Sciences Curriculum Committee
Proposals for Committee Approval (Full Review)

January 30, 2020
2 Minor Program Modifications:

Biochemistry Major

Completion Requirements:

8 full courses or their equivalent, including two 400-series half-year courses as noted below.

First Year: (BIO120H1, BIO130H1); (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1; (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1

Second Year: BCH210H1; BIO230H1/BIO255H1; CHM247H1/CHM249H1

Third Year:
1. +: BCH311H1
2. BCH370H1
3. CHM217H1 +.5 full-course equivalents from the following list: BIO220H1/CHM220H1 BIO260H1/BCH340H1
4. 1.0 FCE from CHM217H1 */CHM220H1 */HMB265H1/BCH340H1 * (* if not taken for the requirement immediately above)/BIO220H1/BIO260H1/HMB265H1/JPM300H1. The department is open to the use of ANY 300-level non-field course(s) in CHM/CSB/EEB/HMB/IMM/LMP/MGY/PCL/PSL (departmental approval required). Note: Field courses may not be used to fulfill this requirement, but students must seek approval from the department prior to course enrolment +.5 FCEs.

Fourth Year: Two of: 1.0 FCE from BCH422H1/BCH425H1/BCH426H1/BCH428H1/BCH440H1/BCH441H1/BCH444H1/BCH445H1/BCH446H1/BCH448H1/BCH449H1/CHM447H1

Description of Proposed Changes:
JPM300 is being added to one of the options within the 3rd year. In connection with that, we are rewording that section to bin similar courses and require students to take at least one of either CHM217H1, CHM220H1, or BCH340H1.

Rationale:
The joint course JPM300 (Research Readiness and Advancing Biomedical Discoveries) taught by PharmTox, Physiology, and Biochem, has been explicitly added as an optional 3rd year offering. This is to provide our students greater options and clarify a position that was already reflected in our program requirements. (JPM300 would have fallen under the old language, “ANY 300-level course(s) in CHM/CSB/EEB/HMB/IMM/LMP/MGY/PCL/PSL (departmental approval required)” but may have led to confusion due to its nomenclature. We are now explicitly giving permission to take this course rather than providing departmental approval ad hoc).

Impact:

Consultation:
Regarding JMP300, consultation with Michelle French, one of the coordinators of JPM300 and Associate Chair, Physiology. Culmination of a 2-year discussion about where JPM300 fits within our programs.

Approval of all other changes by the biochemistry undergrad committee.

Consultation with Andy Dicks, Undergrad coordinator Chemistry, by email concerning the potential for more students to take CHM217 or CHM220 as part of the restructuring of the program requirements.
Biochemistry Specialist

Completion Requirements:

(14 full courses or their equivalent, including at least five 400-series courses)

First Year: (BIO120H1, BIO130H1); (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1; and (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1

First or Second Year: (PHY131H1, PHY132H1)/(PHY151H1, PHY152H1)

[PHY131H1, PHY132H1 recommended]

Second Year:

BCH242Y1; MGY280H1; BIO230H1/BIO255H1; STA220H1; CHM247H1/CHM249H1; BIO260H1/HMB265H1*

*Alternatively BIO260H1 may be taken in third year (due to timetable conflicts BIO260H1 may not be taken in 2nd year)

Third Year: BCH340H1; (BCH377H1; BCH378H1); MGY311Y1

Fourth Year:

1. BCH478H1

2. 2.0 FCE Four half courses from the following list, including at least 1.0 FCE in two BCH courses: BCH422H1/BCH425H1/BCH426H1/BCH428H1/BCH440H1/BCH441H1/BCH444H1/BCH445H1/BCH446H1/BCH448H1/BCH449H1/BCH450H1/BCH479H1/BCB420H1/CHM447H1/MGY420H1/MGY425H1/MGY428H1/MGY450H1/MGY470H1

3. BCH372Y1/BCH374Y1/BCH472Y1/BCH473Y1: 1.0 FCE One full credit from these optional research project courses may be taken for the Specialist program**.

Over the course of the Specialist program, additional courses credits (to bring the program total to 14.0 FCE 44 full courses or their equivalent) from the following list: BCH350H1/BIO220H1/CHM217H1 (Analytical Chemistry)/CHM220H1*** (Physical Chemistry for Life Sciences)/CHM223H1 (Physical Chemistry II)/CSC108H1/CSC148H1 (Introductory Computer Science, only one CSC course can be chosen)/MAT235Y1/MAT237Y1 (Calculus II)/STA221H1/JPM300H1/any suitable 300-level course from CHM/CSB/EEB/HMB/IMM/LMP/MGY/PCL/PSL (departmental approval required)

** Additional BCH research project courses can be taken as part of the 20.0 FCE 20 full credits needed for your degree.

***CHM220H1 is highly recommended for students who are interested in pursuing studies in the physical aspects of biochemistry such as structural biology and molecular biophysics.

Description of Proposed Changes:

(Apologies for the changes not being specifically highlighted above - I have tried multiple times and the system is crossing everything out and replacing what is mostly identical text)
In close consultation with the Department of Molecular Genetics, we are adding MGY280 (Specialist Research) to our required Specialist courses.

We are removing BCH378 (a second semester lab course taken in the third year).

We are adding JPM300 as an optional course in the 300-level courses.

BCH350 has been renumbered to BCH450 and so we are reflecting that.

**Rationale:**

The logic of adding MGY280 to our curriculum is several fold: 1) to leverage existing synergies between the departments' research arms, 2) to minimize differences between the two programs in support of cohort cohesiveness in the other shared core courses (BCH242, MGY311), 3) to demystify the independent research environment as early as possible in our 2nd year Specialists through a structured course that combines a mini research experience with weekly seminars/group meetings, writing assignments, and presentations.

To further align our lab course load with the MGY Specialist streams (and make room for MGY280 in our 14 FCEs), we are proposing to remove BCH378 from the program. Our specialists will continue to take BCH377 in the fall of 3rd year and the intensive 4th year lab BCH478 in the first semester of 4th year. The second semester of 3rd year is an intense time for our students, we hope this will reduce that stress and provide them with more space to pursue independent research if they desire (in BCH374 for instance). No other students are required to take BCH378. (Note: subject to consultation, we may reimagine BCH378 course down the road as an optional offering with adjusted content, but we have until 2022 to figure that out (we will continue to offer BCH378 for the existing 2nd and 3rd years in Jan 2020 and Jan 2021)).

In the past cycle, BCH350 became BCH450 and this change is reflected in the requirements.

A joint course JPM300 (Research Readiness and Advancing Biomedical Discoveries) taught by PharmTox, Physiology, and Biochem, has been explicitly added as an optional 3rd year offering. Students could have taken it before, but they would have had to seek departmental approval.

**Impact:**

**Consultation:**

Extensive consultation with Molecular Genetics regarding MGY280. Extensive discussions around MGY280 enrolment and implementation with Undergrad Coordinator (Rick Collins) and Associate Undergrad Coordinator (William Navarre), Will Navarre also serves as course coordinator of MGY280. Unanimous support from the Undergrad committee of Biochem and the Executive committee of Molecular Genetics. Multiple positive discussions with Michelle French, chair of the "Life Sciences Undergraduate Working Group" and Undergrad Coordinator Physiology. Informal discussions with Thierry Mallevaey, Associate Chair Immunology.

BCH378 removal from program requirements approved by Undergrad Committee, Biochemistry with support from the Chair.

**Resource Implications:**
2 Minor Program Modifications:

Materials Science Specialist

Description:

Consult Professor Andrew Dicks Dwight Seferos, Department of Chemistry.

This program draws both on the basic sciences of chemistry and physics, and on the more applied areas such as metallurgy or ceramics. Courses dealing with these latter fields are offered through the Department of Materials Science in the Faculty of Applied Science and Engineering. This would be an appropriate program for students with career interests in solid-state solid state, polymer or composite materials industries, or for graduate work in either chemistry or materials science, with an appropriate choice of options. Students may follow the Materials Chemistry path by taking the research course CHM499Y1 or the Materials Science and Engineering path by taking the research course MSE498Y1.

Completion Requirements:

(14 full courses or their equivalent, including at least one 400-series full-course equivalent)

First Year: (BIO120H1, BIO130H1/BIO220H1); CHM151Y1 (strongly recommended)/(CHM135H1/CHM139H, CHM136H1/CHM138H); (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1; MSE120H1

First or Second Year: BIO130H1/BIO220H1; (PHY131H1, PHY132H1)/(PHY151H1, PHY152H1)

Second Year and Higher Years:

1. MSE101H1
2. (CHM220H1/CHM222H1, CHM223H1/MSE202H1), CHM238Y1, CHM247H1/CHM249H1
3. MSE219H1, MSE318H1, MSE335H1
4. CHM325H1, CHM327H1, CHM338H1, CHM343H1/CHM348H1, CHM426H1, CHM434H1
5. At least three of the following one of which must be a 400-series: MSE302H1, MSE316H1, MSE343H1, CHM434H1, CHM446H1, MSE415H1, MSE430H1, MSE432H1, MSE440H1, MSE442H1, MSE451H1, MSE458H1, MSE459H1, MSE459H1, MSE461H1
6. CHM499Y1/MSE498Y1

Description of Proposed Changes:

Changing MSE101H1 to MSE120H1. Also moving MSE120H1 as a requirement students need to complete in their first-year rather than the second-year.

Rationale:

Students should be taking MSE120H1 (formally MSE101H1) in their first year. Delaying this course to second-year prevents a number of students from taking the program as the course does not work in a second-year schedule and can only be taken in the winter semester. This further delays the other MSE courses they can take as it is a prerequisite for all of the other MSE courses.

Impact:

This is expected to be a positive change for students in planning their program. MSE120H1 is the prerequisite for any upper-year MSE course and having the students take it in second-year ended up putting students a full-year behind. This led to those who were interested in taking the Material Chemistry Specialist going into another program so that they were able to finish their education in the regular four-year period.

Consultation:
Changes were discussed with MSE Undergraduate Counsellor previously in relation to MSE101H1. MSE program is supportive and finds it preferable for students to take MSE120H1 in the first year.

Resource Implications:

Pharmaceutical Chemistry Specialist

Enrolment Requirements:

This is a limited enrolment program. Eligibility is based on a student’s mark(s) in the required course(s). The precise mark thresholds outlined below are an estimate of what will be required in the coming program admission cycle.

- Students interested in applying While it is difficult to the program must have an predict what will be competitive course marks and average of at least 70% in a given year based on previous years; the 3.0 full-course equivalents (FCEs) listed below, and a final mark of at least 60% in each estimate is: course marks = mid 70s; average = high 70s.
- BIO120H1 + BIO130H1;
- CHM135H1 + CHM136H1 or CHM151Y1;
- PHY131H1 + PHY132H1 or PHY151H1 + PHY152H1

Achieving these estimated marks does not guarantee admission to the program in any given year.

Visit the Pharmaceutical Chemistry Program web site for updated information about requirements, course offerings, and events: [http:// pharmacy.utoronto.ca/pharmchem](http:// pharmacy.utoronto.ca/pharmchem).

Completion Requirements:

(13.0 full courses or their equivalent, including at least one 400-series course)

NOTE: Some of the courses listed below may have prerequisites.

First Year:
BIO120H1, BIO130H1; (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1; (PHY131H1, PHY132H1)/ (PHY151H1, PHY152H1)

Second Year:
BCH210H1; BIO230H1; CHM220H1/CHM222H1, CHM223H1; CHM247H1/CHM249H1; PCL201H1; PHC230H1

Third Year:
CHM217H1; PCL201H1; PHC300H1; PHC301H1; PHC320H1; PHC330H1; PHC340Y1

Fourth Year:
1. + PHC489Y1 or CHM499Y1
2. Two full course equivalents from: CHM317H1; CHM342H1; CHM347H1; CHM379H1; CHM410H1; CHM414H1; CHM417H1; CHM427H1; CHM440H1; JM300H1; JPM400Y1; PCL362H1; PCL486H1; PHC331H1; PHC401H1; PHC420H1; PHC421H1; PHC430H1; PHC431H1; PHC432H1; PHC435H1; PHC460H1; PHC462H1; PHC470H1; PSL300H1; PSL301H1

Note that not all of the 400-series PHC courses are offered every academic year.

We also offer an optional 12- or 16-month internship program to qualified students. This is a project-based, paid employment placement that takes place between the third and fourth years of undergraduate study. It provides the student with an opportunity to apply the knowledge acquired in the first three years of university to private- or public-sector.
settings. Placements are available in pharmaceutical and biotechnology companies, university research labs, university-affiliated organizations, or government research agencies.

**Description of Proposed Changes:**

**Rationale:**
We would like to add a few more courses that the students can take. They fit in well with the Pharmaceutical Chemistry program. We would also like to move PCL201 to the second-year. It is a value-added course, and moving it to the second-year is the right place for it. Students who end up taking it in the third-year, where it was previously placed, don't get as much out of it due to repeating some of the concepts they have already studied at a higher level.

**Impact:**
N/A

**Consultation:**
Changes were reviewed by the Pharmaceutical Chemistry Curriculum Committee. This included representatives from the Chemistry Department, Faculty of Pharmacy, Pharmacology & Toxicology Department, Human Biology Department, and a student representative of the Pharmaceutical Chemistry program.

**Resource Implications:**

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**1 New Course:**

**JCC250H1: Computing for Science**

**Contact Hours:**
- **Lecture:** 24  /  **Tutorial:** 24

**Description:**
Computational skills for the modern practice of basic and applied science. Applied computer programming with an emphasis on practical examples related to the simulation of matter, drawing from scientific disciplines including chemistry, biology, materials science, and physics. Studio format with a mixture of lecture, guided programming, and open scientific problem solving. Students will be exposed to Python numerical and data analysis libraries. No prior programming experience is required.

**Prerequisites:**
CHM135H1/CHM136H1/CHM151Y1, 0.5 FCE in MAT (excluding FYF courses)

**Corequisites:**
None

**Exclusions:**
Any CSC course except CSC104H1, CSC196H1, CSC197H1

**Recommended Preparation:**

**Breadth Requirements:**
The Physical and Mathematical Universes (5)

**Distribution Requirements:**
Science

**Competencies:**
- Communication: slightly; Critical and Creative Thinking: slightly; Information Literacy: slightly
Quantitative Reasoning: extensively; Social and Ethical Responsibility: slightly

Experiential Learning:
Research: none; Other: none

Rationale:
As the laboratory is automated and we enter the era of big data, more than ever, computing is an essential tool for science. We believe it is essential to introduce modern scientists of most disciplines to the practical aspects of computing as soon as possible. This course provides hands-on training on programming in a flipped-classroom manner. The students will be exposed to 45 min-1 hour of a contextual/situational lecture, and to a 15-minute overview of the Python Notebooks they will have to employ. These self-graded notebooks, which are stored in a central server are solved in-class while the instructors help the students if they get stuck. The format encourages students to brainstorm with each other as they solve the exercises. A take-home exercise is started during the last 30 min- 1hr of class. This “studio” format allows for a less distracted environment for the modern student.

This course is being proposed as a JSC offering as the teaching staff require expertise in both Computer Science and Chemistry. We currently have a jointly-appointed faculty member arranged to co-teach it, however regardless of that faculty member’s involvement both departments need to be involved going forward.

Staffing: Instructors resources will be split 50/50 between Computer Science and Chemistry on average. TA resources will be provided by both departments: each department will resource TAs for 50% of course enrollment to a total of 100%. The departments will resource TAs using their own prescribed ratio for their half of the enrollment.

The course designator changed to JCC after discussion with Governance December 9, 2019. All references to JSC should be JCC.

Consultation:
This course is modelled after a course taught by one of the proposers at Harvard University (Aspuru-Guzik). Discussion with the Department of Computer Science and faculty from other departments at UofT indicates there is interest from faculty and students in other disciplines for a course teaching computational skills more specific to the physical sciences. We also consulted with the Chemistry Undergraduate Studies Committee.

Resources:
A classroom with teaching station, and with tables where the students can sit in groups, such as one of the new active learning classrooms in the Myhal Centre. Students will be required to bring their own laptops. For the final project, we require a collection of Raspberry Pis, pumps, webcams, and simple wetware. We may require access to a chemistry laboratory to carry out the final project experimentation with simple chemicals to carry out automated titration operations. See the following articles for context.
https://cen.acs.org/education/Teaching-chemistry-students-use-labs/96/i48
https://cen.acs.org/articles/96/web/2018/03/New-software-run-lab-future.html

Budget Implications: The academic unit will provide the resources required for this course from existing budget.

Overlap with Existing Courses:
Some overlap in the first few weeks with other introductory CSC courses.

Programs of Study for Which This Course Might be Suitable:
This course is well-suited for students in any program in the physical and life sciences.

Estimated Enrolment:
100-200 if a TEAL room of that size is available

Instructor:
Alán Aspuru-Guzik and Jacqueline Smith

1 Course Modification:
# CHM136H1: Introductory Organic Chemistry I

<table>
<thead>
<tr>
<th>Prerequisites:</th>
<th>Chemistry SCH4U, Mathematics MHF4U + MCV4U, CHM135H1</th>
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| Rationale: | Students must now successfully complete CHM135H1 before going on to take CHM136H1. |

| Consultation: | Our Associate Chair has spoken about this at the previous Life Sciences planning meeting, and he also held additional consultation sessions at the end of November with invitations sent out to all departments that list CHM135H1 + CHM136H1 as part of their programs, and all College Registrar's Offices. |

| Resources: | |

4 Minor Program Modifications:

Computer Science Major

Enrolment Requirements:

This is a limited enrolment program. Students admitted to Arts & Science in the Computer Science admission category have the Computer Science Admission Guarantee for their first year. These students are guaranteed a place in the Computer Science Specialist, Major or Minor program of choice after first year, provided that the following conditions have been met:

- Completion of at least 4.0 credits.
- CSC110Y1 with a final mark of at least 70%.
- CSC111H1 with a final mark of at least 77%.
- MAT137Y1 or MAT157Y1.

A number of spaces in this program are also available for other Arts & Science students who do not have the CS Admission Guarantee. These students may submit an application to be considered for admission to a Computer Science program. To be eligible to submit an application, students must have completed at least 4.0 FCEs including CSC148H1(with a minimum grade of 70%)and CSC165H1/CSC240H1 (with a minimum grade of 70%). Students will be assessed based on their grades in a competitive average across these courses, and a supplemental application which will be considered alongside their academic results.

Important:

1. Requests for admission will be considered in the first program request period only. For detailed program enrolment instructions and application deadlines for restricted programs please click here.
2. Due to the limited enrolment nature of this program students are strongly advised to plan to enroll in backup programs.
3. Students admitted to the program after second or third year will be required to pay retroactive deregulated program fees.

Completion Requirements:

(8.0 full course equivalents [FCEs], including at least 0.5 FCE at the 400-level)

First year (2.5 FCEs):
1. (CSC108H1, CSC148H1, CSC165H1/CSC240H1)(CSC110Y1, CSC111H1); MAT137Y1/MAT157Y1/(MAT135H1, MAT136H1)

Notes:

a. Students with a strong background in an object-oriented language such as Python, Java or C++ may omit CSC108H1 and proceed directly with CSC148H1. [There is no need to replace the missing half-credit for program completion; however, please base your course choice on what you are ready to take, not on “saving” a half-credit].

b. CSC240H1 is an accelerated and enriched version of CSC165H1 plus CSC236H1, intended for students with a strong mathematical background, or who develop an interest after taking CSC165H1. If you take CSC240H without CSC165H1, there is no need to replace the missing half-credit for program completion; but please see Note (a).

c. Consult the Undergraduate Office for advice about choosing among CSC108H1 and CSC148H1, and between CSC165H1 and CSC240H1.
Computer Science (FAS), Department of

We recommend that students take MAT137Y1 or MAT157Y1, as they have been determined to provide the best preparation for upper-year courses in computer science and benefit students in CSC165H1/CSC240H1. Similarly, we recommend MAT223H1 or MAT240H1, if students choose one of these options in their later years.

Second year (2.5 FCEs):

2. CSC207H1, CSC236H1/CSC240H1, CSC258H1, CSC263H1/CSC265H1; STA247H1/STA255H1/STA257H1

Later years (3.0 FCEs):

3. 3.0 FCEs from the following:

- Any 200-/300-/400-level CSC course;
- BCB410H1, BCB420H1, BCB330Y1/BCB430Y1;
- ECE385H1, ECE489H1;
- MAT223H1/MAT240H1/MAT221H1, MAT235Y1/MAT237Y1/MAT257Y1, any 300-/400-level MAT course except MAT329Y1, MAT390H1, MAT391H1
- STA414H1

with at least 0.5 FCE from a 400-level CSC/BCB course, at least 1.0 additional FCE from 300-/400-level CSC/BCB/ECE courses, and at least 0.5 additional FCE from a 300-/400-level course.

No more than 1.0 FCE from CSC490H1, CSC491H1, CSC494H1, CSC495H1, BCB330Y1/BCB430Y1 may be used to fulfill program requirements.

The choices in 3 must satisfy the requirement for an integrative, inquiry-based activity by including one of the following half-courses: CSC301H1, CSC318H1, CSC404H1, CSC311H1/CSC411H1, CSC417H1, CSC418H1, CSC419H1, CSC420H1, CSC428H1, CSC454H1, CSC485H1, CSC490H1, CSC491H1, CSC494H1, CSC495H1. This requirement may also be met by participating in the PEY (Professional Experience Year) program. Transfer credits cannot comprise more than 1.0 FCE at the 300-/400-level, and cannot be used to satisfy the requirement for an integrative, inquiry-based activity. In addition, transfer credits cannot be used to satisfy the requirement for 0.5 FCE at the 400-level in CSC/BCB.

Description of Proposed Changes:

Currently, for admission to Computer Science POSts, students in the Computer Science admission stream (CMP1) are considered alongside students from other streams in a highly competitive and stressful process. Approximately half of the 550 students offered places in CS POSts each year are from CMP1 and the other half are from other streams. It is important to the Department of Computer Science (DCS) to maintain roughly this balance.

We propose a new enrolment process where admission to CS POSts for CMP1 students is not competitive. Instead, we will pre-publish grade requirements in the required first-year courses (which include new courses CSC110Y1F and CSC111H1S proposed to the Sciences Curriculum Committee); all CMP1 students who meet these requirements will be offered admission. Our expectation is that 80% of the CMP1 students will meet these admission standards. If more than 80% achieve the requirements, then all students meeting the requirements will be offered admission to the program. The remaining places in the POSts will be filled with students from other streams through a separate admission process. These other students will not be taking CSC110 or CSC111.

Added STA414H1 to required courses at 300-/400-level CSC/BCB/ECE/STA courses.
Removed ECE489H1 (it was discontinued). Removed ECE385H1 (changed to CSC385H1). Removed reference to ECE courses.

Added CSC110Y1 and CSC111H1 as alternates to CSC108H1, CSC148H1, CSC165H1/CSC240H in program completion.

Rationale:

Our primary goal for these admission changes is to demonstrate a strong commitment to the first-year CMP1 students, who have chosen to come to Arts & Science intending on pursuing a program in computer science. The competitive
nature of the previous CS POSt admission process has had a significant negative impact on student mental health, overall stress levels (for both students and course staff), and learning atmosphere in first-year courses.

Having an admission guarantee based only on a student’s own performance with a grade requirement that is published in advance (not dependent on class grade distributions) will greatly reduce stress in first-year CMP1 students. This will not address stress for students from other streams for whom admission to the remaining POSt spots will remain competitive. It is important to the atmosphere that these two groups of students have separate first-year courses and so we have designed CSC110Y1F and CSC111H1S.

The choice of the cutoff of 77% in CSC111H1S is proposed after much consultation. Many DCS faculty and members of the CS Undergraduate Committee argued for 80%. In the last few years the required marks have ranged between 82.5 and 87%. The concerns with a grade as low as 77% were the first-class image of the program (primarily in prospective and current students’ eyes) and the predicted gap between the marks required by CMP1 students vs. the marks that will be required by students in other streams. We are also concerned that if we lower the mark below 77% (e.g., 70%) some of these students with very high marks from high school will be misled into thinking that they don’t have to work hard now that they have been accepted into CMP1 and have the guarantee. We have seen some evidence of this in the past (although not recently).

We also propose keeping a very careful eye on the grades (particularly any midterm test grades), making any required mid-course adjustments at the time (rather than at the end of the term) and reminding students that we expect at least 80% of the class to succeed. In some of our discussions, it has been suggested that since this is a new course, we can adjust the grades by changing the marking and difficulty of the assignments so that 80% of the students will achieve 77% or 70% (or whatever cutoff we set.) While we appreciate that there is some flexibility here, we do not want to penalize these very strong students (who will hope will be working hard) by spreading the grade distribution lower than it would have been had they taken CSC108/CSC148 & CSC165 with students from the other streams. This would disadvantage these students in the long run as these grades are included in their CGPA. Based on looking at past grades of CMP1 students in those three courses, our best estimate for the first offering is to use 77% as the guarantee cutoff.

One smaller yet important component of the guarantee is the requirement that students complete MAT137Y1/ MAT157Y1 to be admitted to a CS specialist or major. This change (from previously accepting MAT135H1 & MAT136H1 as alternatives) is motivated by the fact that these two courses align much better with the mathematical content required for success in many areas of computer science—a fact that many students do not realize until they reach their third year of study.

STA414H1 is the same course as CSC412H1 and should be an acceptable alternative.

Impact:

We believe that 80% or more of the students accepted into CMP1 will be able to earn a 77% in CSC111H1S and that this level of mastery best prepares them for future CS courses. We do not want them less prepared than the students admitted from other streams who will likely have earned more than 80% in their first-year courses covering this same content. We want to set a grade requirement that would allow most CMP1 students to progress. After much discussion we agreed to propose 77%. Our concern is that if we use a higher cutoff, we may not see 80% of the students in CMP1 meet the conditions of the guarantee.

We believe that having an admission guarantee based only on a student’s own performance with a grade requirement that is published in advance (not dependent on class grade distributions) will greatly reduce stress in first-year CMP1 students in two ways.

1. CMP1 students will no longer be completing with each other. Although we work hard to encourage first year students to work together and form study groups and generally support each other, we have heard some students (particularly students from under-represented minorities) express that they felt that no-one would want to help them because of the competition. One expressed, “why should anyone help me? If I get in, I might take their spot”.
2. Students will know when their performance is good enough. Many of our students with very high grades are not confident that they will get in and are stressed. This is obvious by the number of students signing up to retaking the admission courses even before they have started them the first time or when they already have an A partway through their first attempt. A student asked, “I have a 90 in the course. Should I retake it or can you guarantee that this grade is enough to be admitted?”

Academic Monitoring and Recovery for Struggling Students
It is our intention to appoint a teaching-stream faculty member as one of the course instructors and also give this person the responsibility of the academic advising of each CMP1 cohort for all of their first year. Over the span of the year, this task combined with coordinating all the sections of both CSC110 and CSC111, is expected to be equivalent to the work of teaching a single CSC half course (approximately 15% of a faculty member’s time). The plan is to closely monitor student progress and meet personally with struggling students as soon as they are identified.

Because of the existence of the alternate pathway (108 followed by 148 and 165), there are a number of recovery options for students who do not meet the admission guarantee in CSC110 and CSC111. The appropriate recovery path will depend on when the student encountered difficulty. Because the content in introductory computer science builds incrementally (each new concept usually requires almost complete mastery of the earlier concepts), a student would be unlikely to be able to keep up in CSC111 without having mastered the content from CSC110.

For CMP1 students with exceptional circumstances during their first-year, the department is open to offering them the opportunity to take CSC148 and CSC165 during the following summer for admission at the end of the summer. Note that students in the other stream only have a single-round of admission so these students can only use the summer courses for admission in June of the following year. For CMP1 students with exception circumstances so extreme that they are unable to take the summer courses and are repeating much of first-year, we could defer their guarantee until the following year and have them join the next cohort.

The vast majority of current CMP1 students take MAT137Y1/MAT157Y1, and complete these courses in their first year. We do not believe this condition of the guarantee will result in a noticeable difference in enrolment in these two math courses, and have consulted with the Math department on this matter.

