance of the first work scheduled work term

4. COPD12H3 - Job Search Competition II
- Prerequisite: COPD11H3 and one Co-op work term
- This course will be completed four months in advance of the second scheduled work term

5. COPD13H3 - Job Search Competition III
- Prerequisite: COPD12H3 and two Co-op work terms
- This course will be completed four months in advance of the third scheduled work term

Students must be available for work terms in each of the Fall, Winter and Summer sessions and must complete at least one of their required work terms in either a Fall or Winter session. This in turn requires that students take courses during at least one Summer session.

For information on fees, status in Co-op programs, and certification of completion of Co-op programs, see Section 6B.5 of the UTSC *Calendar.*

2c. MAJOR (CO-OPERATIVE) PROGRAM IN STATISTICS (SCIENCE)

Co-op Contact: askcoop@utsc.utoronto.ca

The Major (Co-op) Program in Statistics is a Work Integrated Learning (WIL) program that combines academic studies with paid work terms in the public, private, and/or non-profit sectors. The program provides students with the opportunity to develop the academic and professional skills required to pursue employment in these areas, or to continue on to graduate training in an academic field related to Statistics upon graduation.

In addition to their academic course requirements, students must successfully complete the additive Arts & Science Co-op Work Term Preparation courses and a minimum of three Co-op work terms.

Enrolment Requirements

Enrolment in the Major (Co-operative) Program in Statistics is limited.

~~The minimum qualifications for entry are 4.0 credits, plus a cumulative GPA of at least 2.5.~~

Current Co-op Students:

Students admitted to a Co-op Degree POSt in their first year of study must request a Co-op Subject POSt on ACORN upon completion of 4.0 credits and must ~~meet the minimum qualifications for entry as noted above.~~ have passed all of the A-level CSC and MAT courses required in the program ([CSCA08H3 or CSCA20H3], MATA22H3, [MATA30H3 or MATA31H3], and [MATA36H3 or MATA37H3]). Students with a CGPA of 2.5 or greater across the core A-level courses, as well as a CGPA of at least 2.5 across all attempted courses, are guaranteed admission.

Prospective Co-op Students:

Prospective students (i.e., those not already admitted to a Co-op Degree POSt) may apply to the Co-op Program after completing 4.0 credits, and must have passed all of the A-level CSC and MAT courses required in the program ([CSCA08H3 or CSCA20H3], MATA22H3, [MATA30H3 or MATA31H3], and [MATA36H3 or MATA37H3]). Only students with a CGPA of 2.5 or greater across the core A-level courses, as well as a CGPA of at least 2.5 across all attempted courses, will be considered for admission to the Co-op Program.

In addition to requesting the program on ACORN, prospective Co-op students (i.e., those not yet admitted to a Co-op Degree POSt) must also submit a Co-op Supplementary Application Form, which is available from the Arts & Science Co-op Office (http://www.utsc.utoronto.ca/askcoop/future-co-op-students). Submission deadlines follow the Limited Enrolment Program Application Deadlines set by the Registrar's Office each year. Failure to submit both the Supplementary Application Form and the program request on ACORN will result in that student's application not being considered.

Program Requirements

Students must complete the program requirements as described in the Major Program in Statistics.

Co-op Work Term Requirements

Students must satisfactorily complete three Co-op work terms, each of four-months duration. To be eligible for their first work term, students must be enrolled in the Major (Co-op) Program in Statistics and have completed at least 10.0 credits.

In addition to their academic program requirements, Co-op students complete up to five Co-op specific courses. These courses are designed to prepare students for their job search and work term experience, and to maximize the benefits of their Co-op work terms. They cover a variety of topics intended to assist students in developing the skills and tools required to secure work terms that are appropriate to their program of study, and to perform professionally in the workplace. These courses must be completed in sequence, and are taken in addition to a full course load.

They are recorded on transcripts as credit/no credit (CR/NCR) and are considered to be additive credit to the 20.0 required degree credits. No additional course fee is assessed as registration is included in the Co-op Program fee.

Co-op Preparation Course Requirements:

1. COPD01H3 - Navigating the World of Work
- Students entering Co-op from outside of UTSC (high school or other postsecondary) will complete this course in fall of their first year at UTSC
- Current UTSC students entering Co-op in April/May will complete this course in the summer term
- Current UTSC students entering Co-op in July/August will complete this course in the fall term

2. COPD03H3 - Job Search Preparation
- Prerequisite: COPD01H3
- This course will be completed eight months in advance of the first scheduled work term

3. COPD11H3 - Job Search Competition I
- Prerequisite: COPD03H3
- This course will be completed four months in advance of the first work scheduled work term

4. COPD12H3 - Job Search Competition II
- Prerequisite: COPD11H3 and one Co-op work term
- This course will be completed four months in advance of the second scheduled work term

5. COPD13H3 - Job Search Competition III
- Prerequisite: COPD12H3 and two Co-op work terms
- This course will be completed four months in advance of the third scheduled work term

Students must be available for work terms in each of the Fall, Winter and Summer sessions and must complete at least one of their required work terms in either a Fall or Winter session. This in turn requires that students take courses during at least one Summer session.

For information on fees, status in Co-op programs, and certification of completion of Co-op programs, see Section 6B.5 of the UTSC Calendar.