Consultation:
- CMP1 admissions/policy committee chaired by then Vice Dean Melanie Wooden (in 2018/19) – included representatives from OFR, Dean’s office & CS Department of Computer Science working groups on CMP1 policy (summer 2019 and fall 2019)
- Department of Computer Science faculty meetings and undergraduate committee
- Department of Statistics Associate Chair, Undergraduate
- Director of the Data Science Program (Nathan Taback)
- Department of Computer Science student consultation meetings -- Sept 12, Oct 28, Nov 20, 2019
- We held three undergraduate student meetings to discuss the new proposals. Our students strongly supported moving an admission guarantee based on pre-stated requirements rather than a competitive cutoff. They felt that it would help reduce stress.
  - We asked them specifically about the Y1F course and they explained that it would be better to have one set of deadlines, one professor and one fewer final exam in December. The student preference was for 1 double course rather than 2 half courses. They liked the fact that they would be with the same students.
  - When we asked them about which term should have the 1.0 credit course, students pointed out that it was better to have the double course in the fall term because the exam (which would be important) would not be in the same term as the MAT137Y final exam. They also indicated that they felt it was better to introduce more CS in the fall term. They would have wanted to get further into the content than would be possible with only a half course in the fall. They also appreciated that students might want to take CSC240 in parallel with CSC111 in the winter term.

Resource Implications:
In terms of teaching resources (instructors, rooms, TAs, lab space) the changes are basically resource neutral. Most of these students who will take CSC110Y1F and CSC111H1S would previously have taken CSC108, CSC148 and CSC165. Some would have skipped CSC108 but many others repeated either CSC148, CSC165 or both. We expect the total number of enrollments in credits to be the same. The courses will be resourced with TAs at the same ratio as other first-year CS Courses. We do plan to spend department resources on a course coordinator/ CMP1 faculty advisor as discussed above. This will be a “Course Equivalent Teaching Assignment” for one teaching-stream faculty member.

Computer Science Minor
Enrolment Requirements:
This is a limited enrolment program. Students admitted to Arts & Science in the Computer Science admission category have the Computer Science Admission Guarantee for their first year. These students are guaranteed a place in the Computer Science Specialist, Major or Minor after first year, provided that the following conditions have been met:
• Completion of at least 4.0 credits.
• CSC110Y1 with a final mark of at least 70%
• CSC111H1 with a final mark of at least 70%

A number of spaces in this program are also available for other Arts & Science students who do not have the CS Admission Guarantee. These students may submit an application to be considered for admission to a Computer Science program. To be eligible to submit an application, students must have completed at least 4.0 FCEs including CSC148H1 (with a minimum grade of 70%) and CSC165H1/CSC240H1 (with a minimum grade of 70%). Students will be assessed based on their grades in a competitive average across these courses, and a supplemental application which will be considered alongside their academic results.

Important:

1. Requests for admission will be considered in the first program request period only. For detailed program enrolment instructions and application deadlines for restricted programs please click here.
2. Due to the limited enrolment nature of this program students are strongly advised to plan to enroll in backup programs.

Completion Requirements:

(4.0 full course equivalents [FCEs])

1. (CSC108H1/CSC120H1, CSC148H1, CSC165H1/CSC240H1)/(CSC110Y1, CSC111H1)

Notes:

a. Students with a strong background in Java or C++ may omit CSC108H1 and proceed directly with CSC148H1.
b. CSC240H1 is an accelerated and enriched version of CSC165H1 plus CSC236H1, intended for students with a strong mathematical background, or who develop an interest after taking CSC165H1.
c. Consult the Undergraduate Office for advice about choosing among CSC108H1 and CSC148H1, and between CSC165H1 and CSC240H1.

2. CSC207H1, CSC236H1/CSC240H1

(Total of above requirements: 2.5 FCEs. If you take fewer than 2.5 FCEs, you must take more than 1.5 FCEs from the next list, so that the total is 4.0 FCEs.)

3. 1.5 FCEs from the following list, of which at least 1.0 FCE must be at the 300-/400-level:

• CSC: any 200-/300-/400-level

Note:

• Computer Science Minors are limited to three 300-/400-level CSC/ECE half-courses.
• Transfer credits cannot comprise more than 0.5 FCE at the 300-/400-level.

Description of Proposed Changes:

Adding (CSC110Y1, CSC111H1) as an alternative to (CSC108H, CSC148H and CSC165H). See proposed changes to Specialist and Major for full background and details.
Rationale:
We are adding two new first-year courses (CSC110Y1 and CSC111H1) to be taken only by the students in the CMP1 admission stream as alternatives to CSC108, CSC148 and CSC165. This change adds these alternative courses to the program completion requirements.

In the past most of our students have wanted to take the major or specialist. A student in the minor is only allowed to take 1.5 FCE’s of 3rd and 4th year CS Courses and no particular upper-year courses are required. This means students can complete a minor and avoid the courses in the area that the student finds difficult. For example, a student who struggles with the mathematics can complete a minor with no upper-year theory courses. For this reason, we feel that 70% in CSC111 is sufficient preparation for admission to the minor.

Impact:
Only CMP1 students will take these new courses. This is only adding alternatives for program completion and so not changing anything for students from other units.

Consultation:
Computer science undergrad committee.

Resource Implications:
In terms of teaching resources (instructors, rooms, TAs, lab space) the changes are basically resource neutral. Most of these students who will take CSC110Y1F and CSC111H1S would previously have taken CSC108, CSC148 and CSC165. Some would have skipped CSC108 but many others repeated either CSC148, CSC165 or both. We expect the total number of enrollments in credits to be the same. The courses will be resourced with TAs at the same ratio as other first-year CS Courses. We do plan to spend department resources on a course coordinator/ CMP1 faculty advisor as discussed above. This will be a “Course Equivalent Teaching Assignment” for one teaching-stream faculty member.

Computer Science Specialist

Enrolment Requirements:

This is a limited enrolment program. Students admitted to Arts & Science in the Computer Science admission category have the Computer Science Admission Guarantee for their first year. These students are guaranteed a place in the Computer Science Specialist, Major or Minor after first year, provided that the following conditions have been met:

- Completion of at least 4.0 credits.
- CSC110Y1 with a final mark of at least 70%.
- CSC111H1 with a final mark of at least 77%.
- MAT137Y1 or MAT157Y1.

A number of spaces in this program are also available for other Arts & Science students who do not have the CS Admission Guarantee. These students may submit an application to be considered for admission to a Computer Science program. To be eligible to submit an application, students must have completed at least 4.0 FCEs including CSC148H1(with a minimum grade of 70%)and CSC165H1/CSC240H1 (with a minimum grade of 70%). Students will be assessed based on their grades in a competitive average across these courses, and a supplemental application which will be considered alongside their academic results.

Important:

1. Requests for admission will be considered in the first program request period only. For detailed program enrolment instructions and application deadlines for restricted programs please click here.
2. Due to the limited enrolment nature of this program students are strongly advised to plan to enroll in backup programs.
3. Students admitted to the program after second or third year will be required to pay retroactive deregulated program fees.
Completion Requirements:

(12.0 full course equivalents [FCEs], including at least 1.5 FCEs at the 400-level)

**First year (2.5 FCEs):**

1. (†) CSC108H1, CSC148H1, CSC165H1/CSC240H1)/(CSC110Y1, CSC111H1); MAT137Y1/MAT157Y1/(MAT135H1, MAT136H1)

Notes:

a. Students with a strong background in an object-oriented language such as Python, Java or C++ may omit CSC108H1 and proceed directly with CSC148H1. There is no need to replace the missing half-credit for program completion; however, please base your course choice on what you are ready to take, not on “saving” a half-credit.

b. CSC240H1 is an accelerated and enriched version of CSC165H1 plus CSC236H1, intended for students with a strong mathematical background, or who develop an interest after taking CSC165H1. If you take CSC240H1 without CSC165H1, there is no need to replace the missing half-credit for program completion; but please see Note (a).

c. Consult the department's Undergraduate Office for advice about choosing among CSC108H1 and CSC148H1, and between CSC165H1 and CSC240H1.

d. We recommend that students take MAT137Y1 or MAT157Y1, as they have been determined to provide the best preparation for upper-year courses in computer science and benefit students in CSC165H1/CSC240H1. Similarly, we recommend MAT223H1 or MAT240H1 from the options in second year.

**Second year (3.5 FCEs):**

2. CSC207H1, CSC209H1, CSC236H1/CSC240H1, CSC258H1, CSC263H1/CSC265H1; MAT223H1/MAT240H1/MAT221H1; STA247H1/STA255H1/STA257H1

**Later years (6.0 FCEs):**

3. CSC369H1, CSC373H1

4. 5.0 FCEs from the following:

- Any 300-/400-level CSC course;
- BCB410H1, BCB420H1, BCB330Y1/BCB430Y1;
- ECE385H1, ECE489H1;
- MAT224H1/MAT227H1, MAT235Y1/MAT237Y1/MAT257Y1, any 300-/400-level MAT course except MAT329Y1, MAT390H1, MAT391H1;
- STA248H1/STA261H1, any 300-/400-level STA course

with at most 2.0 FCEs from APM or MAT or STA courses, (excluding STA414H1), and at least 1.5 FCEs from 400-level CSC, BCB, or BCB ECE courses.

No more than 1.0 FCE from CSC490H1, CSC491H1, CSC494H1, CSC495H1, BCB330Y1/BCB430Y1 may be used to fulfill program requirements.

The choices in 4 must satisfy the requirement for an integrative, inquiry-based activity by including one of the following half-courses: CSC301H1, CSC318H1, CSC404H1, CSC311H1/CSC411H1, CSC417H1, CSC418H1, CSC419H1, CSC420H1, CSC428H1, CSC454H1, CSC485H1, CSC490H1, CSC491H1, CSC494H1, CSC495H1. This requirement may also be met by participating in the PEY (Professional Experience Year) program. Transfer credits cannot comprise more than 1.0 FCE at the 300-/400-level, and cannot be used to satisfy the requirement for an integrative, inquiry-based activity. In addition, transfer credits cannot comprise more than 0.5 FCE of the 400-level CSC, BCB, or BCB ECE courses.
Choosing courses

This program offers considerable freedom to choose courses at the 300-/400-level, and you are free to make those choices on your own. We are eager to offer guidance, however, and both our Undergraduate Office and individual faculty members are a rich source of advice.

Description of Proposed Changes:

Currently, for admission to Computer Science POSs, students in the Computer Science admission stream (CMP1) are considered alongside students from other streams in a highly competitive and stressful process. Approximately half of the 550 students offered places in CS POSs each year are from CMP1 and the other half are from other streams. It is important to the Department of Computer Science (DCS) to maintain roughly this balance.

We propose a new enrolment process where admission to CS POSs for CMP1 students is not competitive. Instead, we will pre-publish grade requirements in the required first-year courses (which include new courses CSC110Y1F and CSC111H1S proposed to the Sciences Curriculum Committee); all CMP1 students who meet these requirements will be offered admission. Our expectation is that 80% of the CMP1 students will meet these admission standards. If more than 80% achieve the requirements, then all students meeting the requirements will be offered admission to the program. The remaining places in the POSs will be filled with students from other streams through a separate admission process. These other students will not be taking CSC110 or CSC111.

Added to item 4, text " (excluding STA414H1) " .
Removed ECE489H1 (it was discontinued). Removed ECE385H1 (changed to CSC385H1). Removed references to ECE courses.
Added CSC110Y1 and CSC111H1 as alternatives for program completion to CSC108H1, CSC148H1 and CSC165H1.

Rationale:

STA414 and CSC412 are the same and so should be considered the same.
CSC110Y1 and CSC111H1 are the new first-year courses taken by students in the CMP1 stream.

Impact:

We believe that having an admission guarantee based only on a student’s own performance with a grade requirement that is published in advance (not dependent on class grade distributions) will greatly reduce stress in first-year CMP1 students in two ways.

1. CMP1 students will no longer be completing with each other. Although we work hard to encourage first year students to work together and form study groups and generally support each other, we have heard some students (particularly students from under-represented minorities) express that they felt that no-one would want to help them because of the competition. One expressed, “why should anyone help me? If I get in, I might take their spot”.

2. Students will know when their performance is good enough. Many of our students with very high grades are not confident that they will get in and are stressed. This is obvious by the number of students signing up to retaking the admission courses even before they have started them the first time or when they already have an A partway through their first attempt. A student asked, “I have a 90 in the course. Should I retake it or can you guarantee that this grade is enough to be admitted?”

Academic Monitoring and Recovery for Struggling Students

It is our intention to appoint a teaching-stream faculty member as one of the course instructors and also give this person the responsibility of the academic advising of each CMP1 cohort for all of their first year. Over the span of the year, this task combined with coordinating all the sections of both CSC110 and CSC111, is expected to be equivalent to the work of teaching a single CSC half course (approximately 15% of a faculty member’s time). The plan is to closely monitor student progress and meet personally with struggling students as soon as they are identified. Because of the existence of the alternate pathway (108 followed by 148 and 165), there are a number of recovery options for students who do not meet the admission guarantee in CSC110 and CSC111. The appropriate recovery path will depend on when the student encountered difficulty. Because the content in introductory computer science builds incrementally (each new concept usually requires almost complete mastery of the earlier concepts), a student would be unlikely to be able to keep up in CSC111 without having mastered the content from CSC110. For CMP1 students with exceptional circumstances during their first-year, the department is open to offering them the
opportunity to take CSC148 and CSC165 during the following summer for admission at the end of the summer. Note that students in the other stream only have a single-round of admission so these students can only use the summer courses for admission in June of the following year. For CMP1 students with exception circumstances so extreme that they are unable to take the summer courses and are repeating much of first-year, we could defer their guarantee until the following year and have them join the next cohort.

Consultation:
- CMP1 admissions/policy committee chaired by then Vice Dean Melanie Wooden (in 2018/19) – included representatives from OFR, Dean’s office & CS Department of Computer Science working groups on CMP1 policy (summer 2019 and fall 2019)
- Department of Computer Science faculty meetings and undergraduate committee
- Department of Statistics Associate Chair, Undergraduate
- Director of the Data Science Program (Nathan Taback)
- Department of Computer Science student consultation meetings -- Sept 12, Oct 28, Nov 20, 2019
- We held three undergraduate student meetings to discuss the new proposals. Our students strongly supported moving an admission guarantee based on pre-stated requirements rather than a competitive cutoff. They felt that it would help reduce stress.
- We asked them specifically about the Y1F course and they explained that it would be better to have one set of deadlines, one professor and one fewer final exam in December. The student preference was for 1 double course rather than 2 half courses. They liked the fact that they would be with the same students.
- When we asked them about which term should have the 1.0 credit course, students pointed out that it was better to have the double course in the fall term because the exam (which would be important) would not be in the same term as the MAT137Y final exam. They also indicated that they felt it was better to introduce more CS in the fall term. They would have wanted to get further into the content than would be possible with only a half course in the fall. They also appreciated that students might want to take CSC240 in parallel with CSC111 in the winter term.

Resource Implications:
In terms of teaching resources (instructors, rooms, TAs, lab space) the changes are basically resource neutral. Most of these students who will take CSC110Y1F and CSC111H1S would previously have taken CSC108, CSC148 and CSC165. Some would have skipped CSC108 but many others repeated either CSC148, CSC165 or both. We expect the total number of enrollments in credits to be the same. The courses will be resourced with TAs at the same ratio as other first-year CS Courses. We do plan to spend department resources on a course coordinator/ CMP1 faculty advisor as discussed above. This will be a “Course Equivalent Teaching Assignment” for one teaching-stream faculty member.

Data Science Specialist

Enrolment Requirements:

This is a limited enrolment program. Students from any admission category are invited to apply. The Computer Science Admission Guarantee does not apply to this program. However 20 spaces will be reserved for students in the Computer Science admission category (CMP1). To apply to these spaces, CMP1 students must meet the following conditions:

- Complete at least 4.0 credits.
- CSC110Y1 with a final mark of at least 70%.
- CSC111H1 with a final mark of at least 77%.
- MAT137Y1 or MAT157Y1 with a final mark of at least 70%.
- STA130H1 with a final mark of at least 70%.

Remaining places in the specialist will be filled by students from any admission category (including Computer Science). Eligibility is based on the average of a student’s grades in CSC148H1/CSC111H1 and MAT137Y1/MAT157Y1 and STA130H1. (MAT157Y1 grades will be adjusted to account for the course’s greater difficulty.)

In addition, students must have completed at least 4.0 FCEs and achieved a minimum grade of 70% in each of CSC148H1/ CSC111H1, MAT137Y1/MAT157Y1 and STA130H1.
Students not in the CMP1 stream must also submit will be assessed based on a competitive average across these courses, and a supplemental application which will be considered alongside their academic results.

Important:

1. Requests for admission will be considered in the first program request period only. For detailed program enrolment instructions and application deadlines for restricted programs please click here .
2. Due to the limited enrolment nature of this program students are strongly advised to plan to enroll in backup programs.
3. Students admitted to the program after second or third year will be required to pay retroactive deregulated program fees.

Completion Requirements:

(13.0-13.5 Full Course Equivalents [FCEs], including at least 1.5 FCEs at the 400-level)

First year (3.3-3.5 FCEs)
MAT137Y1/MAT157Y1; MAT223H1/MAT240H1 (MAT240H1 is recommended); STA130H1; (CSC108H1, ; CSC148H1)/(CSC110Y1, CSC111H1);
Note: Students with a strong background in an object-oriented language such as Python, Java or C++ may omit CSC108H1 and proceed directly with CSC148H1. There is no need to replace the missing half-credit for program completion; however, please base your course choice on what you are ready to take, not on "saving" a half-credit. Consult with the Computer Science Undergraduate Office for advice on choosing between CSC108H1 and CSC148H1.

Second year (3.5-4.0 FCEs)
MAT237Y1/MAT257Y1; STA257H1; STA261H1; CSC207H1; (CSC165H1, CSC236H1)/CSC236H1/CSC240H1 (CSC240H1 is recommended); JSC270H1 (Data Science I)
Note: CSC240H1 is an accelerated and enriched version of CSC165H1 plus CSC236H1, intended for students with a strong mathematical background, or who develop an interest after taking CSC165H1. If you take CSC240H1 without CSC165H1, there is no need to replace the missing half-credit for program completion; however, please base your course choice on what you are ready to take, not on "saving" a half-credit. Consult the Computer Science Undergraduate Office for advice on choosing between CSC165H1 and CSC240H1. CSC236H1 may be taken without CSC165H1 for students who completed CSC111H1.

Later years (6.5 FCEs)

1. STA302H1; one of STA303H1 or STA305H1; STA355H1; CSC209H1; CSC263H1/CSC265H1 (CSC265H1 is recommended); CSC343H1; CSC373H1; JSC370H1 (Data Science II)
2. STA314H1/CSC311H1/CSC411H1;
3. 2.0 FCEs from the following list, including at least 1.0 FCE at the 400 level (see below for additional conditions): STA303H1/STA305H1 (whichever one was not taken previously), STA347H1, CSC401H1, STA414H1/CSC412H1, CSC413H1/CSC421H1, any 400-level STA course; JSC470H1 (Data Science III); CSC454H1, CSC490H1, CSC491H1, CSC494H1, CSC495H1.

The choices from 3 must satisfy the requirement for an integrative, inquiry-based activity by including at least 0.5 FCE from the following: JSC470H1 (Data Science III); CSC454H1, CSC490H1, CSC491H1, CSC494H1, CSC495H1, STA490Y1, STA496H1, STA497H1, STA498Y1, STA499Y1. This requirement may also be met by participating in the PEY Co-op (Professional Experience Year Co-op) program.

Students will be advised to develop domain expertise in at least one area where Data Science is applicable, by taking a sequence of courses in that area throughout their program. Examples of such areas will be provided to students by program advisors and will form the basis for a later proposal for program Focuses (to be approved through internal Arts & Science governance procedures).
Description of Proposed Changes:

Added CSC110Y1 and CSC111H1 as alternatives to CSC108H1, CSC148H1 and CSC165H1. For some students this moves 0.5 FCEs from second-year to first-year. Overall it does not increase the program to beyond 13.5 FCEs since students who complete 3.5 FCEs in first year would only do 3.5 FCEs in second year.

Rationale:

CSC110Y1 and CSC111H1 are the new first-year courses for students in the CMP1 admission stream. These students are eligible to apply to the data-science program and should use these courses instead of CSC108, CSC148 and CSC165.

Because the Data Science Specialist only has space for at most 50 students, we cannot guarantee CMP1 students a place in the program based only on their own grades in pre-stated requirements. We will accept CSC111H1S grades instead of CSC148H1 grades for admission and we will hold at least 20 places in the DS program for CMP1 students who meet the admission requirements and would prefer to specialize in Data Science.

Impact:

None.

Consultation:

Statistics Department and Computer Science Department.

Resource Implications:

5 New Courses:

CSC110Y1: Foundations of Computer Science I

Impact on Programs:

This proposal triggers modifications in the unit's program(s)

Contact Hours:

Lecture: 72 / Practical: 24

Description:

An introduction to the field of computer science combining the tools and techniques of programming (using the Python programming language) with rigorous mathematical analysis and reasoning. Topics include: data representations; program control flow (conditionals, loops, exceptions, functions); mathematical logic and formal proof; algorithms and running time analysis; software engineering principles (formal specification and design, testing and verification). Prior programming experience is not required to succeed in this course.

This course is restricted to students in the first year Computer Science admission stream, and is only offered in the Fall term. Other students planning to pursue studies in computer science should enrol in CSC108H1, CSC148H1, and CSC165H1/CSC240H1.

Prerequisites:

None

Corequisites:

None

Exclusions:

CSC108H1, CSC148H1, CSC165H1
Recommended Preparation:

Topics Covered:
- Programming in Python; elementary data types, memory model; control flow structures; classes. Formal logic and proof; number theory and cryptography; running time time analysis.

Methods of Assessment:
- Online short answer and programming exercises; problem sets and programming projects; participation in weekly labs; term tests and final exam.

Breadth Requirements:
- The Physical and Mathematical Universes (5)

Distribution Requirements:
- Science

Competencies:
- Communication: notably; Critical and Creative Thinking: extensively; Information Literacy: slightly
- Quantitative Reasoning: extensively; Social and Ethical Responsibility: slightly

Experiential Learning:
- Research: none; Other: none

Rationale:
CSC110Y1 is the first of two courses intended to prepare students for a Computer Science POSt, aimed at students admitted to Arts & Science in the first-year Computer Science admission stream. This is one of two pathways into computer science, with the existing pathway (involving CSC148H1 and CSC165H1) still available to students in other admission streams and programs.

The most novel aspect of this proposal is that CSC110Y1 is meant to be a full credit (1.0 FCE) but taken only in the fall semester: a “double course”. This idea developed out of several departmental discussions this summer as a result of a few considerations, which we explain here.

First, the existing first-year CS courses have a divide between “programming” (CSC108H1, CSC148H1) and “theory” (CSC165H1), and this separation of courses enforces a common but incorrect student belief that these two domains are completely separate. By creating a “double course” CSC110Y1, we are able to combine topics from practical programming and computer science theory in every aspect of the course, and so make these connections explicitly and repeatedly throughout the semester. We believe that explicit connections between practical and theoretical concepts will help students in several ways. For example, students who excel from a practical standpoint will see how they can use that strength to understand theoretical concepts (and vice versa). In addition, we can avoid redundancy in the material being taught because we know exactly which computer science concepts have been introduced to students and when.

This course will not result in an increased overall workload for students, as it will be equivalent in work to two half courses we otherwise would have proposed. The double course provides substantial opportunities for students to get to know their fellow CMP1 peers right at the very start of their university career. By enrolling in one section of the double course, students will work with the same group of peers for six lecture hours per week (in addition to a two-hour weekly lab practical). If we were to split the course into two half-courses, many students who share the same section for one of the courses would be in different sections for the other. While we of course want all CMP1 students to feel like part of the same cohort, there is a great opportunity to keep the same group of students together for all six weekly lecture hours, to accelerate the community building. A sense of community and belonging is one of the best ways to improve student mental health.

The Department of Computer Science will also employ a drop down policy. While we do not anticipate high take-up, CMP1 students who wish may drop down to CSC108H1 (Introduction to Computer Programming) up to the fourth week of classes. This will reduce their overall workload for the term, while still providing these students with a pathway to apply for a Computer Science program (albeit without the Computer Science Admission Guarantee). In addition to relaxing constraints on the sequence of topics being taught, having a single cohort take CSC110Y1 will...
Computer Science (FAS), Department of

facilitate community building among first-year Computer Science students.

Finally, our department is well aware that this “double course” is a departure from how students (not to mention administrators and instructors) normally envision courses, and so we will be working hard to connect with the first-year CS students to help them understand this structure. During summer course selection, we’ll reach out to ensure they only enrol in three additional courses other than CSC110Y1 in the fall semester. Our course instructors will make clear the expectations around workload for this class being double that of a standard half-course, and will monitor student progress with low-stakes assessments in the first few weeks to quickly identify students who are having difficulty early on.

Consultation:
- Existing instructors of CSC108H1, CSC148H1, and CSC165H1.
- Faculty from other departments that rely on CSC108H1, CSC148H1, and CSC165H1 as program requirements.
- The Department of Computer Science Undergraduate Committee.

Resources:
- Access to the CS Teaching Labs is required for the Practical component of the course (2 scheduled hours per week).

Budget Implications: The academic unit will provide the resources required for this course from existing budget.

Overlap with Existing Courses:
CSC110Y1’s course material overlaps with three other courses: CSC108H1, CSC148H1, and CSC165H1/CSC240H1. These three courses are also offered by the Department of Computer Science, and are requirements for programs in Computer Science and a few other departments.

Programs of Study for Which This Course Might be Suitable:
Computer Science

Estimated Enrolment:
350

Instructor:
- David Liu (but will be taught by multiple faculty members)

CSC111H1: Foundations of Computer Science II

Impact on Programs:
This proposal triggers modifications in the unit's program(s)

Contact Hours:
- Lecture: 36 / Practical: 24

Description:
A continuation of CSC110Y1 to extend principles of programming and mathematical analysis to further topics in computer science.

Topics include: object-oriented programming (design principles, encapsulation, composition and inheritance); binary representation of numbers; recursion and mathematical induction; abstract data types and data structures (stacks, queues, linked lists, trees, graphs); the limitations of computation.

This course is restricted to students in the first year Computer Science admission stream, and is only offered in the Winter term. Other students planning to pursue studies in computer science should enrol in CSC108H1, CSC148H1, and CSC165H1/CSC240H1.
### Computer Science (FAS), Department of

<table>
<thead>
<tr>
<th>Prerequisites:</th>
<th>CSC110Y1 (70% or higher)</th>
</tr>
</thead>
</table>

| Corequisites:          | None                       |

| Exclusions:            | CSC108H1, CSC148H1, CSC165H1 |

| Recommended Preparation: |                                |

| Topics Covered:         | Abstract data types, stacks and queues; linked lists; binary search trees; sorting algorithms; average-case running time analysis. Number representations and floating point error. Graphs. |

| Methods of Assessment:  | Online short answer and programming exercises; problem sets and programming projects; participation in weekly labs; term tests and final exam. |

| Breadth Requirements:   | The Physical and Mathematical Universes (5) |

| Distribution Requirements: | Science |

| Competencies:            | Communication: notably; Critical and Creative Thinking: extensively; Information Literacy: slightly; Quantitative Reasoning: extensively; Social and Ethical Responsibility: slightly |

| Experiential Learning:   | Research: none; Other: none |

| Rationale:              | Students enrolled in CSC111H1 are a single cohort that have met the progression requirements for CSC110Y1. The course continues with topics introduced in CSC110Y1, extending the students’ knowledge of practical programming and computer science theory. The intention is to cover the remaining material that would be taught in CSC148H1 and CSC165H1 but has not yet been covered in CSC110Y1. CSC111H1 is similar to CSC110Y1 in two ways. First, the course continues to make explicit connections between practical programming and computer science theory concepts (albeit for more advanced material). Second, students will have the chance to continue to build on relationships they established in CSC110Y1 and create new ones in CSC111H1 (i.e., the sections for CSC111H1 are not guaranteed to match CSC110Y1, but there will be significant overlap). The practical lab component (2 hours per week) will be designed as a direct continuation as the labs in CSC110Y1. |

| Consultation:           | -Existing instructors of CSC148H1 and CSC165H1. -Faculty from other departments that rely on CSC148H1 and CSC165H1 as program requirements. -The Department of Computer Science Undergraduate Committee (UGC). |

| Resources:              | Access to the CS Teaching Labs is required for the Practical component of the course (2 scheduled hours per week). Budget Implications: The academic unit will provide the resources required for this course from existing budget. |

| Overlap with Existing Courses: | CSC111H1’s course material overlaps with three other courses: CSC148H1 and CSC165H1/CSC240H1. These courses are also offered by the Department of Computer Science and are prerequisites for courses in several other departments. |

| Programs of Study for Which This Course Might be Suitable: | 23 |
Computer Science (FAS), Department of

Estimated Enrolment:
350

Instructor:
David Liu (but will be taught by multiple faculty members)

CSC196H1: Great Ideas in Computing

Contact Hours:
Lecture: 36

Description:
We will pursue the general (and very debatable) theme of GREAT IDEAS in COMPUTING (including some surprising algorithms). The ambitious goal is to try to identify some of the great ideas that have significantly influenced the field and have helped to make computing so pervasive. We will concentrate on mathematical, algorithmic and software ideas with the understanding that the importance and usefulness of these ideas depends upon (and often parallels) the remarkable ideas and progress in computing and communications hardware. As we will see, many of the great ideas were against the "prevailing opinion". The list of topics we shall discuss will depend to some degree on the background and interests of the class. Restricted to first-year students. Not eligible for CR/NCR option.

Prerequisites:

Corequisites:

Exclusions:

Recommended Preparation:
Some knowledge of probability theory

Topics Covered:
Some possible topics are:
1. Alan Turing and his precise and well accepted mathematical definition of computable functions. The concept of interpreters. Functions that are provably not computable.
2. What is a digital computer? The von Neumann architecture. Digital vs analogue. What were/are the alternatives?
3. Claude Shannon and Information theory. Error correcting codes; compression.
4. Fortran, the first commercial source level language and compiler.
5. Operating systems.
6. HCI: the mouse, menus, click, paste and drag.
7. The internet and packet routing.
9. NP completeness; what is ``efficiently computable"”? Complexity based cryptography.
10. Statistical machine learning and deep neural nets.

Methods of Assessment:
assignments, midterm, final exam

Breadth Requirements:
Society and its Institutions (3)

Distribution Requirements:
Science
Computer Science (FAS), Department of

Competencies:

- Communication: notably
- Critical and Creative Thinking: notably
- Information Literacy: slightly
- Quantitative Reasoning: slightly
- Social and Ethical Responsibility: slightly

Experiential Learning:

- Research: none
- Other: none

Rationale:

The computing that is so pervasive in our lives is based on a number of fundamental ideas many of which are not difficult to understand but are not necessarily obvious to computer users. Some of these ideas were also not obvious to scientists and technological leaders at the time that they were first proposed. Some ideas were even seen as unrealistic or impossible. Exploring the historical development of ideas and ensuing opportunities for technological progress is not only an interesting intellectual exercise, but it will help students reflect on current technological challenges and seemingly impossible problems or impractical solutions.

Consultation:

Computer Science Undergraduate Committee, Nov 26, 2019

Resources:

- standard

Budget Implications:

The academic unit will provide the resources required for this course from existing budget.

Overlap with Existing Courses:

none that we know of

A 1.0 FCE version of this material was taught years ago as a SCI199Y course.

Programs of Study for Which This Course Might be Suitable:

Any

Estimated Enrolment:

25

Instructor:

University Professor Allan Borodin

CSC457H1: Principles of Computer Networks

Contact Hours:

- Lecture: 24
- Tutorial: 12

Description:

The course covers fundamental principles of computer networks, as well as currently used network architectures and protocols. Its emphasis is 1) to explain why reliable data transfer, addressing, routing and congestion control are the fundamental concepts, 2) to explore the design principles behind algorithms/protocols for reliable data transfer, addressing, routing and congestion control and 3) to use current protocols such as TCP/IP, ARQ, Ethernet, CSMA/CD, DNS and Internet routing protocols as examples of concrete implementations/designs of these protocols. It will highlight the trade-offs (and approaches to navigate these trade-offs) in the design of computer network protocols.

Prerequisites:

CSC373H1/CSC373H5/CSCC73H3, STA247H1/STA255H1/STA257H1

Corequisites:

Exclusions:

CSC358H1; NOTE: Students not enrolled in the Computer Science Major or Specialist program at FAS, UTM, or UTSC, or the Data Science Specialist at FAS, are limited to a maximum of three 300-/400-level CSC/ECE half-courses.
Computer Science (FAS), Department of

**Recommended Preparation:**
CSC309H1, CSC369H1

**Topics Covered:**
same as replaced 358

**Methods of Assessment:**
assignments, midterm, final -- same as replaced CSC358

**Breadth Requirements:**
The Physical and Mathematical Universes (5)

**Distribution Requirements:**
Science

**Competencies:**
- Communication: slightly
- Critical and Creative Thinking: extensively
- Information Literacy: none
- Quantitative Reasoning: extensively
- Social and Ethical Responsibility: slightly

**Experiential Learning:**
- Research: none
- Other: none

**Rationale:**
This is a renumbering of CSC358 to CSC457. This will make it clearer to students that the two networking courses (now both 4th year) are not sequential and can be taken in either order. The course content is sufficiently difficult that it is appropriate for 4th year and may eventually become a cross-listed graduate course.

The course requires knowledge of algorithm design (CSC373) as well as probability theory (STA247H1/STA255H1/STA257H1). The designation of the course as a 4th year course reflects these requirements.

**Consultation:**
Associate Chair, Undergraduate Computer Science Department
Other faculty instructor of CSC458 – Computer Networking System
Approved by the Department of Computer Science Undergraduate Committee, Nov 26, 2019.

**Resources:**
No special resources required.

**Budget Implications:**
The academic unit will provide the resources required for this course from existing budget.

**Overlap with Existing Courses:**
This is a renumbering of CSC358 because it was felt that the material was more appropriate in 4th year rather than third.

**Programs of Study for Which This Course Might be Suitable:**
All CS POSs.

**Estimated Enrolment:**
30-80

**Instructor:**
Peter Marbach

**JCC250H1: Computing for Science**

**Contact Hours:**
- Lecture: 24
- Tutorial: 24

**Description:**
Computer Science (FAS), Department of

Computational skills for the modern practice of basic and applied science. Applied computer programming with an emphasis on practical examples related to the simulation of matter, drawing from scientific disciplines including chemistry, biology, materials science, and physics. Studio format with a mixture of lecture, guided programming, and open scientific problem solving. Students will be exposed to Python numerical and data analysis libraries. No prior programming experience is required.

Prerequisites:
CHM135H1/CHM136H1/CHM151Y1, 0.5 FCE in MAT (excluding FYF courses)

Corequisites:
None

Exclusions:
Any CSC course except CSC104H1, CSC196H1, CSC197H1

Recommended Preparation:

Breadth Requirements:
The Physical and Mathematical Universes (5)

Distribution Requirements:
Science

Competencies:
Communication: slightly; Critical and Creative Thinking: slightly; Information Literacy: slightly
Quantitative Reasoning: extensively; Social and Ethical Responsibility: slightly

Experiential Learning:
Research: none; Other: none

Rationale:
As the laboratory is automated and we enter the era of big data, more than ever, computing is an essential tool for science. We believe it is essential to introduce modern scientists of most disciplines to the practical aspects of computing as soon as possible. This course provides hands-on training on programming in a flipped-classroom manner. The students will be exposed to 45 min-1 hour of a contextual/situational lecture, and to a 15-minute overview of the Python Notebooks they will have to employ. These self-graded notebooks, which are stored in a central server are solved in-class while the instructors help the students if they get stuck. The format encourages students to brainstorm with each other as they solve the exercises. A take-home exercise is started during the last 30 min-1 hr of class. This “studio” format allows for a less distracted environment for the modern student.

This course is being proposed as a JSC offering as the teaching staff require expertise in both Computer Science and Chemistry. We currently have a jointly-appointed faculty member arranged to co-teach it, however regardless of that faculty member’s involvement both departments need to be involved going forward.

Staffing: Instructors resources will be split 50/50 between Computer Science and Chemistry on average. TA resources will be provided by both departments: each department will resource TAs for 50% of course enrollment to a total of 100%. The departments will resource TAs using their own prescribed ratio for their half of the enrollment.

The course designator changed to JCC after discussion with Governance December 9, 2019. All references to JSC should be JCC.

Consultation:
This course is modelled after a course taught by one of the proposers at Harvard University (Aspuru-Guzik). Discussion with the Department of Computer Science and faculty from other departments at UofT indicates there is interest from faculty and students in other disciplines for a course teaching computational skills more specific to the physical sciences. We also consulted with the Chemistry Undergraduate Studies Committee.
## Computer Science (FAS), Department of

### Resources:
A classroom with teaching station, and with tables where the students can sit in groups, such as one of the new active learning classrooms in the Myhal Centre. Students will be required to bring their own laptops. For the final project, we require a collection of Raspberry Pis, pumps, webcams, and simple wetware. We may require access to a chemistry laboratory to carry out the final project experimentation with simple chemicals to carry out automated titration operations. See the following articles for context.
https://cen.acs.org/education/Teaching-chemistry-students-use-labs/96/i48  
https://cen.acs.org/articles/96/web/2018/03/New-software-run-lab-future.html

**Budget Implications:** The academic unit will provide the resources required for this course from existing budget.

### Overlap with Existing Courses:
Some overlap in the first few weeks with other introductory CSC courses.

### Programs of Study for Which This Course Might be Suitable:
This course is well-suited for students in any program in the physical and life sciences.

### Estimated Enrolment:
100-200 if a TEAL room of that size is available

### Instructor:
Alán Aspuru-Guzik and Jacqueline Smith

### 10 Course Modifications:

#### CSC104H1: Computational Thinking

**Description:**
Humans have solved problems for millennia on computing devices by representing data as diverse numbers, text, images, sound and genomes, and then transforming the data. A gentle introduction to designing programs (recipes) for systematically solving problems that crop up in diverse domains such as science, literature, and graphics. Social and intellectual issues raised by computing. Algorithms, hardware, software, operating systems, the limits of computation.

Note: you may not take this course concurrently with any Computer Science course, but you may take CSC108H1 / CSC148H1 after CSC104H1.

**Exclusions:**
JCC250H1; Any CSC Computer Science course except CSC196H1, CSC197H1, CSC199H1

**Rationale:**
Adding FYF CSC courses to not be exclusions because these new courses do not have programming and were previously excluded because they begin with CSC. Also adding new course JSC250 because it covers some of the same introductory programming.

**Consultation:**

**Resources:**

### CSC108H1: Introduction to Computer Programming

**Exclusions:**
CSC110Y1, CSC120H1, CSC121H1, CSC148H1
### Computer Science (FAS), Department of

**Rationale:**
CSC110Y1 is a new course taken only by students in the CMP1 admission stream. It covers all the material from CSC108H.

**Consultation:**

**Resources:**

**CSC148H1: Introduction to Computer Science**

**Exclusions:**
CSC111H1, CSC207H1

**Rationale:**
CSC111H1 is a new course for CMP1 students that covers much of the same material as CSC148.

**Consultation:**

**Resources:**

**CSC165H1: Mathematical Expression and Reasoning for Computer Science**

**Exclusions:**
CSC111H1, CSC236H1, CSC240H1

**Rationale:**
CSC111H1 is a new course only for students in the CMP1 admission stream. It covers much of the same material as CSC165H.

**Consultation:**

**Resources:**

**CSC207H1: Software Design**

**Prerequisites:**
- 60% or higher in CSC148H1/60% or higher in CSC111H1
  (Please note: The minimum prerequisite grade in CSC148H1 is lower than the minimum grade for program admission in Computer Science. If you take this course when your grade in CSC148H1 is lower than the requirement for program admission, you will be unable to enrol in a Computer Science program. If you hope to enrol in a Computer Science program in future, please ensure that you satisfy the program admission grade requirements in CSC148H1 before completing CSC207H1.)

**Rationale:**
We are adding CSC111H1 as an alternative to CSC148H1

**Consultation:**
Computer science undergrad committee

**Resources:**

### CSC236H1: Introduction to the Theory of Computation

**Prerequisites:**
- 60% or higher in CSC148H1/60% or higher in CSC111H1, 60% or higher in CSC165H1/60% or higher in CSC111H1
  (Please note: The minimum prerequisite grade in CSC148H1 and CSC165H1/CSC240H1 is lower than the minimum grade...
Computer Science (FAS), Department of

for program admission in Computer Science. If you take this course when your grade in CSC165H1/CSC240H1 is lower than the requirement for program admission, you will be unable to enrol in a Computer Science program. If you hope to enrol in a Computer Science program in future, please ensure that you satisfy the program admission grade requirements in CSC165H1/CSC240H1 before completing CSC236H1. Students will not be permitted to retake CSC165H1 after completing CSC236H1.)

<table>
<thead>
<tr>
<th>Rationale:</th>
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<tbody>
<tr>
<td>We are adding CSC111H1 as an alternative prerequisite to CSC148H1 and CSC165H1</td>
</tr>
</tbody>
</table>

Consultation:

Computer science undergrad committee

Resources:

CSC240H1: Enriched Introduction to the Theory of Computation

<table>
<thead>
<tr>
<th>Corequisites:</th>
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</thead>
<tbody>
<tr>
<td>CSC111H1/CSC148H1; MAT137Y1/MAT157Y1</td>
</tr>
</tbody>
</table>

Rationale:

CSC111H1 is a new course only for students in the CMP1 admission stream who take it instead of CSC148H.

Consultation:

Resources:

CSC258H1: Computer Organization

<table>
<thead>
<tr>
<th>Contact Hours:</th>
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</thead>
<tbody>
<tr>
<td>Previous: Lecture: 24 / Practical: 13 / Tutorial: 12</td>
</tr>
<tr>
<td>New: Lecture: 24 / Practical: 36 / Tutorial: 12</td>
</tr>
</tbody>
</table>

Prerequisites:

60% or higher in CSC111H1/CSC148H1, 60% or higher in CSC111H1/CSC165H1/CSC240H1 (Please note: The minimum prerequisite grades in CSC148H1 and CSC165H1/CSC240H1 are lower than the minimum grades for program admission in Computer Science. If you take this course when your grade in CSC148H1 or CSC165H1/CSC240H1 is lower than the requirement for program admission, you will be unable to enrol in a Computer Science program. If you hope to enrol in a Computer Science program in future, please ensure that you satisfy the program admission grade requirements in CSC148H1 and CSC165H1/CSC240H1 before completing CSC258H1.)

Rationale:

Consultation:

Discussed and approved by CS UGC September 2019.

Resources:

CSC336H1: Numerical Methods

<table>
<thead>
<tr>
<th>Prerequisites:</th>
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<tbody>
<tr>
<td>CSC148H1/CSC111H1; CSC148H1; MAT133Y1(70%)/(MAT135H1, MAT136H1)/MAT135Y1/MAT137Y1/MAT157Y1, MAT221H1/MAT223H1/MAT240H1</td>
</tr>
</tbody>
</table>

Exclusions:

CSC350H1, CSC351H1. NOTE: Students not enrolled in the Computer Science Major or Specialist program at FAS the UTSG, UTM, or UTSC, or the Data Science Specialist at FAS, are limited to a maximum of three 300-/400-level BSc/
**Computer Science (FAS), Department of**

**ECE half-courses.**

**Rationale:**
We are adding CSC111H1 as an alternative prerequisite to CSC148H1. In addition, we're updating the exclusions language to reflect the fact that the Data Science Specialist is one of the Specialist programs offered by the Department of Computer Science.

**Consultation:**
Discussed and approved by CS UGC September 2019. There was also consultation between the Department of Computer Science and the Enrolment and Records team at Arts & Science OFR.

**Resources:**

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### CSC343H1: Introduction to Databases

**Prerequisites:**

CSC111H1/CSC165H1/CSC240H1 ECE120H1/ (MAT135H1, MAT136H1)/ MAT135Y1/MAT137Y1/MAT157Y1 / (MAT186H1, MAT187H1)/(MAT194H1, MAT195H1)/(ESC194H1, ESC195H1) ; MAT157Y1; CSC207H1/. Prerequisite for Engineering students only: ECE345H1/ESC190H1/CSC190H1/CSC192H1

**Exclusions:**

CSC443H1. NOTE: Students not enrolled in the Computer Science Major or Specialist program at FAS the UTSG, UTM, or UTSC, or the Data Science Specialist at FAS, are limited to a maximum of three 300-/400-level CSC/ECE half-courses.

**Rationale:**
We are adding engineering course prerequisites to all our CSC courses regularly taken by FASE students. This does not change our courses in any way, just allows prerequisites to be checked automatically through Degree Explorer. In addition, we're updating the exclusions language to reflect the fact that the Data Science Specialist is one of the Specialist programs offered by the Department of Computer Science.

**Consultation:**
Discussed in the IDT meeting and also with Tamara Jones, Jason Foster, Sharon Brown, Cheryl O'Donoghue and the CSC undergrad office staff.

Re: update to exclusions language: Consultation between the Department of Computer Science and the Enrolment and Records team at Arts & Science OFR.

**Resources:**
6 Minor Program Modifications:

Earth and Environmental Systems Major

Completion Requirements:

(8 full courses or their equivalent including at least 2.0 FCE at 300+ series with at least 0.5 FCE at 400 level series.)

1. 2.0 FCE foundation science courses: 2.0 FCE selected from JEG100H1/ESS102H, BIO120H1/BIO130H1, CHM135H1/CHM139H, CHM136H1/CHM138H, PHY131H1, PHY132H1, MAT135H1, ENV237H1/ENV238H1

2. 3.0 FCE ESS core courses:

   - 1.0 FCE at 200 level chosen from the following courses: ESS224H1 ESS241H1 ESS261H1, ESS262H1 (NOTE: ESS261H and ESS262H1 may be taken in either order)
   - 1.0 FCE at 300 level: ESS345H1, ESS361H1/ESS362H1/GGR305H1
   - 0.5 FCE field course: ESS410H1/ESS450H1/GGR390H1
   - 0.5 FCE capstone course: ESS461H1/ESS462H1/ESS463H1/ESS464H1

3. 3.0 FCE elective courses:

   In addition to the above core courses, you need to take 3 FCE electives. This requirement can be satisfied by any of the Earth Sciences Courses listed in categories A to F below. The following clusters of courses are neither mutually exclusive nor meant to limit choice but intended to show logical course complements. These are not POSt requirements; rather the clusters are presented to aid students in course selection according to their interests.

   Strongly recommended: ESS224H1

   a) Earth Surface Processes

      ESS224H1, ESS241H1, ESS311H1, ESS331H1, ESS445H1, GGR201H1, GGR205H1, GGR272H1

   b) Paleoclimate

      ESS261H1, ESS331H1, ESS361H1, ESS362H1, ESS461H1, ESS464H1, ENV234H1, GGR305H1

   c) Biogeochemistry

      ESS223H1/ENV233H, ESS311H1, ESS312H1, ESS362H1, ESS410H1, ESS462H1

   d) Global Environmental Change

      ESS362H1, ESS462H1, ESS463H1, GGR203H1, GGR314H1, PHY392H1

   e) Quaternary Science

      ESS224H1, ANT314H1, ANT315H1, ANT409H1, ANT419H1, ESS461H1

   f) Other Relevant Courses

      ESS261H1 ESS224H1, ESS222H1, JGA305H1, ESS321H1, ESS322H1, ESS323H1, ESS450H1, GGR337H1, ENV337H1, JSC301H1, ESS381H1, ESS399Y0, ESS481H1, ESS490H1, ESS491H1/ESS492Y1
Earth Sciences (FAS), Department of

<table>
<thead>
<tr>
<th>Description of Proposed Changes:</th>
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<table>
<thead>
<tr>
<th>Rationale:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace ESS261 with ESS224</td>
</tr>
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<table>
<thead>
<tr>
<th>Impact:</th>
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<tbody>
<tr>
<td>We now have a new course (ESS224) which teaches field techniques and core concepts to identify important minerals and rocks in hand specimens and place them into their geological context. No such course existed before, and we believe that this course is central to a geoscience degree. In order to keep the ESS core course count at its current level, we move ESS261 into the electives.</td>
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<tr>
<th>Consultation:</th>
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<tr>
<td>ES Ugrad committee</td>
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<tr>
<th>Resource Implications:</th>
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<tbody>
<tr>
<td>ESS224 is also part of the Geology Specialist Program, so adding it to this program has no resource implications.</td>
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Environmental Geosciences Specialist (Science Program)

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<tr>
<th>Completion Requirements:</th>
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</table>

(12 full courses or their equivalent which includes fulfillment of the Faculty’s Distribution requirement, including at least one FCE from 400-series courses)

1st year required courses (2 FCE): CHM151Y1/(CHM135H1, CHM136H1), MAT135H1, PHY131H1/PHY151H1

1st year elective courses: 1 FCE from MAT136H1, PHY132H1/PHY152H1, ENV237H1/ENV238H1, BIO120H1, CSC108H1/ESS345H1, JEG100H1

2nd year required courses (2 FCE): ESS241H1, ESS223H1/ENV233H, ESS262H1, GGR201H1

2nd year elective courses: 1 FCE from ESS224H1, ESS221H1/ESS241H1, ESS234H1/ESS330H1, ESS331H1, ESS362H1, GGR337H1, GGR390H1, ENV333H1, ESS431H1, ESS441H1, ESS445H1, ESS450H1, ESS462H1, ESS463H1, ESS464H1, ESS490H1, ESS491H1/ESS492Y1

3rd and 4th year required courses (2 FCE): ESS311H1, ESS312H1, ESS410H1, ESS461H1

3rd and 4th year elective courses: 4 FCE from JGA305H1, ESS234H1/ESS330H1, ESS331H1, ESS361H1, ESS362H1, GGR337H1, GGR390H1, ENV333H1, ESS431H1, ESS441H1, ESS445H1, ESS450H1, ESS462H1, ESS463H1, ESS464H1, ESS490H1, ESS491H1/ESS492Y1

Other courses which might of interest: ESS391H1, ESS392Y1, ESS381H1, ESS481H1

If you plan to become APGO certified, we suggest you consider the following courses to fulfill minimum qualifications. This list comprises courses which are required for the specialist as well as suggested courses; together they fulfill groups 1A, 1B, 2A and 2B of the APGO requirements and add up to 13.5 FCE:

Group 1A: CHM135H1, MAT135H1, PHY131H1

Group 1B: BIO120H1, MAT136H1, CHM136H1, PHY132H1, STA220H1, CSC108H1/ESS345H1

Group 2A: ESS224H1, ESS221H1, ESS241H1, ESS234H1/ESS330H1, ESS331H1

Group 2B: ESS223H1/ENV233H, ESS312H1, GGR201H1, GGR337H1, JGA305H1

Group 2C: 4.5 FCE of 200/300/400 level ESS or other allowable courses
All students, regardless of their career aspirations, are encouraged to talk to the undergraduate chair about their selection of electives.

Description of Proposed Changes:
Under second-year elective courses: Replace ESS221 with ESS224. Replace ESS222 with ESS262
Group 2A: Replace ESS221 with ESS224

Rationale:

Impact:
ESS224 is a new course which teaches field techniques and core concepts to identify important minerals and rocks in hand specimens and place them into their geological context. Development of practical skills is emphasized. It replaces ESS221 which emphasized optical mineralogy which is only needed in the Geology Specialist Program.

Since ESS222 is no longer available and ESS321 and ESS322 are to specialized, we here include ESS262 Earth System Processes which provides a good introduction into Earth Sciences.

Also, student feedback indicates that students would like the option to take other ES courses as electives. Specifically ESS391H/ESS392Y Directed studies (typically an undergraduate research project), as well as ESS381H/ESS481H Special topics courses, which change on a yearly basis.

Consultation:
A copy of this request was sent to the School of the Environment.

Resource Implications:
ESS262 is an existing course with no resource implications.

ESS224 is also part of the Geology Specialist Program, so adding it to this program has no resource implications.

Geology Specialist

Description:
This program gives the deepest level of education within the field of geology, and is geared towards preparing students for a career in the energy and mineral resources sector or as a government-employed geologist. The program meets the requirements for gaining membership in the Association of Professional Geoscientist of Ontario (APGO) and similar organizations in other Canadian provinces and territories countrywide. The Geology Specialist Program focusses on core specialist program involves heavy course load in classical geology subjects, such as mineralogy and petrology, sedimentology, structural geology, paleontology, mineral resources and geologic field mapping. Students are advised to be aware of course prerequisites, check clusters of courses listed for the Geology Specialist program, and consult the Earth Sciences Undergraduate Handbook for logical course progressions. For further questions, please consult with the Student Affairs Coordinator (Scott Moore, Department of Earth Sciences, 22 Russell St. Earth Sciences Center, Room 1062 email: ugrad@es.utoronto.ca).

Keywords: Geology, Petrology, Energy and Mineral Resources

Completion Requirements:

Please consult the undergraduate handbook for detailed information on this program.

14 full courses or their equivalent to be chosen according to this list:

Compulsory Foundation Sciences (1.5 FCE):
CHM135H1, MAT135H1, PHY131H1

Additional Foundation Sciences (3.5 FCE):

Any six half-courses from the following, with no more than two half foundation courses from the same category:

- Biology: BIO120H1, BIO130H1
- Computer Science: CSC108H1, CSC148H1, CHM151Y1/(CHM135H1, ESS345H1
- Chemistry: CHM136H1/(CHM138H, CHM220H1, CHM222H1
- Math: CHM139H1; MAT135H1 & MAT136H1; (PHY131H1, MAT221H1
- Physics: PHY132H1; PHY151H1, PHY152H1
- Statistics: ; BIO120H1/MAT221H1/MAT223H1; STA220H1/GGR270H1; GGR20H1; CSC108H1/STA247H1
  ESS345H1; recommended: ESS262H1/STA257H1, STA248H1 ESS102H/STA261H
JEG100H1

Compulsory Foundation Geosciences (3.5 6.0 FCE) core courses:

- Field techniques: ESS234H1
- Mineralogy and Petrology: ESS222H1 ESS223H1/ESS224H1
- Sedimentation and Stratigraphy: ESS331H1
- Structural Geology: ESS241H1
- Additionally: ESS262H1 ENV233H, ESS221H1/ESS321H1; ESS222H1, ESS324H1

Additional Foundation Geosciences (2.5 FCE):

At least one ESS241H1, but no more than two courses from each subgroup:

- Geochemistry and Geophysics: ESS223H1 ESS261H1, JGA305H1
- Mineralogy and Petrology: ESS322H1, ESS323H1
- Sedimentology ESS311H1, Glacial Geology ESS312H1, Geomorphology ESS322H1, Remote Sensing: ESS431H1
  ESS331H1, GGR201H1 ESS441H, GGR301H, GGR337H1
  ESS431H1/ESS332H

Other Geosciences (3.5 4.0 FCE) field courses:

A minimum of 7 courses from the following list that have not been used to fulfill the above requirements. At least two need to be at the 400 level ESS234H1/ESS330H, and no more than 3 from the 200 level. ESS324H1/ESS420H

- Second-year courses 2.0 FCE electives chosen from: ENV234H1, ESS223H1, ESS261H1, GGR201H1, GGR205H1, GGR206H1, GGR272H1, GGR273H1
- Third-year courses: ESS311H1, ESS312H1, ESS323H1, ESS324H1, ESS345H1, ESS362H1, ESS381H1, ESS391H1
  , ESS392Y1, GGR301H1, GGR337H1, JGA305H1, JPE395H1
- Fourth-year Courses: ESS410H1, ESS423H1, ESS425H1, ESS431H1, ESS441H1, ESS450H1, ESS461H1, ESS481H1, ESS324H1/ESS420H/ESS490H1, ESS491H1/ESS492Y1

Notes:
1. Advanced courses, like CHM151Y1, PHY151H1, MAT137Y1 or MAT157Y1, can be used as credits for both foundation sciences sections, meaning, half of the credit will count for Compulsory Foundation Sciences, and the other half will count for Additional Foundation Sciences. ESS362H1

2. You may choose for more than 2.5 FCE from the Additional Foundation Geosciences list. In that case information, please contact the additional courses will count towards the Other Geosciences.

3. You need a minimum Department of 4.0 FCE of 300/400-level courses

4. Students are advised to check the prerequisites of the upper-year courses when deciding on their 2nd and 3rd-year-course selection.

5. Students who do not wish to attain APGO certification are advised to speak to the Associate Chair Undergraduate Affairs concerning their course selection Earth Sciences, ugrad@es.utoronto.ca.

**Recommended Course Combinations:**

Students interested in Mineral Exploration:

First Year: BIO120H1, CHM135H1, CHM136H1, MAT135H1, MAT136H1, PHY131H1, PHY132H1

Second year: ESS223H1, ESS224H1 or ESS221H1 and ESS222H1, ESS234H1, ESS241H1, ESS262H1, STA220H1

Third Year: ESS331H1, ESS321H1, ESS322H1, ESS323H1, ESS345H1, JGA305H1, ESS311H1, ESS324H1

Fourth Year: ESS423H1, ESS431H1, ESS441H1, ESS461H1, ESS490H1, ESS491H1, ESS492Y1

Students with an interest in GIS:

First Year: CHM135H1, CHM136H1, MAT135H1, PHY131H1, PHY132H1, CSC108H1

Second year: STA220H1, ESS223H1, ESS224H1, ESS234H1, ESS241H1, ESS262H1, GGR272H1, GGR273H1, MAT221H1

Third Year: ESS311H1, ESS312H1, ESS321H1, ESS322H1, ESS331H1, JGA305H1, GGR337H1, ESS323H1, ESS324H1

Fourth Year: ESS431H1, ESS490H1, ESS491H1, ESS492Y1

**Description of Proposed Changes:**

Mineralogy and Petrology are currently taught in ESS221, ESS222, ESS322. In particular, ESS221 aims to teach practical rock identification skills, the basics of Mineralogy as well as microscopy techniques. Here we propose to untangle this by adding a new course: ESS224, which teaches fundamental rock identification skills (hand sample identification, rather than microscopy) needed by students in all our programs. The more specialized Mineralogy course will be moved to the third year (ESS321H1F), and classes that require Mineralogy as a prerequisite (ESS222,  ESS223,  ESS321,  etc.) will move to the fourth year (ESS423H1,  ESS431H1,  etc.).
ESS322) will be transferred to the third year and streamlined with our current third-year offerings. ESS222 Petrology will become ESS322H1S Igneous Petrology, and ESS322 Igneous and Metamorphic Petrology will become ESS323H1S Metamorphic Petrology. This scheme provides for a much better course progression. We also propose to change the Calendar wording for the Geoscience Specialist, so that it is defined in the same categories as those used by the Association of Professional Geoscientists Ontario (APGO, see the attached table), which governs professional licensing in the Earth sciences provincially (and is tied to national standards). The new language will clarify to students how their university education relates to the requirements needed to become a certified professional.

Last but not least, we propose to allow students to get credit for courses that lead to APGO accreditation but are taught in cognate departments (i.e., Geography). As such, the new program is giving students increased flexibility while building multi-disciplinary connections.

• While the below changes involve a fair amount of rewording and some course shuffling, they do not change the enrollment and degree requirements, nor do they change the course progression or the learning outcomes substantially.

Rationale:

1) Integration of ESS224 into the Geology Specialist program
Rationale: ESS224 is a new course that will teach rock and mineral identification in hand specimens. This course will serve our Minor, Major and Geophysics and Environmental Geoscience Specialist programs, as well as the mineral Engineering Program, and provides them with the necessary practical skills to do fieldwork. Having this course also provides opportunities in the Geoscience Specialist (GS) program. In consultation with our petrology colleagues and the Undergraduate Earth Science Association, the following modifications are proposed:
• Retire ESS221 Minerals and Rocks and ESS222 Igneous and Metamorphic petrology. All GS students will now take ESS224 Introduction to Mineralogy and Petrology
• ESS221 Mineralogy moves into the 3rd year and becomes the new course ESS321H Mineralogy, and will focus on Mineralogy and optical microscopy only.
• ESS322H1S Igneous and Metamorphic Petrology is being renamed Igneous Petrology and will focus on Igneous Petrology only
• ESS323H1S will be a new 3rd-year course called Metamorphic Petrology and will focus on Metamorphic Petrology only.
• The total number of FCE’s of the GS program remains at 14.

2) Clarify the relationship between the APGO requirements and the courses taught
In the Completion Requirements you will find a reworded version of the GS curriculum which uses the same language and categories as the APGO instructions Table (attached). This will help students better navigate between our course offerings and the APGO requirements.

3) Allow for APGO approved geoscience courses which are not taught in our department
We propose to allow students in our GS program to take APGO approved courses, even though they are taught in other departments. For example, knowledge in Geographic Information Systems is a crucial asset in today’s geoscience job market, and this is being offered in the Geography department. These courses will be part of the 3.5 FCE elective other geoscience courses mentioned in the APGO table 1, and do not substitute for the core geology courses. We specifically propose to add the following courses as options in our program:
1. GGR201 Geomorphology
2. GGR205 Soil Science
3. GGR272 Geographic Information and Mapping I
4. GGR273 Geographic Information and Mapping II
5. GGR301 Fluvial Geomorphology. This course is a modern variant fluvial Sedimentology, and many of our students take it already.
6. GGR337 Environmental Remote Sensing

Impact:

Internal consultations:
• With affected instructors: The last two years
• With the ES Undergraduate affairs committee: October 2019. One colleague remains concerned that allowing non-ESS courses for program credits, changes the nature of the GS program.
• With the department at large: Oct 15th, to 29th, official presentation at our Departmental Council Meeting Oct 25th.
• With students in the current GS program: The undergraduate student association did some informal polling in 2019, and a townhall style meeting was held on Dec 5th
Student feedback indicates that 6 out of 8 students worry that those changes render the current geology degree a geoscience degree, which would be less valuable than a 'geology' degree. Further, students see no need to take ESS262 (i.e., Introduction to Geology). Those concerns are noted, and we will carefully evaluate the effect of these decisions.

A) In response to these concerns, we will hold several outreach meetings to explain better how the proposed changes improve the student experience in the classroom and how they will enhance students' success in the workplace.

Outside the Unit: A program draft was sent to the Undergraduate Affairs Coordinators of the School of the Environment and Geography by mid-October. No concerns have been raised. The Geography department has been involved in the development of this proposal and provided a formal letter of consent. The introduction of ESS224 and how to best address the teaching needs of Engineering students has been discussed with the Engineering Department at length. Starting in the fall of 2020, ENG student will take ESS224 and ESS262 instead of ESS221, and ESS222.

Consultation:

Internal consultations:
- With affected instructors: The last two years
- With the ES Undergraduate affairs committee: October 2019. One colleague remains concerned that allowing non-ESS courses for program credits, changes the nature of the GS program.
- With the department at large: Oct 15th, to 29th, official presentation at our Departmental Council Meeting Oct 25th.
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Resource Implications: none

Geophysics Specialist

Completion Requirements:

Consult Departments of Earth Sciences and Physics

(13.5 to 14 full courses or their equivalent with at least one course at the 400-level)

9.0 FCEs core courses:

100-level: PHY131H1/PHY151H1, PHY132H1/PHY152H1; (MAT135H1, MAT136H1)/MAT137Y1

200-level: PHY250H1, PHY254H1; MAT235Y1/MAT237Y1; ESS224H1 ESS224H1, ESS241H1

300-level: JPE395H1; JGA305H1

400-level: PHY408H1, JPE493H1, ESS452H1; ESS441H1, ESS445H1, ESS450H1

0.5 to 1.0 FCEs ethics course chosen from the following list: JPH441H1, ENV333H1, IMC200H1, PHL273H1, PHL275H1, INS201Y1
Earth Sciences (FAS), Department of

4.0 to 4.5 additional FCEs chosen from Groups A, B, and/or C:

Group A -- courses required and relevant for professional registration (APGO):
CHM135H1; ESS345H1/CSC108H1; STA220H1/GGR270H1; MAT223H1, MAT244H1; APM346H1; ESS331H1

Group B -- emphasis on physics (suitable for graduate school preparation in a physics program):
PHY252H1, PHY350H1, PHY354H1, PHY392H1, PHY454H1, PHY495H1

Group C -- other relevant courses:
PHY224H1, MAT224H1, MAT233H1, APM346H1, ESS211H1; ESS223H1, ESS322H1, ESS323H1, ESS324H1, ESS431H1, ESS234H1/ESS330H1, ESS410H1, ESS490H1, ESS491H1/ESS492Y1, ESS381H1, ESS391H1, ESS392Y1, ESS481H1

Description of Proposed Changes:
Replace ESS221 with ESS224
Replace ESS222 with ESS322
Add ESS321 to ESS323 to Group C
Add ESS381, ESS391, ESS481 to group C

Rationale:
ESS224 is a new course which teaches field techniques and core concepts to identify important minerals and rocks in hand specimens and place them into their geological context. Development of practical skills is emphasized. It replaces ESS221 which emphasized optical mineralogy which is only needed in the Geology Specialist Program.
The new petrology courses ESS321/322/323 are now available as electives, and so is field camp 2 (ESS324).
Student feedback indicates a great interest to add directed studies (i.e., student project based research ESS399) as well as the special topic courses ESS381 and ESS481 to the lists of electives.

Impact:
ESS241 will enable Geophysics Specialists to participate in Field Camp one, which was previously not possible.
Providing more optional courses at the upper year level, provides for more flexibility in the program.

Consultation:
ES Undergraduate Committee

Resource Implications:
ESS224 is also part of the Geology Specialist Program, so adding it to this program has no resource implications.

Geoscience Major

Completion Requirements:

(8 full courses or their equivalent including at least 2.0 FCE at 300+ series with at least 0.5 FCE at 400-series.)

2.0 to 2.5 FCE chosen from BIO120H1; (CHM135H1, CHM136H1)/(CHM138H, CHM139H); MAT135H1, MAT136H1, MAT137Y1; PHY131H1, PHY132H1 ; JEG100H1/ESS102H ; ENV234H1

2.5 FCE core courses: JEG100H1/ESS102H/ENV234H1/ESS262H1, ESS223H1/ENV233H ESS221H1, ESS224H1/ESS222H1, ESS241H1; ESS261H1, ESS331H1

0.5 FCE field courses chosen from course: ESS234H1/ESS324H1 ESS330H/ESS410H1/ESS450H1

3.0 to 3.0 FCE chosen from 300/400 level ESS courses/JGA courses. Note JGA305H1 ; note course progressions and prerequisites.

We suggest that students consider the following logical course clusters in their higher years:
(a) Earth/planetary materials and mineral resources: ESS321H1 ESS223H1/ESS221H1 ENV233H, ESS322H1.
Earth Sciences (FAS), Department of

**ESS323H1, ESS324H1, ESS431H1, ESS322H, ESS423H1, ESS441H1**

(b) Tectonics: JGA305H1, ESS345H1/CSC108H1, ESS321H1, ESS322H1, ESS323H1, ESS441H1, ESS445H1

(c) Environmental biogeochemistry: ESS261H1, ESS223H1/ENV233H, ESS311H1, ESS312H1, ESS410H1, ESS461H1

(d) Geoarchaeology: ESS261H1, JGA305H1, ESS461H1, ESS450H1

### Description of Proposed Changes:

- Replace ESS221 with ESS224
- Replace ESS222 with ESS321
- Add ESS322 to list of core courses and increase FCE to 3
- Add ESS262 to the choice of core courses

### Rationale:

The Geology Specialist Program changes the way petrology will be taught. Previously, this subject was taught in 3 courses (ESS221, ESS222, ESS322). It will now be taught in 4 courses (ESS224, ESS321, ESS322, ESS323). This necessitates changes to course codes in the Geoscience Major since ESS221 and ESS222 are being retired.

### Impact:

None. These changes are made to facilitate the integration of ESS241.

### Consultation:

ES Undergraduate Committee

### Resource Implications:

ESS224 is also part of the Geology Specialist Program, so adding it to this program has no resource implications.

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**Geoscience Minor**

### Completion Requirements:

(4 full courses or their equivalent, with at least 1.0 FCE at 300+ series.)

1. 1.0 FCE of 100-series CHM, BIO, MAT or PHY courses.

2. 2.0 FCE of 100- or 200-level ESS courses (excluding ESS103H1, ESS104H1, ESS105H1, and ESS205H1). It is however recommended to include at least ESS262H1/or ENV234H1/or JEG100H1 and ESS224H1.

3. 1.0 FCE of 300/400 level ESS/JGA courses; including JGA305H1.

Be aware of course prerequisites, check clusters of courses listed for the geoscience major program, and consult the geology undergraduate handbook for logical course progressions.

### Description of Proposed Changes:

- Replace ESS221 with ESS224

### Rationale:

ESS224 is a new course which teaches field techniques and core concepts to identify important minerals and rocks in hand specimens and place them into their geological context. Development of practical skills is emphasized. It replaces ESS221 which emphasized optical mineralogy which is only needed in the Geology Specialist Program.

### Impact:

None

### Consultation:

ES Undergraduate Committee

### Resource Implications:
Earth Sciences (FAS), Department of

ESS224 is also part of the Geology Specialist Program, so adding it to this program has no resource implications.

3 New Courses:

**ESS224H1: Introduction to Mineralogy and Petrology**

**Impact on Programs:**
This proposal triggers modifications in the unit's program(s)

**Contact Hours:**
Lecture: 24 / Practical: 48

**Description:**
An introduction to atomic structure, chemistry, physical properties, and geological significance of rock-forming minerals and rocks. Field techniques and core concepts to identify important minerals and rocks in hand specimens and place them into their geological context. The development of practical skills is emphasized.

**Prerequisites:**

**Corequisites:**

**Exclusions:**

**Recommended Preparation:**
CHM135H1, PHY131H1, MAT135H1. For Mineral Engineering students, recommended preparation is MAT186H1 and CHE112H1.

**Topics Covered:**

**Methods of Assessment:**
Quizzes, lab assignments, mid-terms, and finals

**Breadth Requirements:**
The Physical and Mathematical Universes (5)

**Distribution Requirements:**
Science

**Competencies:**
*Communication:* slightly; *Critical and Creative Thinking:* slightly; *Information Literacy:* none
*Quantitative Reasoning:* slightly; *Social and Ethical Responsibility:* none

**Experiential Learning:**
*Research:* none; *Other:* notably;
*Nature of "Other" Experiential Learning:* Distinctive Practicals or Laboratories

**Rationale:**
Every geology student regardless of program should have a working knowledge of rock identification. At present, this skill is taught in two different courses (ESS221 and ESS22). This somewhat unique split serves the needs of our students in the Geology Specialist stream, who require a much more in-depth knowledge, and more advanced skills like rock identification of thin-sections using optical microscopy. This puts an undue course load on our Geophysics
Earth Sciences (FAS), Department of

and Environmental Geoscience Specialist programs, our Major programs, as well as the Mining Engineering program. We, therefore, propose a separate dedicated course which will serve the needs of this constituency.

Consultation:
This proposal was discussed with all ES faculty, Geography, School of the Environment, and Engineering. Note that those discussions were held in the 2017/2018 academic year, but that the proposal submission was delayed so that Engineering had more time to adapt their curriculum.

Resources:
Instructor, TA's, lab-space, samples.

Budget Implications: The academic unit will provide the resources required for this course from existing budget.

Overlap with Existing Courses:
There is some thematic overlap between ESS224 and ESS221 & ESS222. The latter serves however the needs of our Geology Specialists, whereas the former serves the needs of all other ES programs.

Programs of Study for Which This Course Might be Suitable:
Geophysics Specialist
Earth and Environmental Geoscience Specialist
Earth and Environmental Systems Major
Geoscience Major
Geoscience Minor

Estimated Enrolment:
~40

Instructor:
Melissa Anderson

ESS321H1: Mineralogy

Impact on Programs:
This proposal triggers modifications in the unit's program(s)

Contact Hours:
Lecture: 24 / Practical: 36

Description:
Systematic mineralogy (including identification, classification, and description); physical and chemical properties of minerals; crystallography and crystal systems (symmetry, crystal structure, crystal systems); optical techniques in mineral identification.

Prerequisites:
ESS224H1, ESS234H1

Corequisites:

Exclusions:

Recommended Preparation:

Topics Covered:
Systematic mineralogy (including identification, classification, and description), Physical and chemical properties of minerals. Crystallography and crystal systems (symmetry, crystal structure, crystal systems). Optical techniques in mineral identification.
### Methods of Assessment:
- Exams, written lab assignments

### Breadth Requirements:
- The Physical and Mathematical Universes (5)

### Distribution Requirements:
- Science

### Competencies:
- **Communication:** slightly; **Critical and Creative Thinking:** slightly; **Information Literacy:** none
- **Quantitative Reasoning:** none; **Social and Ethical Responsibility:** none

### Experiential Learning:
- **Research:** none; **Other:** notably;
- **Nature of "Other" Experiential Learning:** Distinctive Practicals or Laboratories

### Rationale:
With the introduction of ESS224 to the Geology Specialist Program, Rock identification in hand samples will be taught in ESS224, whereas the more advanced concepts of Mineralogy will be taught in the third year. This will provide a better connection between courses.

### Consultation:
Undergraduate Affairs Committee, ES-Faculty at large, UTM ES faculty

### Resources:
- **Budget Implications:** The academic unit will provide the resources required for this course from existing budget.

### Overlap with Existing Courses:
None

### Programs of Study for Which This Course Might be Suitable:
- Geology Specialist

### Estimated Enrolment:
10

### Instructor:
Grant Henderson

### ESS323H1: Metamorphic Petrology

**Impact on Programs:**
- This proposal triggers modifications in the unit's program(s)

**Contact Hours:**
- **Lecture:** 24  /  **Practical:** 36

**Description:**
This course provides a basic understanding of the formative processes of metamorphic rocks through quantitative applications of simple thermodynamic and kinetic principles. Topics include processes of heat and mass transport in orogenic belts, fluid-rock interaction in metasomatic systems, pressure-temperature-time paths of metamorphic rocks, temporospatial patterns of metamorphism through geologic time, and metamorphism in extreme conditions.

**Prerequisites:**
- (ESS224H1, ESS234H1, ESS321H1, ESS322H1) or (ESS221H1, ESS222H1, ESS234H1)

**Corequisites:**
Exclusions:

Recommended Preparation:

Topics Covered:
Formative processes of metamorphic rocks, quantitative applications of thermodynamic and kinetic principles. Heat and mass transport in orogenic belts, Fluid-rock interaction in metasomatic systems, Pressure-temperature-time paths of metamorphic rocks, temporospatial patterns of metamorphism through geologic time, metamorphism in extreme conditions.

Methods of Assessment:
Exams and written Lab assignments

Breadth Requirements:
The Physical and Mathematical Universes (5)

Distribution Requirements:
Science

Competencies:
Communication: slightly; Critical and Creative Thinking: slightly; Information Literacy: none
Quantitative Reasoning: none; Social and Ethical Responsibility: none

Experiential Learning:
Research: none; Other: notably;
Nature of "Other" Experiential Learning: Distinctive Practicals or Laboratories

Rationale:
Taking advantage of the new second-year course ESS224 Introduction to Mineralogy and Petrology, we can now use the two advanced petrology courses formerly called ESS222 and ESS322 to treat Igneous and Metamorphic petrology in two separate courses (ESS322 and ESS323)

Consultation:
Undergraduate Affairs Committee, ES facult at large, UTM ES faculty

Resources:
Lab space and instructor. No new resources since this course replaces ESS222

Overlap with Existing Courses:
none

Programs of Study for Which This Course Might be Suitable:
Geology Specialist

Estimated Enrolment:
10

Instructor:
Xu Chu

6 Course Modifications:
# ESS234H1: Introduction to Geological Field Methods

**Prerequisites:** ESS224H1/ESS222H1, ESS241H1, ESS262H1/JEG100H1

**Rationale:** The new Geology Specialist program will teach the subject of Petrology in 4, rather than 3 courses. As such, we are retiring ESS221 and ESS222, and change the focus of ESS322. The new course scheme will look like this: ESS224, rock identification in hand samples, ESS321 Optical Mineralogy, ESS322, Igneous Petrology, and ESS323 Metamorphic Petrology. Such, we here adopt the pre-requisites accordingly.

**Consultation:** ES Undergraduate Committee, ESS234 instructor

**Resources:**

# ESS322H1: Igneous and Metamorphic Petrology

**Title:** Igneous and Metamorphic Petrology

**Description:**

An overview of the nature and origin of igneous as well as metamorphic rocks, with particular emphasis on the interpretation of textures and mineral assemblages as they reflect rock-forming processes. Topics include laboratory exercises familiarise students with the physical and chemical properties of magma, origin most common rock types, and evolution provide practical examples of different magmatic series the theoretical principles discussed in specific lectures. This course also has a mandatory weekend field trip to view igneous/tectonic environments, geochemical and isotopic characteristics of igneous metamorphic rocks, and structures in the assimilation, fractionation & crystallization processes Bancroft or Montreal area.

**Prerequisites:** ESS224H1 ESS221H1, ESS234H1 ESS222H1, ESS321H1 ESS223H1 ESS223H1/ESS221H1 ENV233H1; ESS330H1

**Exclusions:**

- Previous: GLG318H1, GLG319H1
- New:

**Topics Covered:**

- Previous:
- New: Topics include the physical and chemical properties of magma, origin, and evolution of different magmatic series in specific igneous/tectonic environments, geochemical and isotopic characteristics of igneous rocks, and the assimilation, fractionation & crystallization processes.

**Methods of Assessment:**

- Previous:
- New: Exams, written lab assignments

**Rationale:** Since ESS224 will provide an introduction to Petrology and teach all the necessary skills for Field camp 1 at the end of the second year (ESS234), the more focused treatment of Igneous Petrology will be taught in 3rd year. This provides for a better connection between courses since at this stage students will have field experience and a background in plate tectonics. Course content will be an extended version of the currently taught ESS322 (Igneous and Metamorphic Petrology)

**Consultation:**
### ESS324H1: Advanced Geological Field Methods

**Impact on Programs:**
This proposal triggers modifications in the unit's program(s)

**Recommended Preparation:**
- **Previous:** ESS323H1
- **New:**

**Rationale:**
The new Geology Specialist program will teach the subject of Petrology in 4, rather than 3 courses. As such, we are retiring ESS221 and ESS222, and change the focus of ESS322. The new course scheme will look like this: ESS224, rock identification in hand samples, ESS321 Optical Mineralogy, ESS322, Igneous Petrology, and ESS323 Metamorphic Petrology. A such, we here adopt the pre-requisites accordingly

**Consultation:**
ES Undergraduate Committee, Course Instructor

**Resources:**
- none

### ESS331H1: Sedimentation and Stratigraphy

**Prerequisites:**
- **Previous:** ESS221H1
- **New:** ESS224H1

**Recommended Preparation:**
ESS222H1, ESS234H1/ESS330H1

**Rationale:**
ESS224 is a new course that teaches field techniques and core concepts to identify important minerals and rocks in hand specimens and place them into their geological context. The development of practical skills is emphasized. It replaces ESS221 which emphasized optical mineralogy which is only needed in the Geology Specialist Program

**Consultation:**
ES Undergraduate Committee, Course Instructor

**Resources:**
- none

### ESS423H1: Mineral Deposits

**Prerequisites:**
ESS322H1, ESS323H1

**Rationale:**
The new Geology Specialist program will teach the subject of Petrology in 4, rather than 3 courses. As such, we are retiring ESS221 and ESS222, and change the focus of ESS322. The new course scheme will look like this: ESS224, rock identification in hand samples, ESS321 Optical Mineralogy, ESS322, Igneous Petrology, and ESS323 Metamorphic Petrology. A such, we here adopt the pre-requisites accordingly

**Consultation:**
ES Undergraduate Committee, Course Instructor
### ESS441H1: Advanced Structural Geology

**Prerequisites:**
8.0 FCE of ESS courses including ESS322H1, ESS222H1, ESS234H1, ESS241H1, ESS331H1

**Recommended Preparation:**
ESS345H1, ESS323H1

**Rationale:**
The new Geology Specialist program will teach the subject of Petrology in 4, rather than 3 courses. As such, we are retiring ESS221 and ESS222, and change the focus of ESS322. The new course scheme will look like this: ESS224, rock identification in hand samples, ESS321 Optical Mineralogy, ESS322, Igneous Petrology, and ESS323 Metamorphic Petrology. As such, we here adopt the pre-requisites accordingly.

**Consultation:**
ES Undergraduate Committee, Course Instructor

**Resources:**
none

### 2 Retired Courses:

#### ESS221H1: Minerals and Rocks

**Rationale:**
The new Geology Specialist program will teach the subject of Petrology in 4, rather than 3 courses. As such, we are retiring ESS221 and ESS222, and change the focus of ESS322. The new course scheme will look like this:

ESS224, rock identification in hand samples, ESS321 Optical Mineralogy, ESS322, Igneous Petrology, and ESS323 Metamorphic Petrology.

**Consultation:**
Earth Sciences Undergraduate Affairs Committee, ES faculty at large, UTM ES faculty, Engineering

#### ESS222H1: Petrology

**Rationale:**
As such, we are retiring ESS221 and ESS222, and change the focus of ESS322. The new course scheme will look like this:

ESS224, rock identification in hand samples, ESS321 Optical Mineralogy, ESS322, Igneous Petrology, and ESS323 Metamorphic Petrology.

**Consultation:**
Undergraduate Affairs Committee, ES faculty at large, UTM ES faculty, Engineering
4 Minor Program Modifications/Revisions:

Biodiversity and Conservation Biology Major

Completion Requirements:

(8 FCEs including at least 2.0 FCEs at 300+ series with at least 0.5 FCE at the 400 level series)

First Year (1.0 FCE): BIO120H1; MAT135H1/MAT137Y1/MAT221H1/MAT223H1

Higher Years:

1. 2.0 FCEs: BIO220H1 (ecology and evolutionary biology); EEB225H1 (recommended)/STA220H1/STA257H1/STA288H1/GGR270H1/PST201H1 (statistics); EEB255H1 (conservation biology); ENV234H1 (environmental biology; cannot be substituted with EEB375H1)

2. 1.5 FCEs in organismal biology (with at least 0.5 FCE from Group 1 and 0.5 FCE from Group 2) from:
   Group 1 (plant or microbial): BIO251H1; EEB268H1, EEB331H1, EEB340H1; FOR305H1
   Group 2 (animal): EEB263H1, EEB266H1, EEB267H1, EEB380H1, EEB382H1, EEB384H1, EEB386H1, EEB388H1

3. 0.5 FCE in core evolution: EEB318H1, EEB323H1, EEB362H1

4. 0.5 FCE in core ecology from: EEB319H1, EEB320H1, EEB321H1, EEB328H1

5. 0.5 FCE: EEB365H1 (applied conservation biology)

6. 1.5 FCEs from: BIO130H1, BIO251H1; EEB263H1, EEB266H1, EEB267H1, EEB268H1, EEB313H1, EEB318H1, EEB319H1, EEB320H1, EEB321H1, EEB322H1, EEB323H1, EEB324H1, EEB325H1, EEB328H1, EEB331H1, EEB340H1, EEB341H1, EEB342H1, EEB348H1, EEB428H1, EEB430H1, EEB433H1, EEB440H1, EEB441H1, EEB445H1, EEB459H1, EEB491H1, EEB495H1, EEB497H1, EEB498Y1, EEB499Y1; EHB352H1; ENV334H1, ENV432H1; FOR200H1, FOR201H1, FOR207H1, FOR307H1, FOR313H1; GGR272H1, JHE353H1, JHE355H1; NUS

7. 0.5 FCE at 400 series from: EEB465H1, EEB466H1; field course: EEB403H0, EEB403H1, EEB405H0, EEB405H1, EEB406H0, EEB406H1, EEB407H0, EEB407H1, EEB410H0, EEB410H1; seminar: EEB491H1, EEB495H1; EEB497H1; research project: EEB498Y1 (recommended research subject in biodiversity and/or conservation biology) and concurrent research issues course EEB488H1 (0.5 FCE)

NOTE: BIO260H1/HMB265H1 (genetics) is recommended. Note that both BIO260H1 and HMB265H1 require BIO130H1 and BIO230H1; BIO230H1 requires both CHM135H1 and CHM136H1

Students interested in law, economics, policy, or environmental studies may choose to pair their Biodiversity and Conservation Biology Major with another Major such as Economics, Environmental Ethics, or Environmental Studies (all three are Arts programs), or Science programs (e.g., School of the Environment programs).

Description of Proposed Changes:
Adding new course EEB441H1 to list of electives in req. 6.

Rationale:

Impact:
Ecology and Evolutionary Biology (FAS), Department of

Consultation:
Undergraduate faculty committee and departmental faculty.

Resource Implications:

Ecology & Evolutionary Biology Major

Completion Requirements:

(8 FCEs including at least 2.0 FCEs at 300+ series with at least 0.5 FCE at the 400 series level)

First Year (2.0 FCEs): BIO120H1; BIO130H1; (CHM135H1, CHM136H1)/CHM151Y1

Higher Years:

1. 2.0 FCEs: BIO220H1; BIO230H1; BIO260H1/HMB265H1; EEB225H1/STA220H1/STA257H1/STA288H1/ GGR270H1/PSY210H1
2. 1.0 FCE from: BIO251H1, BIO270H1/PSL300H1, BIO271H1/PSL301H1, EEB263H1, EEB266H1, EEB267H1, EEB268H1, ENV234H1
3. 0.5 FCE in core ecology and evolution from: EEB318H1, EEB319H1, EEB320H1, EEB321H1, EEB322H1, EEB328H1, EEB362H1

4. 1.5 FCEs from: EEB313H1, EEB318H1, EEB319H1, EEB320H1, EEB321H1, EEB322H1, EEB323H1, EEB324H1, EEB325H1, EEB328H1, EEB331H1, EEB362H1, EEB365H1, EEB375H1, EEB380H1, EEB382H1, EEB384H1, EEB386H1, EEB388H1, EEB390H1, EEB397Y1, EEB398H0, EEB398Y0, EEB399Y1, EEB428H1, EEB430H1, EEB433H1, EEB440H1, EEB441H1, EEB455H1, EEB459H1, EEB460H1, EEB465H1, EEB466H1; EHJ352H1; ENV432H1; NUS201H0, NUS301H0, NUS302H0, NUS303H0, NUS304H0, NUS401H0*; PSY305H1

*More information about NUS courses and programs can be found on the Biology Calendar section

5. 0.5 FCE from: BIO251H1; BIO270H1/PSL300H1; BIO271H1/PSL301H1; EEB (excluding EEB197H1, EEB198H1, EEB199H1, EEB202H1, EEB208H1, EEB214H1, EEB215H1); ENV234H1, ENV334H1, ENV432H1; EHI1352H1; JHE335H1, JHE355H1; MAT135H1/MAT136H1/MAT137Y1/MAT221H1/MAT223H1; MGY340H1; NUS201H0, NUS301H0, NUS302H0, NUS303H0, NUS304H0, NUS401H0*

*More information about NUS courses and programs can be found on the Biology Calendar section

6. 0.5 FCE at the 400-series from: field course, EEB403H0, EEB403H1, EEB405H0, EEB405H1, EEB406H0, EEB406H1, EEB407H0, EEB407H1, EEB410H0, EEB410H1; seminar EEB491H1, EEB495H1; independent research project course, EEB497H1, EEB498Y1/EEB499Y1 (concurrent with research issues course EEB488H1); advanced lecture/discussion course, EEB428H1, EEB430H1, EEB433H1, EEB440H1, EEB455H1, EEB459H1, EEB460H1, EEB465H1, EEB466H1; ENV432H1

Description of Proposed Changes:
Adding EEB441H1 to req. 4 as an elective.

Rationale:

Impact:

Consultation:
Undergraduate committee and departmental faculty.

Resource Implications:
Ecology and Evolutionary Biology Specialist

Completion Requirements:

(12 FCEs including at least 4.0 FCEs at the 300+ series level, 1.0 of which must be at the 400 series level)

First Year (3.0 FCEs): BIO120H1; BIO130H1; (CHM135H1, CHM136H1)/CHM151Y1; (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1

1. 2.0 FCEs: BIO220H1 (ecology and evolutionary biology); BIO230H1 (molecular and cell biology); BIO260H1/HMB265H1 (genetics); BIO251H1/BIO270H1/PSL300H1/ENV234H1 (plant or animal form and function/environmental biology); Please note: ENV234H1 environmental biology cannot be substituted with EEB375H1.

2. 0.5 FCE in statistics from: EEB225H1 (recommended)/STA220H1/STA257H1/STA288H1/GGR270H1/PSY201H1

3. 0.5 FCE in core evolution from: EEB318H1, EEB323H1, EEB362H1

4. 0.5 FCE in core ecology from: EEB319H1, EEB320H1, EEB321H1, EEB328H1

5. 0.5 FCE in organismal biology from: EEB263H1, EEB266H1, EEB267H1, EEB268H1, EEB331H1, EEB340H1, EEB380H1, EEB382H1, EEB384H1, EEB386H1, EEB388H1

6. 1.0 FCE at 300+ series, from: EEB313H1, EEB318H1, EEB319H1, EEB320H1, EEB321H1, EEB322H1, EEB323H1, EEB324H1, EEB325H1, EEB328H1, EEB331H1, EEB340H1, EEB356H1, EEB362H1, EEB365H1, EEB380H1, EEB382H1, EEB384H1, EEB386H1, EEB388H1, EEB390H1, EEB398H0, EEB399Y0, EEB428H1, EEB430H1, EEB433H1, EEB440H1, EEB441H1, EEB455H1, EEB459H1, EEB460H1, EEB465H1, EEB466H1, EEB491H1, EEB495H1; EHJ352H1; ENV334H1, ENV432H1; ENV395Y1; NUS301H0, NUS302H0, NUS303H0, NUS304H0, NUS401H0*

* More information about NUS courses and programs can be found on the Biology Calendar section

Sub-total = 8.0 FCEs

7. 1.0 to 1.5 FCEs in at least two of the three following categories: (1) one field course (0.5 FCE) from EEB403H0, EEB403H1, EEB405H0, EEB405H1, EEB406H0, EEB406H1, EEB407H0, EEB407H1, EEB410H0, EEB410H1; (2) one seminar (0.5 FCE) from EEB495H1; and/or (3) one independent research course (0.5 FCE) from EEB497H1/(1.0 FCE) from EEB498Y1

Sub-total = 9.0 or 9.5 FCEs (depending on options chosen in #7)

8. Select the remaining FCEs for a total of 12.0 FCEs (at least 1.0 must be 300+ series if 1.0 FCE is completed in #7 above) from: BIO251H1, BIO270H1/PSL300H1, BIO271H1/PSL301H1; all EEB courses (excluding EEB197H1, EEB198H1, EEB199H1, EEB202H1, EEB208H1, EEB214H1, EEB215H1); EHJ352H1; ENV234H1, ENV334H1, ENV432H1; JHE353H1, JHE355H1; and no more than 1.0 FCE from the following (note that some courses may require prerequisites that are not listed within this program): ANT336H1, ANT333Y1, ANT335Y1, ANT338H1, ANT430H1, ANT436H1; CSB328H1, CSB340H1, CSB349H1, CSB350H1, CSB352H1, CSB353H1, CSB431H1, CSB452H1, CSB458H1, CSB472H1, CSB474H1; ENV346H1; FOR200H1, FOR201H1, FOR301H1, FOR306H1, FOR307H1, FOR413H1, FOR416H1, FOR417H1, FOR418H1; GGR201H1, GGR203H1, GGR205H1, GGR206H1, GGR272H1, GGR273H1, GGR305H1, GGR307H1, GGR308H1; MAT221H1; MGY340H1; NUS201H0, NUS301H0, NUS302H0, NUS303H0, NUS304H0, NUS401H0*; PSY100H1, PSY260H1, PSY270H1, PSY280H1, PSY290H1, PSY305H1, PSY390H1, PSY397H1, PSY474H1, PSY492H1, PSY497H1 (note that many PSY courses have limited enrolment)

* More information about NUS courses and programs can be found on the Biology Calendar section

Total = 12 FCEs
NOTE: Students may wish to concentrate in ecology, evolutionary biology, or behaviour. Recommended EEB, EHJ and JHE courses for these concentrations are as follows:

Ecology: EEB255H1, EEB319H1, EEB320H1, EEB321H1, EEB328H1, EEB365H1, EEB428H1, EEB433H1, EEB440H1, EEB465H1, EEB495H1; ENV432H1
Evolutionary Biology: EEB323H1, EEB324H1, EEB325H1, EEB362H1, EEB390H1, EEB440H1, EEB441H1, EEB459H1, EEB460H1; EHJ352H1; JHE353H1, JHE355H1
Behaviour: EEB322H1, EEB455H1

Description of Proposed Changes:
Adding the new course EEB441H1 to list of evolutionary biology electives.

Rationale:

Impact:

Consultation:
Internal undergraduate committee and departmental faculty meeting.

Resource Implications:

Environmental Biology Major

Completion Requirements:

(8 FCEs including at least 2.0 FCEs at 300+ series with at least 0.5 FCE at the 400 level series)

First Year (2.0 FCEs): BIO120H1; (CHM135H1, CHM136H1)/CHM151Y1; MAT135H1/MAT136H1/MAT137Y1/MAT221H1/MAT223H1 or PHY131H1/PHY151H1 or BIO130H1

1. 2.0 FCEs: BIO220H1 (ecology and evolutionary biology); ENV234H1 (cannot be substituted with EEB375H1 for this requirement), ENV334H1 (environmental biology); EEB225H1 (recommended)/STA220H1/STA257H1/STA288H1/GGR270H1/PSY201H1 (statistics)

2. 0.5 FCE in biological diversity and function from: BIO251H1, BIO270H1; EEB266H1, EEB267H1, EEB268H1, EEB340H1; BIO260H1/HMB265H1 (note that both require BIO130H1 and BIO230H1)

3. 0.5 FCE in physical environment from: CHM210H1; ENV237H1, ENV238H1; ESS223H1, ESS261H1, ESS262H1; GGR201H1, GGR203H1, GGR205H1, GGR206H1; PHY131H1, PHY132H1, PHY151H1, PHY152H1

4. 1.0 FCE in core ecology from: EEB319H1, EEB320H1, EEB321H1, EEB322H1, EEB324H1, EEB328H1

5. 1.5 FCEs from: EEB313H1, EEB319H1, EEB320H1, EEB321H1, EEB322H1, EEB323H1, EEB324H1, EEB325H1, EEB328H1, EEB365H1, EEB375H1, EEB386H1, EEB403H0, EEB403H1, EEB405H0, EEB405H1, EEB406H0, EEB406H1, EEB407H0, EEB407H1, EEB410H0, EEB410H1, EEB428H1, EEB430H1, EEB433H1, EEB441H1, EEB497H1, EEB498Y1, EEB499Y1; ENV316H1, ENV337H1, ENV432H1, ENV452H1; ESS311H1, ESS361H1, ESS362H1, ESS363H1, ESS364H1, FOR305H1, FOR307H1, FOR418H1; GGR305H1, GGR307H1, GGR308H1; JFG470H1

6. 0.5 FCE at the 400-series from: field course EEB403H0, EEB403H1, EEB405H0, EEB405H1, EEB406H0, EEB406H1, EEB407H0, EEB407H1, EEB410H0, EEB410H1/FOR418H1; seminar/lecture course EEB428H1, EEB430H1, EEB433H1, EEB491H1, EEB495H1, ENV432H1, ENV452H1; ESS462H1, ESS463H1, ESS464H1; JFG470H1; EEB497H1, independent research project course EEB498Y1 (concurrent with research issues course 51
This program can be combined with other Environmental programs (see School of the Environment), as well as Science (e.g., Chemistry, Earth Sciences) and Social Science (e.g., Economics) programs.

**Description of Proposed Changes:**
Adding new course to req. 5 electives.

**Rationale:**

**Impact:**

**Consultation:**
Undergraduate committee and departmental faculty.

**Resource Implications:**
1 New Course:

**EEB441H1: Reproductive Strategies**

<table>
<thead>
<tr>
<th>Impact on Programs:</th>
<th>This proposal triggers modifications in the unit's program(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Hours:</td>
<td>Lecture: 24 / Tutorial: 24</td>
</tr>
<tr>
<td>Description:</td>
<td>Behaviour, ecology, genetics and life history theory in the study of the evolution of sex, mate choice, sexual competition, sex ratio, hermaphroditism, age at maturity, fecundity, parental care and alternative strategies. Examples may be drawn from nonhuman animals, plants or fungi and highlight the research focus of the instructor.</td>
</tr>
<tr>
<td>Prerequisites:</td>
<td>BIO220H1</td>
</tr>
<tr>
<td>Corequisites:</td>
<td></td>
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<tr>
<td>Exclusions:</td>
<td></td>
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<tr>
<td>Recommended Preparation:</td>
<td></td>
</tr>
<tr>
<td>Breadth Requirements:</td>
<td>Living Things and Their Environment (4)</td>
</tr>
<tr>
<td>Distribution Requirements:</td>
<td>Science</td>
</tr>
<tr>
<td>Competencies:</td>
<td>Communication: notably; Critical and Creative Thinking: notably; Information Literacy: notably; Quantitative Reasoning: notably; Social and Ethical Responsibility: none</td>
</tr>
<tr>
<td>Experiential Learning:</td>
<td>Research: none; Other: none</td>
</tr>
<tr>
<td>Rationale:</td>
<td>Within EEB, reproductive strategies broadly overlaps with the primary research of several faculty and acts as a common question across research labs, yet this topic is dealt with in a piecemeal fashion across several courses. Reproductive strategies are a major determinant of the fitness of individuals and the viability of populations and species. As such, they encompass classic and emerging questions in evolutionary biology, from &quot;why does sex evolve?&quot; to &quot;what are the evolutionary consequences of sex chromosomes?&quot; Similarly, reproductive strategies often structure, and are structured by behaviors that can have large ecological consequences, and in turn be influenced by the ecological milieu individual’s experience. Our goal is to present reproductive strategies as a common theme that links our understanding of behavior, ecology and evolutionary biology.</td>
</tr>
<tr>
<td>Consultation:</td>
<td>Internal consultation in 2019 with 1) available professors who teach related topics and/or with research interests specific to the course, 2) EEB Undergrad Affairs Committee, and 3) All faculty at regular Faculty meeting</td>
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<tr>
<td>Resources:</td>
<td>No additional resources (will be provided by EEB)</td>
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<table>
<thead>
<tr>
<th><strong>Budget Implications:</strong></th>
<th>The academic unit will provide the resources required for this course from existing budget.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overlap with Existing Courses:</strong></td>
<td>Potential overlap with two third-year EEB courses. Course instructors are aware of the potential overlap, and will plan Reproductive Strategies to benefit from these lower level courses and minimize repetitiveness.</td>
</tr>
<tr>
<td><strong>Programs of Study for Which This Course Might be Suitable:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Estimated Enrolment:</strong></td>
<td>30</td>
</tr>
<tr>
<td><strong>Instructor:</strong></td>
<td>Various suggested instructors. There isn’t just one and the department has no idea at this point who will be teaching it.</td>
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</tbody>
</table>
4 Minor Program Modifications:

Environment & Health Major

Completion Requirements:

Required Courses (8.0 FCE)

Year 1: Students must complete Year 1 requirements 1 and 2 prior to entering POSt:

1. BIO120H1; BIO130H1

2. (CHM136H1/CHM138H1; CHM135H1/CHM139H1)/CHM151Y1 (Only transfer credits that carry exclusions to CHM136H1/CHM138H1 and/or CHM135H1/CHM139H1 will be accepted)

3. GGR100H1/JEG100H1/GGR101H1/ESS102H1/GLG102H1/MAT135H1/PHY131H1/PSY100H1

Year 2: Foundations in environment and health

4. BCH210H1/CHM247H1

5. BIO220H1; BIO230H1/BIO255H1

6. HMB265H1/BIO260H1

7. 1.0 FCE from environmental core courses: ENV221H1/ENV222H1/ENV234H1/ENV337H1/JEE337H1

Year 3: Third year core courses

8. ENV341H1

9. PSL300H1; PSL301H1

Years 3 or 4:

10. 0.5 FCE from environment and health relevant courses: HMB302H1/HMB303H1/HMB312H1/HMB314H1/HMB322H1/HMB390H1/HMB496Y1/HMB499Y1/ANA300Y1/ANA301H1/BCH311H1/CSB349H1/PSL350H1/BCH370H1/CHM310H1/CSB325H1/CSB327H1/CSB328H1/CSB331H1/CSB346H1/CSB347H1/CSB350H1/CSB351Y1/EED318H1/EED319H1/EED321H1/EED328H1/EED362H1/EED375H1/EED428H1/ENV315H1/ESS425H1/ENV316H1/ENV336H1/GGR303H1/GGR305H1/GGR409H1/GGR347H1/GGR348H1/GGR372H1/HIS423H1/GGR433H1/HST405H1/HST405H1/HST405H1/JGE347H1/JGE348H1/JGE348H1/ESS311H1/ESS312H1/ESS463H1/IMM334Y1/LMP301H1/LMP363H1/MGY377H1/NFS382H1/NFS386H1/NFS488H1/PSL372H1/PSL420H1/PSY435H1

Year 4: Environment & Health Capstone Course

11. JEH455H1

E&H Major Program Note:

• Not all non-ENV courses listed in requirement 10 above have priority enrolment for the Environment & Health Major. Students are responsible for checking the priority of courses, as well as meeting course prerequisites for courses they wish to take.

Description of Proposed Changes:
**Rationale:**
These additional environment-related elective courses are relevant to the program, and also provide more choice to students in the program, particularly for those students also taking a program with a unit offering one of these new elective courses, as they can double count the course for both programs.

**Impact:**
Please see rationale above.

**Consultation:**
We consulted with and received permission from the units offering these courses, to add these elective courses to the program.

**Resource Implications:**
None.

### Environment & Health Specialist

**Completion Requirements:**

(14 full courses or their equivalent which includes fulfillment of the Faculty’s Distribution requirements; must include at least four 300+-series courses, one of which must be at the 400-level)

Year 1: Students must complete Year 1 requirements 1 and 2 prior to entering POSIt:

1. BIO120H1; BIO130H1

2. (CHM136H1/CHM138H1; CHM135H1/CHM139H1)/CHM151Y1 (Only transfer credits that carry exclusions to CHM136H1/CHM138H1 and/or CHM135H1/CHM139H1 will be accepted)

3. 1 full course or its equivalent in half courses from among: GGR100H1/JEG100H1/GGR101H1/MAT135H1/MAT136H1/JMB170Y1/PHY131H1/PHY132H1/PHY151H1/PHY152H1/PSY100H1

Year 2: Foundations of environment and health

4. BCH210H1/CHM247H1

5. BIO220H1; BIO230H1/BIO255H1

6. HMB265H1/BIO260H1

7. ENV221H1; ENV222H1

8. ENV234H1; ENV337H1/JEE337H1

9. PHL273H1

Year 3: Selected topics in environment and health with greater depth.

10. STA220H1/STA288H1; STA221H1

11. BCH311H1/CSB349H1/LMP363H1/NFS284H1/(PSL300H1, PSL301H1)/PSL350H1

12. JGE321H1; ENV341H1

13. 1.0 FCE from: CHM210H1/ENV334H1/(only one from ENV233H1/ESS261H1/GGR203H1/GGR303H1/GGR314H1/PHY231H1)
Environment (FAS), School of

Years 3 & 4:

14. 1.5 FCE from environment and health relevant courses: HMB302H1/HMB303H1/HMB312H1/HMB314H1/HMB322H1/HMB390H1/HMB496Y1/HMB499Y1/ANA300Y1/ANA301H1/BCH311H1/CSB349H1/PSL350H1/BCH370H1/CHM310H1/CSB325H1/CSB327H1/CSB328H1/CSB331H1/CSB346H1/CSB347H1/CSB350H1/CSB351Y1/EEB318H1/EEB319H1/EEB321H1/EEB328H1/EEB362H1/EEB428H1/ENV315H1/ESS425H1/ENV316H1/ENV336H1/ESS463H1/GGR303H1/GGR305H1/GGR409H1/GGR347H1/GGR348H1/GGR372H1/HIS423H1/GGR433H1/JGE347H1/HST405H1/JGE348H1/ESS311H1/ESS312H1/IMM334Y1/LMP301H1/LMP363H1/MGY377H1/NFS382H1/NFS386H1/NFS488H1/PSL372H1/PSL420H1/PSY435H1 or any other approved course for which the student has appropriate prerequisites. The 1.5 FCE can be chosen to reflect the particular academic interests of each student.

Year 4: Advanced topics in environment and health with emphasis on primary research and critical analysis

15. ENV421H1/ENV491Y1 */ENV492H1 */ENV493H1* or a minimum of 0.5 FCE from any approved departmental or college independent research project (* the research topic for these courses must be related to environment and health)

16. JEH455H1

E&H Specialist Program Note:

• Not all non-ENV courses listed in requirement 14 above have priority enrolment for the Environment & Health Specialist. Students are responsible for checking the priority of courses, as well as meeting course prerequisites for courses they wish to take.

Description of Proposed Changes:

Added courses from other units as elective courses for the program.

Rationale:

These additional environment-related elective courses are relevant to the program, and also provide more choice to students in the program, particularly for those students also taking a program with a unit offering one of these new elective courses, as they can double count the course for both programs.

Impact:

See rationale above.

Consultation:

We consulted with and received permission from the units offering these courses, to add these elective courses to the program.

Resource Implications:

None:

Environmental Science Major

Completion Requirements:

(8.0 full courses or their equivalent)

First Year (1.5 FCEs): BIO120H1; 0.5 FCE from CHM136H1/CHM138H/CHM135H1 (recommended)/CHM139H/CHM151Y1; 0.5 FCE from MAT135H1/MAT137Y1/MAT157Y1/JMB170Y1

Second Year (2.5 FCEs):
1. ENV221H1
2. ENV234H1
3. One of CHM210H1 (recommended) or ESS262H1

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ENVI237H1/ENV238H1*
*ENV238H1 is for students who have previously taken PHY131H1/PHY132H1/PHY151H1/PHY152H1
5. STA220H1/STA288H1/EEB225H1/GGR270H1 or other science courses providing training in statistics as approved by the Academic Associate Director.

NOTE: students interested in taking EEB Field Courses (Group B) in third/fourth year are encouraged to take BIO220H1

Third Year (1.5 FCE):
1. The other of CHM210H1 or ESS262H1 not taken in second year
2. ENV337H1/JEE337H1
3. ENV316H1

Third/Fourth Year (2.0 FCEs):
1. 2.0 FCE from among the courses in Group A, B, and C, with no more than 0.5 FCE from Group C. At least 0.5 FCE must be at the 300+ level

**Group A: Environmental Science**
BIO220H1 */CHM310H1/CHM410H1/CHM415H1/EEB319H1/EEB320H1/EEB321H1/EEB328H1/EEB365H1/
EEB428H1/EEB430H1/EEB433H1/EEB440H1/EEB465H1/ENV334H1/ENV341H1/ENV346H1/ENV430H1/
ENN432H1/ESS261H1/ESS311H1/ESS312H1/ESS461H1/ESS463H1/GGR203H1/GGR301H1/GGR305H1/GGR308H1/
GGR314H1/GGR347H1/GGR348H1/GGR409H1/GGR413H1/GJA305H1/PCL362H1/PHY392H1**/*PHY492H1**

Notes:*BIO220H1 is required for all upper-year 300+ EEB series courses, with no exceptions.** PHY392H1 and
PHY492H1 include relevant environmental content, but prerequisites for these courses cannot be used towards Group A
requirements.

**Group B: Environmental Science-related Field Courses**
ANT330Y1/ARH306Y1/EEB403H1/EEB405H1/EEB406H1/EEB407H1/EEB410H1/ENV336H1/ENV395Y0/
ENV396Y0/ESS330H1/ESS410H1/ESS450H1/GGR390H1

Note:*BIO220H1 is required for all upper-year 300+ EEB series courses, with no exceptions.

**Group C: Environmental Policy & Society (no more than 0.5 FCE from Group C)**
ENV222H1/ENV261H1/ENV281H1/ENV282H1/ENV307H1/ENV320H1/ENV322H1/ENV323H1/ENV330H1/
ENV333H1/ENV335H1/ENV347H1/ENV350H1/ENV351H1/ENV361H1/ENV362H1/ENV381H1/ENV382H1/ENV422H1/
ENV461H1/ENV462H1/FOR302H1

Fourth Year (0.5 FCE):
1. 0.5 FCE from the following: ENV432H1 */ENV440H1/ENV452H1*
*Note that ENV432H1 requires one of EEB319H1/EEB321H1/EEB365H1/ENV334H1 as a prerequisite, and ENV452H1
requires one of ENV316H1/ENV334H1/ENV337H1 as a prerequisite.

Notes:

- Students combining the Environmental Science Major with a second BSc or BA Major, and who are also interested in obtaining a basic understanding of the social/political/policy aspects of environment, can add the Environmental Studies Minor. Some of the courses taken for the Environmental Science Major may be double counted for this Minor. Please contact the Undergraduate Student Advisor (see above) to learn more about this option.
- Daniels Students enrolled in this program may be able to fulfil up to 1.5 FCE in requirement 3 from ARC courses. Consult the School of the Environment for more information.

**Description of Proposed Changes:**
Elective courses added to the program.

CHM210H1 recommended to be taken in second year as it is a good preparation for the ENV316H1 course in third year.

Rationale:
These additional environment-related elective courses are relevant to the program, and also provide more choice to students in the program, particularly for those students also taking a program with a unit offering one of these new elective courses, as they can double count the course for both programs.

Impact:
See rationale above.

Consultation:
We consulted with and received permission from the units offering these courses, to add these elective courses to the program.

Resource Implications:
None.

Environmental Science Minor

Completion Requirements:

First Year (1.5 FCE):

1. BIO120H1: 0.5 FCE from CHM136H1/CHM138H/CHM135H1 (recommended)/CHM139H/CHM151Y1; 0.5 FCE from MAT135H1/MAT137Y1/MAT157Y1/JMB170Y1

Higher Years (2.5 FCEs):
2. ENV221H1
3. 1.0 FCE from CHM210H1, ENV234H1, ENV237H1/ENV238H1 *, ESS262H1
4. ENV337H1/JEE337H1
5. 0.5 FCE from courses in Group A or B**

Notes

- *ENV238H1 is for students who have previously taken PHY131H1/PHY132H1/PHY151H1/PHY152H1
- ** Students should verify the prerequisites for the courses listed under the groups below in advance of their course selection.
- BIO220H1 is required for all upper-year EEB 300+-series courses (Group A and B) and there are no exceptions.
- Daniels Students enrolled in this program may be able to fulfil up to 1.0 FCE of elective courses from ARC courses. Consult the School of the Environment for more information

Group A: Environmental Science
CHM310H1/CHM410H1/CHM415H1/EWB319H1/EEB320H1/EEB321H1/EEB328H1/EEB365H1/EEB428H1/
EEB430H1/EEB433H1/EEB440H1/EEB465H1/ENV334H1/ENV341H1/ENV346H1/ENV430H1/ENV432H1/
ESS261H1/ESS311H1/ESS312H1/ESS461H1/ESS463H1/GGR301H1/GGR305H1/GGR308H1/GGR314H1/GGR347H1/
GGR348H1/GGR413H1,GGR499H1/JGA305H1/PCL362H1/PHY392H1 */PHY492H1*

Notes :*PHY392H1 and PHY492H1 include relevant environmental content, but prerequisites for these courses cannot be used towards Group A requirements.

Group B: Environmental Science-related Field Courses
ANT330Y1/ARH306Y1/EEB403H1/EEB405H1/EEB406H1/EEB407H1/EEB410H1/ENV316H1/ENV336H1/
Description of Proposed Changes:
Added elective courses from other units to the program.

Rationale:
These additional environment-related elective courses are relevant to the program, and also provide more choice to students in the program, particularly for those students also taking a program with a unit offering one of these new elective courses, as they can double count the course for both programs.

Impact:
See rationale above.

Consultation:
We consulted with and received permission from the units offering these courses, to add these elective courses to the program.

Resource Implications:
None.

1 New Course:

ENV491Y1: Independent Studies Project

Impact on Programs:
This proposal triggers modifications in the unit's program(s)

Contact Hours:

Description:
A research project or selected topic in an area of environment not otherwise available in the Faculty, meant to develop skills in independent study of interdisciplinary topics. This course is restricted to students enrolled in a School of the Environment program. A written proposal co-signed by the student and supervisor must be submitted for approval by the Academic Associate Director of the School normally one month prior to commencing the course. Not eligible for CR/NCR option.

Prerequisites:
Completion of 14.0 FCE including ENV221H1/ ENV222H1

Corequisites:

Exclusions:

Recommended Preparation:

Topics Covered:
Research topic to be determined by the student, in consultation with faculty supervisor.

Methods of Assessment:
Some combination of annotated bibliography or literature review, research outline, written methodology, primary analysis, oral presentation, final research report.

Breadth Requirements:
### Distribution Requirements:
None

### Competencies:
- **Communication:** notably; **Critical and Creative Thinking:** extensively; **Information Literacy:** notably
- **Quantitative Reasoning:** notably; **Social and Ethical Responsibility:** slightly

### Experiential Learning:
- **Research:** extensively; **Other:** none

### Rationale:
The School offers two independent studies half courses, ENV492H1 and ENV493H1. We would like to reintroduce a full-year independent studies course to accommodate students who wish to take on a research project that cannot be completed within the time frame and time available in a half course. We have had several of these over the past three years, and the students have had to take both of our independent studies courses, ENV492H1 and ENV493H1 in order to complete their projects. This complicates their work by requiring them to divide the work load and assignments equally between the two courses.

In addition, because students in the Environment & Health Specialist are no longer allowed to take one of HMB396Y0, HMB496Y1 or HMB499Y1 to meet requirement 15 of the specialist (these courses have been replaced with ENV492H1 and ENV493H1), they must take ENV492H1 and ENV493H1 if they want to do primary research for requirement 15.

#### 2018-19 requirement:
15. ENV421H1/ HMB396Y0/ HMB496Y1/ HMB499Y1 or a minimum of 0.5 FCE from any approved departmental or college independent research project

#### 2019-20 requirement:
15. ENV421H1/ ENV492H1*/ ENV493H1* or a minimum of 0.5 FCE from any approved departmental or college independent research project (*the research topic for these courses must be related to environment and health)

### Consultation:
N/A

### Resources:
None
- **Budget Implications:** The academic unit will provide the resources required for this course from existing budget.

### Overlap with Existing Courses:
N/A

### Programs of Study for Which This Course Might be Suitable:
The course will be restricted to students in School of the Environment programs.

### Estimated Enrolment:
1 - 5 students per year.

### Instructor:
Various Faculty
3 Minor Program Modifications:

Physical and Environmental Geography Major

Completion Requirements:

*Introductory Courses*: Any 4 half courses or the equivalent (2.0 FCEs) from GGR100H1, MAT133Y1/MAT135H1/MAT136H1/MAT137Y1/MAT223H1/MAT240H1, MAT224H1/MAT247H1, PHY131H1/PHY151H1, PHY132H1/PHY152H1, CHM138H/CHM136H1, CHM139H/CHM135H1, CHM151Y1, BIO120H1, BIO130H1, at least two of which must be Math or Phys half courses.

*Core Courses*: Any 3 courses (1.5 FCE) from GGR201H1, GGR203H1, GGR205H1, GGR206H1

*Regional Geography Course*: Any course (0.5 FCE) from GGR101H1, GGR240H1, GGR246H1, GGR254H1, GGR341H1, GGR342H1, GGR343H1, **GGR344H1**

*Methods Courses*: All (1.5 FCE) of GGR270H1, GGR272H1, GGR390H1

*Applications*: Any 4 courses (2.0 FCEs) from GGR273H1, GGR301H1, GGR305H1, GGR307H1, GGR308H1, GGR310H1/FOR310H1, GGR314H1, GGR337H1, GGR373H1, GGR347H1, GGR348H1, GGR416H1, GGR493Y1 (based on internship), any GGR course from the list for Core Courses and Fourth Year Courses not already used; any one half course from Group I. No more than one from GGR273H1, GGR373H1.

*Fourth Year Course*: Any course (0.5 FCE) from GGR401H1, GGR405H1, **GGR406H1**, GGR413H1, GGR414H1, GGR491Y1, GGR493Y1 (0.5 FCE can be used based on internship), GGR498H1

**Total FCEs: 8.0**

Description of Proposed Changes:
1) Remove GGR100
2) Add GGR344H1 to the list of course options for the Regional Geography Course requirement.
3) Add GGR406H1 to the list of course options for the Fourth Year Course requirement.

Rationale:
1) GGR100 was replaced by JEG100 5 years ago, so we are simplifying the language by just listing the current course code.
2) GGR344 is a new course that is suitable for this requirement.
3) GGR406 is a new course that is suitable for this requirement.

Impact:
1) Increased clarity on course options.
2) Increased course options for these program requirements.

Consultation:
Geography Undergraduate Committee

Resource Implications:

Physical and Environmental Geography Minor

Completion Requirements:
First Year Geography Courses: Any 2 courses (1.0 FCE) from GGR100H1/JEG100H1 (recommended), GGR101H1, GGR107H1, GGR112H1, GGR124H1, GGR196H1, GGR197H1, GGR198H1, GGR199H1

Core Courses: Any 2 courses (1.0 FCE) from GGR201H1, GGR203H1, GGR205H1, GGR206H1

Methods Courses: One (0.5 FCE) of GGR301H1/GGR305H1/GGR308H1 and one (0.5 FCE) of GGR272H1/GGR337H1

Applications: Any 2 courses (1.0 FCE) from GGR201H1, GGR203H1, GGR205H1, GGR206H1, GGR305H1, GGR307H1, GGR308H1, GGR310H1/FOR310H1, GGR314H1, GGR347H1, GGR348H1, GGR390H1, GGR401H1, GGR405H1, GGR406H1, GGR413H1; GGR414H1

Total FCEs: 4.0

Description of Proposed Changes:
1) Add GGR196H1, GGR197H1, GGR198H1, GGR199H1 to the list of course options to complete the First Year Geography Course requirement.
2) Remove GGR100
3) Add GGR406H1 to the list of course options for the Applications requirement.

Rationale:
1) These courses were formerly SII199's. They are taught by Geography faculty on Geography topics, so we feel they should count towards our programs.
2) GGR100 was replaced by JEG100 5 years ago, so we are simplifying the language by just listing the current course code.
3) GGR406 is a new course that is suitable for this requirement.

Impact:
1) Students will have more course options to complete this program requirement.
2) Increased clarity on course options.
3) Increased course options for this program requirement.

Consultation:
Geography Undergraduate Committee

Resource Implications:

Physical and Environmental Geography Specialist

Completion Requirements:

Introductory courses: Any 6 half courses or the equivalent (3.0 FCEs) from GGR100H1/JEG100H1, MAT133Y1/MAT135H1/MAT136H1/MAT137Y1/MAT157Y1, MAT223H1/MAT240H1, MAT224H1/MAT247H1, PHY131H1/PHY151H1, PHY132H1/PHY152H1, CHM138H/CHM136H1, CHM139H/CHM135H1, CHM151Y1, BIO120H1, BIO130H1, at least two of which must be Math or Phys half courses.

Core Courses: Any 4 courses (2.0 FCEs) from GGR201H1, GGR203H1, GGR205H1, GGR206H1, up to one half course from Group H.

Regional Geography Courses: Any course (0.5 FCE) from GGR101H1, GGR240H1, GGR246H1, GGR254H1, GGR341H1, GGR342H1, GGR343H1, GGR344H1

Methods Courses: All (2.0 FCEs) of GGR270H1, GGR272H1, GGR337H1, GGR390H1

Applications: Any 7 courses (3.5 FCEs) from GGR273H1, GGR301H1, GGR305H1, GGR307H1, GGR308H1, GGR310H1, GGR347H1, GGR348H1, GGR413H1; GGR414H1
Geography and Planning (FAS), Department of

GGR310H1/FOR310H1, GGR314H1, GGR373H1, GGR347H1, GGR348H1, GGR416H1, (but no more than one of GGR273H1, GGR373H1), GGR493Y1 (based on internship), any GGR course from the list for Core Courses and Fourth Year Courses not already used; up to three half courses from Group I. No more than one of GGR273H1, GGR373H1.

Fourth Year Courses: Any 2 courses (1.0 FCE) from GGR401H1, GGR405H1, GGR406H1, GGR413H1, GGR414H1, GGR491Y1, GGR493Y1 (0.5 FCE can be used based on internship), GGR498H1, 400-series in Group I, but the total number of half courses from Group I (including 300-series courses) must not exceed 3.

Total FCEs: 12.0

Description of Proposed Changes:
1) Remove GGR100
2) Add GGR344H1 to the list of course options for the Regional Geography Course requirement.
3) Add GGR406H1 to the list of course options for the Fourth Year Course requirement.

Rationale:
1) GGR100 was replaced by JEG100 5 years ago, so we are simplifying the language by just listing the current course code.
2) GGR344 is a new course that is suitable for this requirement.
3) GGR406 is a new course that is suitable for this requirement.

Impact:
1) Increased clarity on course options.
2 & 3) Increased course options for these program requirements.

Consultation:
Geography Undergraduate Committee

Resource Implications:

1 New Course:

GGR406H1: Geomorphology and the Anthropocene

Impact on Programs:
This proposal triggers modifications in the unit's program(s)

Contact Hours:
Lecture: 12 / Seminar: 12

Description:
In this seminar course, we will explore the nature of geomorphology and the Anthropocene (the proposed geological time interval during which human activities have greatly impacted the global environment) using a combination of lectures, readings, and discussions. We will consider the ways in which hillslope, fluvial, coastal, aeolian, and other domains have been altered or influenced by humans and consider the role of geomorphology as a science for understanding and examining the changes in landscape form and processes.

Prerequisites:
GGR201H1

Corequisites:

Exclusions:
GGR401H1 (Special Topics in Geography II: Geomorphology and the Anthropocene), offered in Winter 2020.
### Recommended Preparation:
- GGR272H1

### Breadth Requirements:
- The Physical and Mathematical Universes (5)

### Distribution Requirements:
- Science

### Competencies:
- **Communication**: extensively; **Critical and Creative Thinking**: extensively; **Information Literacy**: extensively
- **Quantitative Reasoning**: slightly; **Social and Ethical Responsibility**: slightly

### Experiential Learning:
- **Research**: notably; **Other**: none

### Rationale:
This seminar course will explore contemporary concepts in the field of geomorphology, filling a current gap in the upper-year physical geography academic offerings of the Department of Geography & Planning.

In addition to providing a much-needed upper-year physical geography course, the aim of the Geomorphology and the Anthropocene course is to enhance the students’ transferable communication skills using a combination of written, oral, and visual formats. Students will engage with scientific literature, facilitate group discussions, complete an extensive review of primary and secondary literature sources, and synthesize their learning into a final capstone project. The concepts, themes, and skills addressed in this course fall within the academic goals of the department and will contribute to students’ academic career in physical geography.

Upper-year courses in the Department of Geography & Planning are meant to be integrative and inquiry-based. Geomorphology and the Anthropocene aims to achieve this by hosting a largely ‘flipped classroom’ in which students are responsible for contributing to seminar discussions and for facilitating their own seminar activity (in pairs or small groups). This will require a range of skills (e.g. communication, organization, planning, time management etc.) while also allowing the students to engage in self-directed learning outside of the classroom. Similarly, the final capstone project will have students complete a self-directed research project related to the course content. This capstone project has been scaffolded, or broken-down into several components, so that students are receiving feedback throughout the process. Each component is directed at a different type of communication style (writing, oral presentation, writing/data visualization) so that students can practice and enhance a range of transferable skills and competencies throughout the course.

Furthermore, the final component of the capstone project can be submitted as an ArcGIS Story Map. This is a relatively new platform for scientific communication that encourages the use of GIS and spatial analysis as well as data visualization. In the future, this could be integrated into data collection and spatial analysis, further contributing to the goals of an integrated final project.

Overall, this course aims to provide a learning opportunity for upper-year students interested in investigating a facet of physical geography in more detail. At the same time, as an upper-year course, students will engage with various forms of communication that are integrated, inquiry-based, and relevant to any professional path they choose beyond their academic careers.

### Consultation:
- **Content and topic consultation:**
  - Dr. Matthew Farish, Undergraduate Chair, Department of Geography & Planning
  - Dr. Joseph Desloges, Professor, Department of Geography & Planning
  - Dr. Jane Liu, Associate Professor, Department of Geography & Planning
  - Dr. Jing Chen, Professor, Department of Geography & Planning
  - Dr. Uli Wortmann, Undergraduate Associate Chair, Department of Earth Sciences

- **Course structure/design consultation:**
  - Dr. Matthew Farish, Undergraduate Chair, Department of Geography & Planning
### Resources:
- Instructor
- Classroom appropriate for seminar discussions (e.g. movable chairs, desks)
- Classroom with presentation equipment (e.g. projector)
- Access to ArcGIS StoryMap (free access to all U of T students)

**Budget Implications:** The academic unit will provide the resources required for this course from existing budget.

### Overlap with Existing Courses:
Topics in the course will overlap with courses in physical geography and earth sciences (e.g. processes of geomorphology, human impacts on the environment etc.) but the course delivery and scope are different from other courses, being both seminar based and an upper-year reading course.

In addition to a general search of course offerings, preliminary versions of the course description and syllabus for Geomorphology and the Anthropocene were shared with Undergraduate Associate Chairs of Geography & Planning (Dr. Matthew Farish) and Earth Sciences (Dr. Uli Wortmann) for review.

### Programs of Study for Which This Course Might be Suitable:
- Physical and Environmental Geography - Major, Minor, Specialist
- Earth Sciences

### Estimated Enrolment:
30

### Instructor:
Sarah Peirce
7 Minor Program Modifications/Revisions:

Health & Disease Major

Completion Requirements:

Required Courses (8.0 FCE, including at least 0.5 FCE at the 400-level)

Chemical and Physical Foundations of Biological Systems

1. (CHM135H1, CHM136H1)/CHM151Y1
   Transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion or equivalency to a pre-approved chemistry course
2. MAT135H1/PHY131H1/PHY151H1
3. BCH210H1

Biological Foundations of Living Systems

4. BIO120H1, BIO130H1
5. BIO220H1, BIO230H1/BIO255H1
6. HMB265H1/BIO260H1
7. PSL300H1, PSL301H1

Health & Disease Concentration Courses

8. HMB202H1
9. HMB302H1/HMB322H1
10. 0.5 FCE from: HAJ453H1/HMB401H1/HMB402H1/HMB422H1/HMB432H1/HMB434H1/HMB436H1/
    HMB437H1/HMB440H1/HMB441H1/HMB443H1/HMB452H1/HMB462H1/HMB470H1/HMB471H1/HMB472H1/
    HMB473H1/HMB474H1/EHB352H1/JeH455H1/ANA300Y1/ANA301H1/BCH311H1/CSB345H1/EEB325H1/
    LMP301H1/LMP363H1/LMP403H1/LMP406H1/NFS485H1/NFS486H1/PCL302H1/PCL362H1/PCL469H1/PCL470H1/
    PCL482H1/PCL483H1/PCL486H1/PCL350H1/PCL404H1/PCL421H1/PCL425H1

Data Analysis and Courses in Advanced Research, Laboratory, or Cellular Molecular Topics

11. 0.5 FCE in statistics: EEB225H1/STA220H1/STA288H1/PSY201H1
12. 0.5 FCE from: HMB312H1/HMB314H1/HMB323H1/HMB342H1/HST373H1/HMB490Y1/HMB496Y1 */
    BCH311H1/CSB349H1/PSL350H1

*A research project from a different unit may be accepted with prior written approval from Human Biology if the course is not counting toward a different program.

Health & Disease Major Notes:

1. Courses can only count toward one requirement, even if listed as options to multiple requisites of the program
2. Not all courses listed have priority enrolment for Health & Disease majors. Students are responsible for checking
Human Biology Program

priority of courses and meeting course prerequisites for courses they wish to take.  
3. The Health & Disease major cannot be paired with any other Human Biology Program managed major program.

Description of Proposed Changes:
Adding additional PCL course options.

Rationale:
Students in the Health and Disease program have had limited PCL course options, but for those students interested, there are some really good options. PCL noticed the error and absence and asked us to include.

Impact:
Students have a few more options to pursue their interests. Minor, this is being added to a large list of courses.

Consultation:
Ali Salahpour, PhD (Acting Associate Chair) Undergraduate Education  
Charlotte Pashley, M.Ed, Program Coordinator  
Department of Pharmacology and Toxicology

Resource Implications:
None.

Health & Disease Specialist

Completion Requirements:

Required Courses (13.0 FCE, including at least 1.0 FCE at the 400-level)

Chemical and Physical Foundations of Biological Systems

1. (CHM135H1, CHM136H1)/CHM151Y1  
   Transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion or equivalency to a pre-approved chemistry course
2. MAT135H1/PHY131H1/PHY151H1
3. BCH210H1

Biological Foundations of Living Systems

4. BIO120H1, BIO130H1  
5. BIO220H1
6. BIO230H1/BIO255H1
7. HMB265H1/BIO260H1
8. PSL300H1, PSL301H1
9. 1.0 FCE from depth courses on the molecular biology of cells and tissues: CSB327H1/CSB328H1/CSB331H1, BCH311H1/CSB349H1/PSL350H1

Health & Disease Concentration Courses

10. HMB202H1  
11. HMB302H1  
12. HMB322H1  
13. 2.0 FCE from: HAJ453H1/HMB401H1/HMB402H1/HMB422H1/HMB432H1/HMB434H1/HMB436H1/HMB437H1/HMB440H1/HMB441H1/HMB443H1/HMB452H1/HMB462H1/HMB470H1/HMB471H1/HMB472H1/HMB473H1/HMB474H1/JEH455H1/ANA300Y1/ANA301H1/CSB345H1/CSB351Y1/EEB325H1/IMM340H1/IMM350H1/LMP301H1/LMP365H1/LMP403H1/LMP406H1/MGY377H1/MGY378H1/NFS485H1/NFS486H1/PCL302H1/PCL362H1/PCL469H1/PCL470H1/PCL482H1/PCL483H1/PCL486H1/PSL304H1/PSL421H1/PSL485H1
Human Biology Program

Data Analysis and Research-Based Courses

14. 0.5 FCE in statistics: EEB225H1/STA220H1/STA288H1/PSY201H1
15. 0.5 FCE in bioethics: HMB306H1/HMB406H1/PHL281H1
16. 0.5 FCE from upper-year lab course: HMB312H1/HMB314H1/CSB330H1/PSL372H1/BCH370H1
17. 0.5 FCE from research based courses: HMB323H1/HMB342H1/HST373H1
18. 1.0 FCE from HMB490Y1/HMB496Y1*

*A research project from a different unit may be accepted with prior written approval from Human Biology if the course is not counting toward a different program.

Health & Disease Specialists Notes:
1. Courses can only count toward one requirement, even if listed as options to multiple requisites of the program
2. Not all courses listed have priority enrolment for Health & Disease specialists. Students are responsible for checking priority of courses and meeting course prerequisites for courses they wish to take.

Description of Proposed Changes:
Addition additional PCL course options.

Rationale:
Students in the Health and Disease program have had limited PCL course options, but for those students interested, there are some really good options. PCL noticed the error and absence and asked us to include.

Impact:
Students have a few more options to pursue their interests. Minor, this is being added to a large list of courses.

Consultation:
Ali Salahpour, PhD (Acting Associate Chair) Undergraduate Education
Charlotte Pashley, M.Ed, Program Coordinator
Department of Pharmacology and Toxicology

Resource Implications:
None.

Human Biology Major

Completion Requirements:

Required Courses (8.0 FCE, including at least 0.5 FCE at the 400-level)

Chemical and Physical Foundations of Biological Systems

1. (CHM135H1, CHM136H1)/CHM151Y1
   Transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion or equivalency to a pre-approved chemistry course
2. MAT135H1/PHY131H1/PHY151H1
3. BCH210H1

Biological Foundations of Living Systems

4. BIO120H1, BIO130H1
5. HMB204H1
6. BIO230H1/BIO255H1, BIO220H1
7. HMB265H1/BIO260H1

69
8. PSL300H1, PSL301H1

9. 1.0 FCE from: HMB302H1/ANA300Y1/ANA301H1/BCH311H1/CSB349H1/CSB351Y1/IMM340H1/IMM350H1/ MGY377H1/MGY378H1/PSL350H1


* A research project from a different unit may be accepted with prior written approval from Human Biology if the course is not counting toward a different program.

**Human Biology Major Notes:**
1. Courses can only count toward one requirement, even if listed as options to multiple requisites of the program.
2. Not all courses listed have priority enrolment for Human Biology majors. Students are responsible for checking priority of courses and meeting course prerequisites for courses they wish to take.
3. The Human Biology major cannot be paired with any other Human Biology Program managed major program.

**Description of Proposed Changes:**
Removing one incorrect PCL course and adding addition PCL options.

**Rationale:**
Students in the Human Biology program have had limited PCL course options, but for those students interested, there are some really good options. PCL noticed the error and absence and asked us to include.

**Impact:**
Students have a few more options to pursue their interests. Minor, this is being added to a large list of courses.

**Consultation:**
Ali Salahpour, PhD (Acting Associate Chair) Undergraduate Education
Charlotte Pashley, M.Ed, Program Coordinator
Department of Pharmacology and Toxicology

**Resource Implications:**
Fundamental Genetics and its Applications Specialist

Description:

Previous:

New:

HMB: Fundamental Genetics and its Applications

The objective of the HMB: Fundamental Genetics and its Applications specialist and major programs are to provide students with a solid foundation in the biological sciences with a focus on genetics and its applications in medicine, environment and biotechnology.

Enrolment Requirements:

This specialist is a Type 3 limited enrolment program. Admissions will be based on the following criteria, however achieving the minimum grades listed does not guarantee admission to the Fundamental Genetics and its Applications specialist program in any given year.

Applying with less than 8 FCEs:

- Completion of BIO130H1 with a minimum grade of 65
- Completion of CHM135H1 and completion of CHM136H1 with a minimum grade of 55 (or CHM151Y1 with a minimum grade of 55).

  *Transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion or equivalency to a pre-approved chemistry course. Please carefully check your Transfer Credit Assessments.*
- Completion of 4.0 FCE

Applying with 8 or more FCEs completed:

- Completion of BIO220H1 with a minimum grade of 65
- Completion of BIO230H1/BIO255H1 with a minimum grade of 65
- Completion of HMB265H1/BIO260H1
- Completion of BCH210H1

Students may apply for this specialist program during Round 1 and Round 2 of Type 3 Enrolment after they have earned 4.0 FCE. Students applying for admissions to the program utilizing transfer credits will be considered on a case-by-case basis. Students entering from CEGEP or from another university should contact hmb.undergrad@utoronto.ca after their transfer credit assessment has been complete for program enrolment assessment. For more information about Type 3 enrolment, visit the Faculty of Arts & Science Subject Program Enrolment Instructions website.

Completion Requirements:

**Required Courses (12.0 FCE, including at least 1.0 FCE at the 400 level)**

**Chemical and Physical Foundations of Biological Systems**
Human Biology Program

1. (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1
   *Transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion or equivalency to a pre-approved chemistry course*

2. MAT135H1/PHY131H1/PHY151H1/CSC120H1/CSC148H1
3. BCH210H1

Biological Foundations of Living Systems

4. BIO120H1, BIO130H1
5. BIO220H1
6. BIO230H1/BIO255H1

Courses in Fundamental Genetics

7. HMB265H1/BIO260H1
8. HMB321H1


Courses in Applied Genetics

10. HMB201H1
11. HMB301H1/HMB360H1/BCH311H1/CSB349H1 ECO369H1/PSL350H1

12. 1.5 FCE from: HMB301H1/HMB401H1/HMB431H1/HMB436H1/HMB441H1/HMB489H1/BCH311H1/BCH340H1/BCH441H1/BCH447H1/CSB352H1/CSB458H1/CSB459H1/CSB472H1/CSB473H1/CSB474H1/EEB325H1/EEB459H1/EEB460H1/NFS487H1/PFL384H1/PSL350H1/PSL404H1/PSY390H1

Data Analysis and Research-Based Courses

13. 0.5 FCE in statistics: HMB325H1/EEB225H1/STA220H1/STA288H1/PSY201H1
14. 0.5 FCE from bioethics: HMB306H1/HMB406H1/PHL281H1
15. 0.5 FCE from upper-year lab course: HMB311H1/HMB314H1/MGY314H1/MGY315H1
16. 0.5 FCE from research based courses: HMB342H1/HMB360H1/HST373H1/MGY377H1/MGY378H1
17. 1.0 FCE from research project course: HMB490Y1 HMB496Y1 */HMB496Y1 HMB499Y1*

*A research project from a different unit may be accepted with prior written approval from Human Biology if the course is not counting toward a different program.

Fundamental Genetics and its Applications Specialists Notes:
1. Courses can only count toward one requirement, even if listed as options to multiple requisites of the program .
2. Not all courses listed have priority enrolment for Fundamental Genetics and its Applications specialists. Students are responsible for checking priority of courses and meeting course prerequisites for courses they wish to take.

Description of Proposed Changes:
- Added a program description.
- Removed grade requirement for first year chemistry in enrollment requirements.
- Removed courses: CHM138H1/CHM139H1/ECO369H1/HMB325H1
- Removed HMB499Y1. Added HMB490Y1.
- CSB349H1 was added where PSL350H1/BCH311H1 existed.
- Added PSY201H1 to statistics requirement.

Rationale:
Program description was missing.

Changed enrollment requirement from 55 in CHM to completion to reflect actual enrollment data. For lowering to completion of chemistry, some students have a difficult entry into university and a tough first semester, if they pass chemistry and potentially do better the second semester, we’d like to consider them. We do not think that considering students who get 50-54 in first year chemistry will change our overall enrollment numbers much.

Courses (CHM138H1/CHM139H1/ECO369H1/HMB325H1) aren't offered or retired. Removed HMB499Y1 because it was never intended that students use two research project towards any of our programs, leftover from when HMB499Y1 was our primary 4th year project, now HMB496Y1 is. Students may also choose to do a community engaged full course HMB490Y1, that we proposed last year, we are adding it to programs this year.

Our students take any of BCH311H1/CSB349H1/PSL350 (mostly dependent on if they are enrolled in other majors or minors.) Currently doing manual substitutions on Degree Explorer.

We will use any statistics course, we are normalizing the options across our programs.

Impact:
Minor, students will have to ask for fewer exceptions. They won't see course options that don't exist.

Consultation:
The details of the course changes were reviewed with the Department of Cell and Systems Biology, who were supportive of the addition of CSB349H1. Internal consultation with Dr. Bruce, Dr. Wilson, Katy and myself. As well as presented at the Life Sciences Planning Committee. No concerns raised.

Resource Implications:
None.

Global Health Specialist

Enrolment Requirements:

This specialist is a Type 3 limited enrolment program. Admissions will be based on the following criteria, however achieving the minimum marks listed does not guarantee admission to the Fundamental Genetics and its Applications specialist program in any given year.

Applying with less than 8 FCEs:

- Completion of BIO130H1 with a minimum grade of 65
- Completion of CHM135H1 and completion of CHM136H1 with a minimum grade of 55 (or CHM151Y1 with a minimum grade of 55).
  - Transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion or equivalency to a pre-approved chemistry course. Please carefully check your Transfer Credit Assessments.
- Completion of 4.0 FCE

Applying with 8 or more FCEs completed:

- Completion of BIO230H1/BIO255H1 with a minimum grade of 65
- Completion of BIO220H1
- Completion of HMB265H1/BIO260H1
- Completion of BCH210H1

Students may apply for this specialist program during Round 1 and Round 2 of Type 3 Enrolment after they have earned
Human Biology Program

4.0 FCE. Students applying for admissions to the program utilizing transfer credits will be considered on a case-by-case basis. Students entering from CEGEP or from another university should contact hmb.undergrad@utoronto.ca after their transfer credit assessment has been complete for program enrolment assessment. For more information about Type 3 enrolment, visit the Faculty of Arts & Science Subject Program Enrolment Instructions website.

Completion Requirements:

Required Courses (13.5 FCE, including at least 1.0 FCE at the 400-level)

Chemical and Physical Foundations of Biological Systems

1. (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1
   Transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion or equivalency to a pre-approved chemistry course.
2. MAT135H1/PHY131H1/PHY151H1
3. BCH210H1

Biological Foundations of Living Systems

4. BIO120H1, BIO130H1
5. BIO220H1
6. BIO230H1/BIO255H1
7. HMB265H1/BIO260H1
8. PSL300H1, PSL301H1
9. 1.0 FCE from HMB302H1/ANA300Y1/ANA301H1/BCH311H1/CSB349H1/CSB351Y1/IMM340H1/IMM350H1/MGY377H1/MGY378H1/PSL350H1

Global Health Concentration Courses

10. HMB203H1
11. HMB323H1
12. 0.5 FCE from: PHS100H1/GGR112H1/PSY100H1/INS201Y1/ANT100Y1/SOC101Y1/ECO100Y/ECO101H1/SOC102H/SOC100H1 Transfer credits from AP and IB psychology are not accepted.
13. 0.5 FCE from Epidemiology Courses: HMB342H1/HST373H1
14. 2.0 FCE from courses on the biological dimensions of Global Health: HAJ453H1/HMB323H1/HMB433H1/HMB436H1/HMB437H1/HMB440H1/HMB443H1/HMB452H1/HMB473H1/HMB474H1/HMB496Y1 #HMB499Y1 */JEH455H1/CSB351Y1/EEB225H1/HMB325H1/STA220H1/PSY100H1/PSY120H1/PSY321H1
15. 1.0 FCE from courses on the social and ecological dimensions of Global Health: HMB306H1/HMB307H1/HMB308H1/HMB309H1/HMB310H1/HMB311H1/HMB312H1/HMB313H1/HMB314H1/HMB315H1/HMB316H1/HMB317H1/HMB318H1/HMB319H1/HMB320H1/HMB321H1/HMB322H1/HMB323H1/HMB324H1/HMB325H1/HMB326H1/HMB327H1/HMB328H1/HMB329H1/HMB330H1/HMB331H1/HMB332H1/HMB333H1/HMB334H1/HMB335H1/HMB336H1/HMB337H1/HMB338H1/HMB339H1/HMB340H1/HMB341H1/HMB342H1/HMB343H1/HMB344H1/HMB345H1/HMB346H1/HMB347H1/HMB348H1/HMB349H1/HMB350H1/HMB351H1/HMB352H1/HMB353H1/HMB354H1/HMB355H1/HMB356H1/HMB357H1/HMB358H1/HMB359H1/HMB360H1/HMB361H1/HMB362H1/HMB363H1/HMB364H1/HMB365H1/HMB366H1/HMB367H1/HMB368H1/HMB369H1/HMB370H1/HMB371H1/HMB372H1/HMB373H1/HMB374H1/HMB375H1/HMB376H1/HMB377H1/HMB378H1/HMB379H1/HMB380H1/HMB381H1/HMB382H1/HMB383H1/HMB384H1/HMB385H1/HMB386H1/HMB387H1/HMB388H1/HMB389H1/HMB390H1/HMB391H1/HMB392H1/HMB393H1/HMB394H1/HMB395H1/HMB396H1/HMB397H1/HMB398H1/HMB399H1/HMB400H1/HMB401H1/HMB402H1/HMB403H1/HMB404H1/HMB405H1/HMB406H1/HMB407H1/HMB408H1/HMB409H1/HMB410H1/HMB411H1/HMB412H1/HMB413H1/HMB414H1/HMB415H1/HMB416H1/HMB417H1/HMB418H1/HMB419H1/HMB420H1/HMB421H1/HMB422H1/HMB423H1/HMB424H1/HMB425H1/HMB426H1/HMB427H1/HMB428H1/HMB429H1/HMB430H1/HMB431H1/HMB432H1/HMB433H1/HMB434H1/HMB435H1/HMB436H1/HMB437H1/HMB438H1/HMB439H1/HMB440H1/HMB441H1/HMB442H1/HMB443H1/HMB444H1/HMB445H1/HMB446H1/HMB447H1/HMB448H1/HMB449H1/HMB450H1/HMB451H1/HMB452H1/HMB453H1/HMB454H1/HMB455H1/HMB456H1/HMB457H1/HMB458H1/HMB459H1/HMB460H1/HMB461H1/HMB462H1/HMB463H1/HMB464H1/HMB465H1/HMB466H1/HMB467H1/HMB468H1/HMB469H1/HMB470H1/HMB471H1/HMB472H1/HMB473H1/HMB474H1/HMB475H1/HMB476H1/HMB477H1/HMB478H1/HMB479H1/HMB480H1/HMB481H1/HMB482H1/HMB483H1/HMB484H1/HMB485H1/HMB486H1/HMB487H1/HMB488H1/HMB489H1/HMB490H1/HMB491H1/HMB492H1/HMB493H1/HMB494H1/HMB495H1/HMB496Y1

Data Analysis and Research-Based Courses

16. 0.5 FCE in statistics: EEB225H1 HMB325H1/STA220H1/STA288H1/PSY201H1/HMB325H1*
17. 0.5 FCE in bioethics: HMB306H1/HMB406H1/PHL281H1
18. 1.0 FCE from: HMB490Y1 HMB496Y1 #HMB499Y1
Human Biology Program

*A research project from a different unit may be accepted with prior written approval from Human Biology if the course is not counting toward a different program.

Global Health Specialists Notes:

1. Courses can only count toward one requirement, even if listed as options to multiple requisites of the program
2. Not all courses listed have priority enrolment for Global Health specialists. Students are responsible for checking priority of courses and meeting course prerequisites for courses they wish to take.

Description of Proposed Changes:

Removed grade requirement for first year chemistry in enrollment requirements.
Removed courses: CHM138H1/CHM139H1/HMB325H1
Removed HMB499Y1. Added HMB490Y1
CSB349H1 was added where PSL350H1/BCH311H1 existed.
Added EEB225H1 to statistics requirement.

Rationale:
For lowering to completion of chemistry, some students have a difficult entry into university and a tough first semester, if they pass chemistry and potentially do better the second semester, we’d like to consider them. We do not think that considering students who get 50-54 in first year chemistry will change our overall enrollment numbers much.

Courses ((CHM138H1/CHM139H1/HMB325H1) aren’t offered or retired.
Removed HMB499Y1 because it was never intended that students use two research project towards any of our programs, leftover from when HMB499Y1 was our primary 4th year project, now HMB496Y1 is. Students may also choose to do a community engaged full year course (HMB490Y1), that we proposed last year, we are adding it to programs this year.
Our students take any of BCH311H1/CSB349H1/PSL350 (mostly dependent on if they are enrolled in other majors or minors.) Currently doing manual substitutions on Degree Explorer.
We will use any statistics course, we are normalizing the options across our programs.

Impact:
Minor, students will have to ask for fewer exceptions. They won’t see course options that don’t exist.

Consultation:
The details of the course changes were reviewed with the Department of Cell and Systems Biology, who were supportive of the addition of CSB349H1. Internal consultation with Dr. Bruce, Dr. Wilson, Katy and myself. As well as presented at the Life Sciences Planning Committee. No concerns raised.

Resource Implications:

Neuroscience Major

Enrolment Requirements:

Neuroscience Major(Science Program)8.0 FCE

Admissions will be based on the following criteria, however achieving the minimum grades listed does not guarantee admission to the neuroscience major in any given year.

Applying with less than 8 FCEs:

- Completion of BIO130H1 with a minimum grade of 55
Human Biology Program

• Completion of CHM135H1 and CHM136H1 with a minimum average grade or completion of 70 (or CHM151Y1 with a minimum grade of 70)

• Transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion or equivalency to a pre-approved chemistry course. Please carefully check your Transfer Credit Assessments

• Completion of 4.0 FCE

Applying with 8 or more FCEs completed:

• Completion of BIO230H1/BIO255H1 with a minimum grade of 55
• Completion of HMB265H1/BIO260H1
• Completion of BCH210H1
• Completion of PSL300H1

Students may apply for this major program during Round 1 and Round 2 of Type 2L Enrolment after they have earned 4.0 FCE. Students applying for admissions to the program utilizing transfer credits will be considered on a case-by-case basis. Students entering from CEGEP or from another university should contact hmb.undergrad@utoronto.ca after their transfer credit assessment has been complete for program enrolment assessment. For more information about Type 2L enrolment, visit the Faculty of Arts & Science Subject Program Enrolment Instructions website.

Completion Requirements:

Required Courses (8.0 FCE, including at least 0.5 FCE at the 400-level)

Chemical and Physical Foundations of Biological Systems

1. (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1

   Transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion or equivalency to a pre-approved chemistry course.

2. MAT135H1/PHY131H1/PHY151H1/CSC120H1/CSC148H1

3. BCH210H1

Biological Foundations of Living Systems

4. BIO120H1, BIO130H1
5. BIO230H1/BIO255H1
6. HMB265H1/BIO260H1
7. PSL300H1

Neuroscience Concentration Courses

8. HMB200H1
9. HMB300H1
10. CJH332H1
11. 0.5 FCE from HMB320H1/JHA410H1/ANA300Y1

12. 0.5 FCE from HMB360H1/HMB420H1/HMB430H1/HMB440H1/HMB450H1/HMB471H1/HMB473H1/HMB490Y1

   HMB496Y1 */HMB496Y1 HMB499Y1 */JHA410H1/CSB345H1/CSB346H1/CSB430H1/CSB432H1/CSB445H1/

   CSc321H1/LMP410H1/NEW335H1/NFS489H1/PCL475H1/PCL476H1/PCL374H1/PSC432H1/PSC440Y1/PSC445H1/

   PSC446H1/PSC450H1/PSC452H1/PSC472H1/PSC342H1/PSC371H1/PSC372H1/PSC390H1/PSC395H1/PSC460H1/

   PSC470H1/PSC471H1/PSC473H1/PSC475Y1/PSC480H1/PSC490H1/PSC492H1/PSC493H1/PSC492H1/PSC493H1/
Human Biology Program

PSY494H1/PSY496H1

Data Analysis and Research-Based Courses

13. 0.5 FCE in statistics: EEB225H1/STA220H1/STA288H1/PSY201H1
14. 0.5 FCE from a higher-year lab course: HMB310H1/HMB314H1/PSY369H1

*A research project from a different unit may be accepted with prior written approval from Human Biology if the course is not counting toward a different program.

Neuroscience Major Notes:

1. Courses can only count toward one requirement, even if listed as options to multiple requisites of the program.
2. Not all courses listed have priority enrolment for Neuroscience majors. Students are responsible for checking priority of courses and meeting course prerequisites for courses they wish to take.
3. The Neuroscience major cannot be paired with any other Human Biology Program managed major program.

Description of Proposed Changes:

- Increased grade requirement for first year chemistry in enrollment requirements.
- Removed courses: CHM138H1/CHM139H1
- Removed HMB499Y1. Added HMB490Y1.
- Added EEB225H1 to statistics requirement.

Rationale:

- Changed enrollment grade requirement from completion in CHM to 70 to reflect actual enrollment data. The Neuroscience program is limited enrollment and has the most pressure of all our programs, and 55 was not realistic. Looking at recent data, 70 is a minimum. For increasing to an average of 70 in first year chem (Neuroscience programs only), we have a hard cap on the number in the program, based on the number of lab spaces in HMB310, a required lab course by both the major and the specialist. 70 more accurately reflects the caliber of students being accepted.

Courses (CHM138H1/CHM139H1) aren't offered or retired.

- Removed HMB499Y1 because it was never intended that students use two research project towards any of our programs, leftover from when HMB499Y1 was our primary 4th year project, now HMB496Y1 is. Students may also choose to do a community engaged full year course HMB490Y1, that we proposed last year, we are adding it to programs this year.

We will use any statistics course, we are normalizing the options across our programs.

Impact:

- Minor, students will have to ask for fewer exceptions. They won't see course options that don't exist.
- Students will have a more realistic idea of what grades it'll take to enroll in Neuroscience.

Consultation:

The details of the course changes were reviewed with the Department of Ecology and Evolutionary Biology, who were supportive of the addition of EEB225H1. Internal consultation with Dr. Bruce, Dr. Wilson, Katy and myself. As well as presented at the Life Sciences Planning Committee. No concerns raised.

Resource Implications:

Neuroscience Specialist

Description:

HMB:Neuroscience

Neuroscience is an interdisciplinary field aimed at understanding the brain and nervous system utilizing integration of research at the molecular, cellular, and organismal levels, and through all stages of human development. The application
Human Biology Program

of neuroscience has important implications for understanding human behaviour and for promoting the development of effective strategies for diagnosing and treating nervous system disorders. The objective of the HMB: Neuroscience specialist and major programs is to provide students with a solid foundation and facilitates the integration of concepts from multiple fields to their understanding of neuroscience.

Enrolment Requirements:

This specialist is a Type 3 limited enrolment program. Admissions will be based on the following criteria, however achieving the minimum marks listed does not guarantee admission to the neuroscience specialist in any given year.

Applying with less than 8 FCEs:

- Completion of BIO130H1 with a minimum grade of 70
- Completion of CHM135H1 and completion of CHM136H1 with a minimum average grade of 70 55 (or CHM151Y1 with a minimum grade of 70 55)
  - Transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion or equivalency to a pre-approved chemistry course. Please carefully check your Transfer Credit Assessments
- Completion of 4.0 FCE

Applying with 8 or more FCEs completed:

- Completion of BIO230H1/BIO255H1 with a minimum grade of 70
- Completion of HMB265H1/BIO260H1
- Completion of BCH210H1
- Completion of PSL300H1

Students may apply for this specialist program during Round 1 and Round 2 of Type 3 Enrolment after they have earned 4.0 FCE. Students applying for admissions to the program utilizing transfer credits will be considered on a case-by-case basis. Students entering from CEGEP or from another university should contact hmb.undergrad@utoronto.ca after their transfer credit assessment has been complete for program enrolment assessment. For more information about Type 3 enrolment, visit the Faculty of Arts & Science Subject Program Enrolment Instructions website.

Completion Requirements:

Required Courses (12.0 FCE, including at least 1.0 FCE at the 400-level)

Chemical and Physical Foundations of Biological Systems

1. (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1
   - Transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion or equivalency to a pre-approved chemistry course.
2. MAT135H1/PHY131H1/PHY151H1/CSC120H1/CSC148H1
3. BCH210H1

Biological Foundations of Living Systems

4. BIO120H1, BIO130H1
5. BIO230H1/BIO255H1
6. HMB265H1/BIO260H1
Human Biology Program

7. PSL300H1

Neuroscience Concentration Courses

8. PSY100H1  Transfer credits from AP and IB Psychology are not accepted
9. HMB200H1
10. HMB300H1
11. CJH332H1
12. HMB320H1
13. JHA410H1/ANA300Y1

14. 2.0 FCE from HMB360H1/HMB420H1/HMB430H1/HMB440H1/HMB450H1/HMB471H1/HMB473H1/HMB490Y1 /CSB345H1/CSB346H1/CSB432H1/CSB445H1/CSC321H1/LMP410H1/NEW335H1/NFS489H1/PCL475H1 /PCL476H1/PSL374H1/PSL432H1/PSL440Y1/PSL445H1/PSL446H1/PSL450H1/PSL452H1/PSL472H1/PSY342H1/ PSY371H1/PSY372H1/PSY390H1/PSY395H1/PSY460H1/PSY470H1/PSY471H1/PSY473H1/PSY475Y1/PSY480H1/ PSY490H1/PSY492H1/PSY493H1/PSY492H1/PSY493H1/PSY494H1/PSY496H1

Data Analysis and Research-Based Courses

15. 0.5 FCE in statistics: EEB225H1/STA220H1/STA288H1/PSY201H1
16. 0.5 FCE from bioethics: HMB306H1/HMB406H1/PHL281H1
17. 0.5 FCE from upper-year lab course: HMB310H1/HMB314H1/PSY369H1
18. 1.0 FCE from research project course: HMB496Y1 *#HMB499Y1*

*A research project from a different unit may be accepted with prior written approval from Human Biology if the course is not counting toward a different program.

Neuroscience Specialists Notes:

1. Courses can only count toward one requirement, even if listed as options to multiple requisites of the program.
2. Not all courses listed have priority enrolment for Neuroscience specialists. Students are responsible for checking priority of courses and meeting course prerequisites for courses they wish to take.

Description of Proposed Changes:

Increased grade requirement for first year chemistry in enrollment requirements.
Removed courses: CHM138H1/CHM139H1
Removed HMB499Y1. Added HMB490Y1.
Added EEB225H1 to statistics requirement.

Rationale:

Changed enrollment grade requirement from 55 in CHM to 70 to reflect actual enrollment data. The Neuroscience program is limited enrollment and has the most pressure of all our programs, and 55 was not realistic. Looking at recent data, 70 is a minimum. For increasing to an average of 70 in first year chem (Neuroscience programs only), we have a hard cap on the number in the program, based on the number of lab spaces in HMB310, a required lab course by both the major and the specialist. 70 more accurately reflects the caliber of students being accepted.

Courses (CHM138H1/CHM139H1) aren't offered or retired.
Removed HMB499Y1 because it was never intended that students use two research project towards any of our programs, leftover from when HMB499Y1 was our primary 4th year project, now HMB496Y1 is. Students may also choose to do a community engaged full year course HMB490Y1, that we proposed last year, we are adding it to programs this year.
We will use any statistics course, we are normalizing the options across our programs.

Impact:

Minor, students will have to ask for fewer exceptions. They won't see course options that don't exist.
Students will have more realistic expectations of acceptance to the program.

Consultation:
The details of the course changes were reviewed with the Department of Ecology and Evolutionary Biology, who were supportive of the addition of EEB225H1. Internal consultation with Dr. Bruce, Dr. Wilson, Katy and myself. As well as presented at the Life Sciences Planning Committee. No concerns raised.

Resource Implications:

1 New Course:

HMB226H1: Indigenous Holistic Health

- **Contact Hours:**
  - Practical: 2 / Seminar: 22

- **Description:**
  What is holistic health in an Indigenous framework? How can holistic health (physical, mental, emotional, and spiritual) be ethically explored to inform health and healing? What is cultural safety in health care systems? This course explores the effects of traditional practices, culture, activities, arts, land-based healing, music and ceremony in health and healing.

- **Prerequisites:**
- **Corequisites:**
  HMB200H1/HMB201H1/HMB202H1/HMB203H1/HMB204H1/HST209H1

- **Exclusions:**

- **Recommended Preparation:**

- **Breadth Requirements:**
  Living Things and Their Environment (4)

- **Distribution Requirements:**
  Science

- **Competencies:**
  - Communication: notably; Critical and Creative Thinking: notably; Information Literacy: slightly
  - Quantitative Reasoning: slightly; Social and Ethical Responsibility: extensively

- **Experiential Learning:**
  - Research: none; Other: extensively;

  - Nature of "Other" Experiential Learning: Community Involvement; Experiential Study

- **Rationale:**
  Many science students have interests in Indigenous health and healing, but don’t know how to begin that learning journey. This course will introduce students to ways of knowing Indigenous health in contemporary contexts. Indigenous health and healing modalities are essential for respectful interaction with Indigenous persons. A space for students to explore topics that affect holistic health is necessary. Contextual relevance and respect are critical. This course would transcend traditional academic silos to achieve these goals, and provide an introduction for science students to Indigenous Knowledge Systems.

  This course would also align with the Faculty of Arts & Sciences commitment to the Truth and Reconciliation Commission Report of Canada (2015). The University's response, “Answering the Call” (https://www.provost.utoronto.ca/wp-content/uploads/sites/155/2018/05/Final-Report-TRC.pdf, 2017) notes that reconciliation cannot be achieved without challenging the dominant educational norms at the University. As the University Report
notes, “[w]ithout truth, justice, and healing, there can be no genuine reconciliation. Reconciliation is not about closing a sad chapter of Canada’s past, but about opening new healing pathways of reconciliation that are forged in truth and justice (Final Report of the TRC, Volume 6: Reconciliation, p. 7)”. This course is an initial pathway for students seeking careers in human biology. “Answering the Call” also contains a Report by the Indigenous curriculum working group (Appendix D) which further details how and why these curricula are needed and should unfold. This course will serve as an entryway for life science students in Human Biology and Health Studies to take additional Indigenous Studies courses offered by the Centre for Indigenous Studies and/or Human Biology and/or Health Studies

<table>
<thead>
<tr>
<th>Consultation:</th>
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<tbody>
<tr>
<td>Elder and a faculty committee consultation was in person, beginning in 2012 (when we began to develop a health course for Indigenous Studies). We met in talking circles (focus groups) or individually, and it is not considered appropriate to work with Elders over email generally.</td>
</tr>
<tr>
<td>Janet Smylie, Metis physician Consultant &amp; Course Developer</td>
</tr>
<tr>
<td>Jennifer Murinn, Administrative Assistant, Aboriginal Studies</td>
</tr>
<tr>
<td>Eileen Antone, Former Director of Aboriginal Studies and Centre for Aboriginal Initiatives</td>
</tr>
<tr>
<td>Lee Maracle, Elder &amp; Writer in Residence at FNH</td>
</tr>
<tr>
<td>Mark &quot;Cat&quot; Criger Elder &amp; helper, FNH</td>
</tr>
</tbody>
</table>

Consulted with:
Sarah Wakefield, Health Studies Program Director "This sounds great."
Susan Hill, Director of Centre for Indigenous Studies
Ben Gilbert, Associate Chair Undergrad EEB "Thank you for letting me know about this course. I support it moving forward, and will be very interested to hear about student uptake and how you teach this mix of traditional and western knowledge."
Tony Harris, Associate Chair Undergrad CSB "Thank you for your email. There are no concerns about overlap with CSB courses."
Ashley Waggoner Denton, Psychology, Acting Associate Chair Undergraduate "Sounds like a great course, and I agree that there is no overlap with any of our current offerings."
Helen Miliotis, Undergraduate Coordinator, Physiology "We would be fine with this course moving forward."
Thierry Mallevaey, Associate Chair Undergrad Immunology
Ali Salahpour, Associate Chair Pharm & Tox
Alex Ensminger, Undergraduate Coordinator, Biochemistry
Richard Collins, Undergrad Coordinator & Associate Chair Molecular Genetics "MGY has no objections to the proposed HMB226H1 course."
Anne Agur, Division Chair, Anatomy "Yes we would support this course. It is novel and needed."

<table>
<thead>
<tr>
<th>Resources:</th>
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<tbody>
<tr>
<td>Instructor</td>
</tr>
<tr>
<td>Guest speakers: Elders, traditional knowledge keepers, faculty</td>
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<tr>
<td>Field trip bus, related minor expenses.</td>
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<tr>
<td>Lab equipment (HMB’s lab facility and technicians)</td>
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</table>

Ongoing discussion with the Dean's office regarding receiving funds for some or all course expenses.

<table>
<thead>
<tr>
<th>Budget Implications:</th>
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<tbody>
<tr>
<td>The academic unit will provide the resources required for this course from existing budget.</td>
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</table>

<table>
<thead>
<tr>
<th>Overlap with Existing Courses:</th>
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<tbody>
<tr>
<td>The proposed course does not overlap with any courses offered by the centre for Indigenous Studies. The Indigenous Health Systems course (INS350H), also taught by Melanie Jeffrey, builds upon foundations of Indigenous Studies and the course goals and content are very different. The Indigenous Health Sciences (INS340) course listed in the catalog has not yet been offered, and is a science breadth requirement for students without formal education in life sciences, with a goal of introducing non-science students to biomedical principles. JFP450 is sponsored by the Department of Pharmacy, for students of Pharmacy and Indigenous Studies.</td>
</tr>
<tr>
<td>HST309H1-F Special Topics in Health Studies II, Subtitle: Indigenous Health and Healing in the Six Nations</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Programs of Study for Which This Course Might be Suitable:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Biology, Health Studies</td>
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<table>
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<tr>
<th>Estimated Enrolment:</th>
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<tbody>
<tr>
<td>30</td>
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</table>

| 81 |
Human Biology Program

Instructor:
   Dr. Melanie Jeffrey
1 New Course:

**IMM221H1: Origins of Immunology**

**Impact on Programs:**
This proposal triggers modifications in the unit's program(s)

**Contact Hours:**
- **Lecture:** 24  /  **Tutorial:** 12

**Description:**
This course will examine the milestones in the field of immunology from ancient to current times, with specific emphasis on 1880 to 1980. It will observe how the concept of immunity has changed over time and examine the major events and discoveries that shaped how immunology is viewed today. Pioneers, such as Edward Jenner, Louis Pasteur, Robert Koch, Paul Ehrlich and Brigitte Askonas, and their contributions to the field will be discussed in both historical and scientific context as well as their impact on society. Assignments are staggered for students to build upon instructor’s feedback.

**Prerequisites:**

**Corequisites:**

**Exclusions:**

**Recommended Preparation:**
- BIO120H1, BIO130H1

**Methods of Assessment:**

- **Mid-term (20%)**
  The mid-term will cover Lectures 1-4. It will be an open note test where students will answer three free-response questions. This will take place in Tutorial #2.

- **Infographic (10%)**
  The goal is to design an infographic of a pioneer of choice. The infographic must be submitted in both electronic and hard copy (in-class). Students are encouraged to use different computer software to aid them in designing the infographic. Top three infographic will be selected for publication in IMMPress Magazine.

- **Layperson Summary (10%) & Mock Presentation (10%)**
  Topics for both the written project and presentation will be given in Lecture 5. The group (up to 4 students) will write a two-page double-spaced summary of their chosen topic, followed by a 5-minute presentation, which will take place in Tutorial #3. The summary will be evaluated as a group while the presentation will be individually graded. The group must sign up for a 20-minute timeslot between Tutorial #4-6 to go over the summary and the presentation to receive feedback from the instructor.

- **Final Presentation (25%) & Final Report (25%)**
  Building upon the received feedback from Tutorial #4-6, the group will revise and write a 12-page double-spaced report and give a 15-minute presentation of their findings to the class in Lecture 12. The report will be evaluated as a group while the presentation will be individually graded.

**Breadth Requirements:**
- Society and its Institutions (3)

**Distribution Requirements:**

83
<table>
<thead>
<tr>
<th>Competencies:</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Communication: extensively; Critical and Creative Thinking: extensively; Information Literacy: slightly</td>
<td></td>
</tr>
<tr>
<td>Quantitative Reasoning: slightly; Social and Ethical Responsibility: extensively</td>
<td></td>
</tr>
<tr>
<td>Experiential Learning:</td>
<td></td>
</tr>
<tr>
<td>Research: none; Other: none</td>
<td></td>
</tr>
<tr>
<td>Rationale:</td>
<td>This course is designed with inter-disciplinary principles to enlighten students in both arts &amp; sciences. The course is aimed at students in any discipline to raise the awareness of discoveries and advancements in immunology and their impact upon society. The course content is chosen to demonstrate the key concepts in immunology in a context of history – how they have shaped the field today. To meet the requirements of “Society and Its Institutions”, each lecture will discuss the key scientific experiments conducted in a specific time period and how the theories have evolved to what it is today, followed by how it relates to the current understandings in the field. The evaluation scheme will focus on two parts: 1. Implementing assignments to focus on developing students’ practical knowledge translational skills and 2. Assignments designed in a step-wise progression for students to build upon feedback received from the instructor. In addition, it will increase the offerings for immunology students at the 200-level and a chance for life science students to learn the historical and societal impact of immunology through time.</td>
</tr>
<tr>
<td>Consultation:</td>
<td></td>
</tr>
<tr>
<td>1. Department of Immunology faculty consultation.</td>
<td></td>
</tr>
<tr>
<td>2. Department of Immunology External Review (2016), which included a consultation with Undergraduate Students.</td>
<td></td>
</tr>
<tr>
<td>3. Consultation with Dr. Ashley Bruce, the director of Human Biology Program – she indicated her full support for the proposed course.</td>
<td></td>
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<tr>
<td>4. Consultation with Dr. Joseph Berkovitz (Associate Chair) and Dr. Lucia Dacone, a faculty member and the current instructor for many of the courses related with history of medicine in the History and Philosophy of Science and Technology.</td>
<td></td>
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<tr>
<td>5. Consultation with Dr. Nhung Tuyet Tran, Associate Chair of the History Department.</td>
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<tr>
<td>6. Consultation with the Life Sciences Planning Committee (September 20, 2019).</td>
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<tr>
<td>7. Consultation with the Trinity College Arts and Science Committee (September 26, 2019). The Committee approved this proposal, which will be proposed to the Trinity College Senate on October 7, 2019.</td>
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</tr>
<tr>
<td>Resources:</td>
<td>Classroom with teaching station.</td>
</tr>
<tr>
<td>Budget Implications:</td>
<td>The academic unit will provide the resources required for this course from existing budget.</td>
</tr>
<tr>
<td>Overlap with Existing Courses:</td>
<td>HIS355H1: A History of Pre-modern Medicine – not offered anymore</td>
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<tr>
<td></td>
<td>The Department of History Associate Chair confirmed that there is no overlap with HIS courses.</td>
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<tr>
<td></td>
<td>All the HPS courses below have been shown to have minimal overlap with the proposed course, per discussion with the current instructor Dr. Lucia Dacone.</td>
</tr>
<tr>
<td></td>
<td>HPS318H1: History of Medicine I</td>
</tr>
<tr>
<td></td>
<td>HPS319H1: History of Medicine II</td>
</tr>
<tr>
<td></td>
<td>HPS440H1: Topics in History of Medicine</td>
</tr>
<tr>
<td></td>
<td>Human Biology Program – discussion with the director, Dr. Ashley Bruce, confirmed that this course has no overlap with the current courses offered by the program.</td>
</tr>
<tr>
<td>Programs of Study for Which This Course Might be Suitable:</td>
<td>Immunology Specialist (ASSPE1002)</td>
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<tr>
<td></td>
<td>Immunology Major (ASMAJ1002)</td>
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<tr>
<td></td>
<td>Human Biology: Health and Disease Major (ASMAJ2013)</td>
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<tr>
<td></td>
<td>Human Biology: Global Health Major (ASMAJ2575)</td>
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<tr>
<td></td>
<td>Human Biology: Human Biology Major (ASMAJ2035)</td>
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<tr>
<td>Estimated Enrolment:</td>
<td>84</td>
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<tr>
<td>Instructor:</td>
<td></td>
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<td>---------------------</td>
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</tr>
<tr>
<td>Juan Carlos Zúñiga-Pflücker &amp; Tae Joon Yi</td>
<td></td>
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</tbody>
</table>
1 Course Modification:

MGY280H1: Second Year Specialist Research

<table>
<thead>
<tr>
<th>Contact Hours:</th>
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<tbody>
<tr>
<td>Previous:</td>
</tr>
<tr>
<td>New: Practical: 48 / Seminar: 12</td>
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| Description: |

This course gives students Specialists enrolled in the Molecular Genetics and Microbiology Specialist or Biochemistry Specialist program an opportunity to conduct an original research project in the second semester of their second year in a one of the active research laboratory laboratories in either of those Departments the Department. Laboratory assignments are chosen during the first semester of second year by agreement with a Departmental faculty member and the Course Undergraduate Coordinator. Attendance at a weekly meeting is mandatory and students will present a report at the end of term. Details can be found on the departmental website. Not eligible for CR/NCR option.

<table>
<thead>
<tr>
<th>Prerequisites:</th>
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<tbody>
<tr>
<td>Enrollment in Admission to the Specialist Program in Molecular Genetics and Microbiology Program or in Biochemistry. Student cannot have completed more than 8.5 FCE.</td>
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<table>
<thead>
<tr>
<th>Topics Covered:</th>
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<tbody>
<tr>
<td>Previous:</td>
</tr>
<tr>
<td>New: How research is done in fields related to molecular biology. Seminar topics include: expectations and professional behaviour in the research lab; career paths; how academic research is funded; grant proposal writing, how to publish; career development strategies.</td>
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<tr>
<th>Methods of Assessment:</th>
</tr>
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<tbody>
<tr>
<td>Previous:</td>
</tr>
<tr>
<td>New: Three short written assignments (25%), one a research grant proposal, including draft, peer evaluation, revision and final submission (total 35%), attendance at the weekly seminar/discussion sessions (10%), evaluation by your research supervisor (30%)</td>
</tr>
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</table>

| Rationale: |

The MGY Specialist Program developed this course for its students a few years ago. The BCH Specialist program wants its students to have a similar experience. Because the research topics in these two departments overlap substantially, rather than having BCH mount a parallel course, we propose to allow BCH students to take the MGY280H course. The BCH department will share in the delivery of the course as well as provide opportunities for research placements in laboratories in the BCH Dept.

<table>
<thead>
<tr>
<th>Consultation:</th>
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<tr>
<td>Discussed and agreed upon by the Chairs and Undergrad Coordinators of the MGY and BCH Programs during November 2019</td>
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<tr>
<th>Resources:</th>
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<tbody>
<tr>
<td>Two course co-coordinators/instructors plus three to six rotating faculty members to contribute to seminars on specific topics. All resources are in place.</td>
</tr>
</tbody>
</table>

**Budget Implications:** The academic unit will provide the resources required for this course from existing budget.
2 New Courses:

**PSY195H1: The Science of Babies**

**Contact Hours:**
- **Seminar:** 24

**Description:**
Up until roughly four decades ago, infants were seen as cute, clueless creatures. Yet, research from a range of fields has led to a radical consideration of this claim; infants may be cute but they are not clueless! In this class, we will consider and discuss the science of babies. In particular, we will take a second look at long-held beliefs about the nature of infants and their knowledge. We will learn that studying infants’ perception, cognition and behaviour can offer us critical insights into long-standing philosophical questions. This course provides an interdisciplinary introduction to infancy, that includes content from psychology, philosophy, neuroscience, as well as biology and anthropology. Upon completion of this class, students will (1) have overview knowledge of aspects of infancy as it relates to perception, cognition and behavior; (2) be able to use exploratory writing to develop arguments and develop their understanding of subject matter; and (3) begin to be able to read and summarize a scientific research paper in Developmental Psychology. Restricted to first-year students. Not eligible for CR/NCR option.

**Prerequisites:**

**Corequisites:**

**Exclusions:**

**Recommended Preparation:**

**Topics Covered:**
- See sample syllabus attached.

**Methods of Assessment:**
- See sample syllabus attached.

**Breadth Requirements:**
- Thought, Belief and Behaviour (2)

**Distribution Requirements:**
- Science

**Competencies:**
- **Communication:** extensively; **Critical and Creative Thinking:** extensively; **Information Literacy:** extensively
- **Quantitative Reasoning:** slightly; **Social and Ethical Responsibility:** notably

**Experiential Learning:**
- **Research:** notably; **Other:** none

**Rationale:**
Over the last several decades, scientific perspectives regarding the nature of perception, cognition and behavior in infancy have radically shifted. As recently as the 1960s pediatricians believed infants were born blind, and 3.5 decades later scientists were still debating whether infants could, in fact, think. With an explosion of behavioral and brain-based, infant-friendly methods we now understand that not only do infants possess knowledge, but that such knowledge is arguably abstract. The study of perception, cognition and behavior in infancy provides a portal to long-
standing philosophical debates. Moreover, it offers an important lesson regarding how advances in scientific methods and techniques can dramatically alter the landscape of a field in a short period. Finally, students will leave this class with knowledge and lessons that they can apply to the real-world, not only through analysis of popular press depictions of research relevant to infants, but also because much of what will be learned in the classroom can be applied to child-centered interactions across a broad range of contexts. Our existing Introduction to Development course (PSY210) covers development across a broader range of topics in development using a strictly psychological approach and focuses on the development of children and adolescents. Given the difference in age group of focus and topics, the anticipated overlap with this course is low.

**Consultation:**
Course proposal was shared with Anthropology and Linguistics departments (as these departments offer courses that feature “infants” in their course descriptions). No issues with overlap.

**Resources:**
Seminar room capable of holding 24 students. Audio/Video Equipment for displaying lecture materials.

**Budget Implications:** The academic unit will provide the resources required for this course from existing budget.

**Overlap with Existing Courses:**
None.

**Programs of Study for Which This Course Might be Suitable:**

**Estimated Enrolment:**
24

**Instructor:**
Dr. Jessica Sommerville

### PSY349H1: Laboratory in Social Psychological Field Methods

**Contact Hours:**
- Practical: 36

**Description:**
This laboratory class introduces students to field methods in social psychology used to study social processes as they unfold in daily life and public spaces. Students will get hands on experience to collecting, managing, storing, and communicating data collected through observational and longitudinal methods, including data collection in public spaces around Toronto and online. Course capacity is limited to 15 students and priority is given to PSY Specialists and Research Specialists during the first enrolment period.

**Prerequisites:**
- PSY202H1 (or exclusion); PSY220H1

**Corequisites:**

**Exclusions:**

**Recommended Preparation:**
- PSY203H1

**Topics Covered:**
See attached sample syllabus.

**Methods of Assessment:**
See attached sample syllabus.
**Breadth Requirements:**
- Thought, Belief and Behaviour (2)

**Distribution Requirements:**
- Science

**Competencies:**
- *Communication:* notably;
- *Critical and Creative Thinking:* notably;
- *Information Literacy:* notably;
- *Quantitative Reasoning:* extensively;
- *Social and Ethical Responsibility:* notably

**Experiential Learning:**
- *Research:* notably;
- *Other:* none

**Rationale:**
Social psychology is the study of how the implied, actual, or imagined presence of others affects an individual’s thoughts, feelings, and behaviour. For decades, social psychological research was primarily conducted in the laboratory due to the desire for experimental control. In tandem with advances in statistical analyses and new research paradigms, social psychological research has increasingly been including field observation in public spaces and online. This shift in the methods of social psychology is particularly important to establish the real-world generalizability of classic social psychological findings and extend our existing knowledge. The purpose of this lab class is to give students hands-on experience with field research paradigms and the statistical analyses needed to analyze data gathered in the field to equip them with tools to innovate in their future research careers.

**Consultation:**
We cast a wide net in our consultation with other departments. Our general approach was to reach out to the professors of courses that focus on either field research methods or quantitative methods, and our search identified relevant courses in geography (GGR271H1), environmental studies (ENV223H1, ENV316H1), sociology (SOC204H1, SOC203H1), and economics (ECO220Y1). We reached out to the 9 professors on record for these 6 courses for the current calendar years in the FAS calendar to (a) share the “Calendar Description” provided above and ask for their opinion on overlap and (b) request their syllabi to identify any overlap. We thankfully heard back from all instructors. All professors were very positive about the proposed course, and no one perceived any overlap. To the contrary, a number of professors said the courses would complement each other nicely. As a result of this consultation, we are not proposing any exclusions from other departments.

**Resources:**
We would need access to computers that have R, RStudio, and SPSS installed (e.g., Sidney Smith 560). These resources are already required for another course that Page-Gould teaches (i.e., PSY305), and thus do not represent new budget items.

**Budget Implications:**
The academic unit will provide the resources required for this course from existing budget.

**Overlap with Existing Courses:**
GGR271H1 (Social Research Methods) has the greatest potential for overlap with the proposed course. GGR271H1 offers geography students the opportunity to learn qualitative field methods for social science research. Although the first two lectures of the course overlap with the proposed course in some content due to the need to cover basics of empirical design and research ethics, the two courses diverge very quickly. GGR271H1 specifically teaches qualitative methods and secondary data analysis, both which will not be covered in the proposed course. Similarly, GGR271H1 does not cover quantitative approaches, which will be the focus of the proposed course. Given the strong epistemological and methodological differences between qualitative and quantitative approaches, these two courses will complement rather than compete with one another. In addition, GGR271H1 will be taught in the context of geography research topics, whereas the proposed course will focus on human social behaviour.

**Programs of Study for Which This Course Might be Suitable:**
- ASSPE1160 - PSY Specialist
- ASSPE1958 - PSY Research Specialist

**Estimated Enrolment:**
- 15

**Instructor:**
Dr. Elizabeth Page-Gould
# 2 Course Modifications:

## PSY201H1: Statistics I

### Exclusions:

- ECO220Y1
- ECO227Y1
- EEB225H1
- GGR270H1
- HMB325H1
- POL232H1
- POL222H1
- POL242Y1
- SOC202H1
- STA220H1
- STA248H1
- STA288H1

### Rationale:

Courses either no longer exist or are no longer considered exclusions. POL222H1 added due to exclusion to PSY201H1 listed on Political Science end.

### Consultation:

Changes were either pointed out to department or discovered on own.

### Resources:

## PSY396H1: Neurochemical Basis of Behaviour

### Exclusions:

- PCL200H1
- PCL476H1
- PCL475Y1
- PSYC62H3

### Rationale:

Pharmacology broke PCL475Y1 into two half-courses and determined that both PCL200H1 and PCL476H1 should be exclusions.

### Consultation:

Consulted with Pharmacology via email.

### Resources:
4 Minor Program Modifications/Revisions:

Specialist in Statistical Science: Methods and Practice

Completion Requirements:

(10 or 10.5 FCEs plus a disciplinary focus requiring 2.0-3.5 FCEs)

First year:
1. STA130H1, CSC108H1/CSC120H1/CSC148H1, (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1. (MAT137Y1/MAT157Y1 recommended)

2. Recommended: introductory course in disciplinary focus. MAT223H1/MAT240H1 is also strongly recommended to be taken in first year and is required preparation for MAT237Y1.

Second year:
3. MAT223H1/MAT240H1, MAT235Y1/MAT237Y1/MAT257Y1, (STA237H1, STA238H1)/(STA247H1, STA248H1)/(STA257H1, STA261H1)

((STA257H1, STA261H1) recommended)

Upper years:
4. STA302H1, STA303H1, STA304H1/STA305H1, STA313H1/STA314H1/STA365H1, STA355H1

5. 1.5 FCE from the following list: STA414H1, STA437H1, STA442H1, STA457H1, STA465H1, STA475H1, STA480H1, STA410H1

6. STA490Y1 or successful completion of an internship (see department for information about internships)

7. 1.0 FCE from the following list: MAT224H1/MAT247H1, MAT337H1/MAT357H1, CSC148H1, CSC207H1, STA300+ level courses (excluding STA310H5)

Disciplinary Focuses

Students in the Specialist Program in Statistical Science: Methods and Practice program must complete at least one disciplinary focus.

To enrol in one or more focuses, students must first be enrolled in the Specialist Program in Statistical Science: Methods and Practice program. Enrolment instructions can be found on the Arts & Science Program Toolkit website. Focuses can be chosen on ACORN after admission to the program, which begins in July.

Health Studies: (2.0 FCE) HMB342H1, at least 0.5 FCE from HST209H1/HST211H1/HST250H1, and at least 0.5 FCE from HST308H1/HST310H1/HST405H1/HST330H1/HST440H1/HST464H1

Global Health: (3.0 FCE) BIO120H1, BIO130H1, HMB203H1, HMB265H1, HMB323H1/HMB303H1/HMB306H1/JNH350H1/HMB342H1, HMB433H1/HMB406H1/HMB462H1/HAJ453H1/HMB434H1 (Recommended: HMB433H1)

Health and Disease: (3.0 FCE) BIO120H1, BIO130H1, HMB202H1, HMB265H1, HMB302H1/HMB322H1/HMB312H1/HMB342H1, HMB422H1/HMB402H1/HMB432H1/HMB434H1/HMB435H1/HMB436H1/HMB437H1/HMB432H1/
Fundamental Genetics and its Applications: (3.0 FCE) BIO120H1, BIO130H1, HMB201H1, HMB265H1, HMB301H1/HMB311H1/HMB321H1/HMB360H1, HMB421H1/HMB441H1/HMB401H1/HMB431H1 (Recommended: HMB421H1)

Neuroscience: (3.0 FCE) BIO120H1, BIO130H1, HMB200H1, HMB265H1, HMB300H1/HMB310H1/HMB320H1/HMB360H1/CJH332H1, HMB420H1/JHA410H1/HMB430H1/HMB450H1 (Recommended: HMB420H1)

Social Psychology: (2.0 FCE) PSY100H1, PSY220H1, PSY322H1, PSY326H1/PSY321H1/PSY424H1/PSY426H1/PSY405H1/PSY406H1

Cognitive Psychology: (2.0 FCE) PSY100H1, PSY270H1, PSY493H1, PSY372H1/PSY405H1/PSY406H1/PSY475H1

Sociolinguistics: (3.0 FCE) LIN100Y1; 2 of LIN228H1, LIN229H1, LIN232H1 or LIN241H1; LIN351H1 and LIN456H1

Psycholinguistics: (3.0 FCE) LIN100Y1; 2 of LIN228H1, LIN229H1, LIN232H1 or LIN241H1; 2 of JLP374H1, JLP315H1 or JLP471H1

Astronomy & Astrophysics: (2.5 or 3.0 FCE) (PHY131H1, PHY132H1)/(PHY151H1, PHY152H1); AST221H1, AST222H1; (PHY252H1, AST320H1)/AST325H1/AST326Y1

Sociology: (2.5 FCE) SOC100H1+SOC150H1 (minimum combined average grade of 65%); SOC204H1; 1.0 FCE from SOC303H1, SOC312H1, SOC336H1, SOC355H1, SOC363H1, SOC364H1.

Students interested in advanced study in Sociology should consider additional courses, in particular SOC201H1, SOC251H1, and SOC254H1

Ecology: (3.0 FCE) BIO120H1, BIO220H1; 2.0 FCE from (with at least 0.5 FCE at the 400 level) EEB319H1/EEB321H1/EEB328H1/EEB365H1/EEB428H1/EEB433H1/EEB440H1 or ENV234H1/ENV334H1/ENV432H1

Evolutionary Biology: (3.5 FCE) BIO120H1, BIO130H1, BIO220H1; 1.5 FCE from HMB265H1/BIO260H1, EEB318H1, EEB323H1, EEB324H1, EEB325H1, EEB362H1, EIIJ352H1; 0.5 FCE from EEB440H1, EEB455H1, EEB459H1, EEB460H1

Notes:

- BIO260H1 requires BIO230H1 as a prerequisite.
- Students in the Focus in Evolutionary Biology can request that HMB waive the co-requisite of BIO230H1 for HMB265H1 and that EEB waive the prerequisite of BIO230H1 for EEB460H1. These waivers will only be considered for students in the Applied Statistics specialist focus in Evolutionary Biology. All other pre- and co-requisites are required.

Economics: (3.5 FCE) (ECO101H1, ECO102H1), ECO200Y1/ECO206Y1, ECO202Y1/ECO208Y1, 0.5 FCE 300+ series ECO course with the exception of ECO374H1 and ECO375H1

Biochemistry: (3.0 FCE)
CHM135H1, CHM136H1, BCH210H1, BCH311H1, BCH370H1, BCH441H1

Physics: (2.5 FCE)
PHY131H1/PHY151H1, PHY132H1/PHY152H1, PHY224H1, PHY252H1/PHY254H1/PHY256H1, PHY324H1

Pharmacology and Biomedical Toxicology: (3.0 FCE)
BIO130H1 (minimum grade of 70%), PSL300H1, PSL301H1, PCL201H1, PCL302H1, PCL345H1/PCL362H1/PCL469H1/PCL470H1
Description of Proposed Changes:
Include new courses as program options.

Rationale:
This recognizes the newly introduced courses (i.e., STA475H1 approved on the last round, and STA313H1 which is proposed in this round) in the program requirements.

Impact:
The rationale for introducing these new courses in the first place was to provide more flexible course options for our students to complete their programs. This change will explicitly recognize them in program requirements.

Consultation:
The Statistics Undergraduate Committee was consulted.

Resource Implications:
No resources affected

Specialist in Statistical Science: Theory and Methods

Completion Requirements:

(11 full courses or their equivalent)

First Year:
STA130H1, CSC108H1/CSC120H1/CSC148H1, MAT137Y1/MAT157Y1, MAT223H1/MAT240H1

Second Year:
MAT224H1/MAT247H1, MAT237Y1/MAT257Y1; STA257H1, STA261H1

Higher Years:
1. STA302H1, STA303H1, STA304H1/STA305H1, STA313H1/STA314H1/STA365H1, STA347H1, STA355H1
2. 1.0 FCE from the following list: STA410H1, STA414H1, STA437H1, STA442H1, STA457H1, STA465H1, STA475H1, STA480H1
3. One of STA447H1, STA452H1, STA453H1
4. 1.0 FCE from: ACT451H1, ACT452H1, ACT460H1, MAT327H1, MAT332H1, MAT334H1/MAT354H1, MAT337H1/MAT357H1, MAT301H1/MAT347Y1, MAT344H1, CSC207H1, CSC336H1, CSC343H1, STA300+-level courses (excluding STA310H5)
5. One of STA492H1, STA496H1/STA497H1/STA498Y1/STA499Y1 or successful completion of an internship (see department for more information about internships)

Note: Students planning to take any of these courses should ensure they have the required prerequisites

Description of Proposed Changes:
Include new courses as program options.

Rationale:
This recognizes the newly introduced courses (i.e., STA475H1 approved on the last round, and STA313H1 which is proposed in this round) in the program requirements.

Impact:
The rationale for introducing these new courses in the first place was to provide more flexible course options for our students to complete their programs. This change will explicitly recognize them in program requirements.
Statistics Major

**Completion Requirements:**

(7.0 full courses or their equivalent, including at least one STA 400-series course)

**First Year:**

STA130H1, CSC108H1/CSC120H1/CSC148H1, (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1.

(MAT223H1/MAT240H1 recommended in 1st year)

**Second Year:**

MAT223H1/MAT240H1, MAT235Y1/MAT237Y1/MAT257Y1; (STA247H1, STA248H1)/(STA237H1, STA238H1)/(STA257H1, STA261H1)/ECO227Y1

(STA237H1 and STA238H1 are strongly recommended. MAT221H1 may not be used for this requirement.)

**Higher Years:**

1. STA302H1
2. 0.5 FCE from STA313H1/STA314H1/STA365H1/STA347H1/STA355H1
3. 0.5 FCE from STA414H1/STA437H1/STA442H1/STA457H1/STA465H1/STA475H1/STA480H1
4. 1.0 FCE from all available STA300+ level courses, excluding STA310H5

**Description of Proposed Changes:**

Include new courses as program options.

**Rationale:**

This recognizes the newly introduced courses (i.e., STA475H1 approved on the last round, and STA313H1 which is proposed in this round) in the program requirements.

**Impact:**

The rationale for introducing these new courses in the first place was to provide more flexible course options for our students to complete their programs. This change will explicitly recognize them in program requirements.

**Consultation:**

The Statistics Undergraduate Committee was consulted.

**Resource Implications:**

No resources affected
**Data Science Specialist**

**Enrolment Requirements:**

This is a limited enrolment program. Students from any admission category are invited to apply. The Computer Science Admission Guarantee does not apply to this program. However, 20 spaces will be reserved for students in the Computer Science admission category (CMP1). To apply to these spaces, CMP1 students must meet the following conditions:

- Complete at least 4.0 credits.
- CSC110Y1 with that can only accommodate a final mark of at least 70%.
- CSC111H1 with a final mark of at least 77%.
- MAT137Y1 or MAT157Y1 with a final mark of at least 70%.
- STA130H1 with a final mark certain number of at least 70%.

Remaining places in the specialist will be filled by students from any admission category (including Computer Science). Eligibility is based on the average of a student's grades in CSC148H1/CSC111H1 and MAT137Y1/MAT157Y1 and STA130H1. (MAT157Y1 grades will be adjusted to account for the course's greater difficulty.)

In addition, students must have completed at least 4.0 FCEs and achieved a minimum grade of 70% in each of CSC148H1/CSC111H1, MAT137Y1/MAT157Y1 and STA130H1.

Students not in the CMP1 stream must also submit will be assessed based on a competitive average across these courses, and a supplemental application which will be considered alongside their academic results.

**Important:**

1. Requests for admission will be considered in the first program request period only. For detailed program enrolment instructions and application deadlines for restricted programs please click here.
2. Due to the limited enrolment nature of this program students are strongly advised to plan to enroll in backup programs.
3. Students admitted to the program after second or third year will be required to pay retroactive deregulated program fees.

**Completion Requirements:**

(13.0-13.5 Full Course Equivalents [FCEs], including at least 1.5 FCEs at the 400-level)

*First year (3.3-3.5 FCEs)*
MAT137Y1/MAT157Y1; MAT223H1/MAT240H1 (MAT240H1 is recommended); STA130H1; (CSC108H1, CSC148H1)/(CSC110Y1, CSC111H1);

Note: Students with a strong background in an object-oriented language such as Python, Java or C++ may omit CSC108H1 and proceed directly with CSC148H1. There is no need to replace the missing half-credit for program completion; however, please base your course choice on what you are ready to take, not on "saving" a half-credit. Consult with the Computer Science Undergraduate Office for advice on choosing between CSC108H1 and CSC148H1.

*Second year (3.5-4.0 FCEs)*
MAT237Y1/MAT257Y1; STA257H1; STA261H1; CSC207H1; (CSC165H1, CSC236H1)/(CSC236H1/CSC240H1 (CSC240H1 is recommended); JSC270H1 (Data Science I)

Note: CSC240H1 is an accelerated and enriched version of CSC165H1 plus CSC236H1, intended for students with a
Statistical Sciences (FAS), Department of

strong mathematical background, or who develop an interest after taking CSC165H1. If you take CSC240H1 without CSC165H1, there is no need to replace the missing half-credit for program completion; however, please base your course choice on what you are ready to take, not on "saving" a half-credit. Consult the Computer Science Undergraduate Office for advice on choosing between CSC165H1 and CSC240H1. CSC236H1 may be taken without CSC165H1 for students who completed CSC111H1.

Later years (6.5 FCEs)

1. STA302H1; one of STA303H1 or STA305H1; STA355H1; CSC209H1; CSC263H1/CSC265H1 (CSC265H1 is recommended); CSC343H1; CSC373H1; JSC370H1 (Data Science II)
2. STA314H1/CSC311H1/CSC411H1;
3. 2.0 FCEs from the following list, including at least 1.0 FCE at the 400 level (see below for additional conditions): STA303H1/STA305H1 (whichever one was not taken previously), STA347H1, CSC401H1, STA414H1/CSC412H1, CSC413H1/CSC421H1, any 400-level STA course; JSC470H1 (Data Science III); CSC454H1, CSC490H1, CSC491H1, CSC494H1, CSC495H1.

The choices from 3 must satisfy the requirement for an integrative, inquiry-based activity by including at least 0.5 FCE from the following: JSC470H1 (Data Science III); CSC454H1, CSC490H1, CSC491H1, CSC494H1, CSC495H1, STA490Y1, STA496H1, STA497H1, STA498Y1, STA499Y1. This requirement may also be met by participating in the PEY Co-op (Professional Experience Year Co-op) program.

Students will be advised to develop domain expertise in at least one area where Data Science is applicable, by taking a sequence of courses in that area throughout their program. Examples of such areas will be provided to students by program advisors and will form the basis for a later proposal for program Focuses (to be approved through internal Arts & Science governance procedures).

Description of Proposed Changes:

Added CSC110Y1 and CSC111H1 as alternatives to CSC108H1, CSC148H1 and CSC165H1. For some students this moves 0.5 FCEs from second-year to first-year. Overall it does not increase the program to beyond 13.5 FCEs since students who complete 3.5 FCEs in first year would only do 3.5 FCEs in second year.

Rationale:

CSC110Y1 and CSC111H1 are the new first-year courses for students in the CMP1 admission stream. These students are eligible to apply to the data-science program and should use these courses instead of CSC108, CSC148 and CSC165.

Because the Data Science Specialist only has space for at most 50 students, we cannot guarantee CMP1 students a place in the program based only on their own grades in pre-stated requirements. We will accept CSC111H1S grades instead of CSC148H1 grades for admission and we will hold at least 20 places in the DS program for CMP1 students who meet the admission requirements and would prefer to specialize in Data Science.

Impact:

None.

Consultation:

Statistics Department and Computer Science Department.

Resource Implications:

1 New Course:

STA313H1: Data Visualization

Contact Hours:
**Description:**

An introduction to data visualization and the use of visual and interactive representations of data to support human cognition. This course covers visualization techniques and algorithms based on principles from graphic design, perceptual psychology, cognitive science, and human-computer interaction. Topics include: graphic design, interaction, perception and cognition, communication, and ethics. Computational tutorials involve design review, implementation, and testing of information visualizations.

**Prerequisites:**

At least 70% in CSC108H1 or at least 60% in CSC148H1; STA238H1/STA248H1/STA261H1/ECO227Y1

**Corequisites:**

**Exclusions:**

**Recommended Preparation:**

**Breadth Requirements:**

The Physical and Mathematical Universes (5)

**Distribution Requirements:**

Science

**Competencies:**

*Communication:* notably; *Critical and Creative Thinking:* notably; *Information Literacy:* notably

*Quantitative Reasoning:* extensively; *Social and Ethical Responsibility:* slightly

**Experiential Learning:**

*Research:* none; *Other:* none

**Rationale:**

Rationale and Academic Relevance:

Data visualization is one of the cornerstone areas of the ever-growing, societally important field of data science. Lying at the intersection of statistics, computer science, psychology and visual design, data visualization is an essential data-based skill today, increasingly required in knowledge economy jobs. Data visualization is a multi-disciplinary, rapidly growing research area, that impacts plethora application domains: as soon as data manipulation is involved, data visualization is a powerful tool for effective analysis and communication of results. Students in Statistics undergraduate programs will strongly benefit from learning the fundamentals of visualization science, spanning perception, cognition, and the ethical consideration in visual communication of data.

About the pre-requisites:

CSC108/CSC148: All students will be expected to participate in laboratory activities which will involve some level of computer programming – data manipulations and implementation of visualizations using python, R, and other, more advanced tools such as Javascript. It is therefore critical that students have a solid background in computing to be able to keep up with the course materials and assignments.

STA238/STA248/STA261/ECO227: Being able to design appropriate, relevant data visualizations requires at least an introduction to Statistics and Probability so that students have some background in identifying appropriate, and critically assessing statistical summaries and analyses to communicate insights. These students should have the second-year STA sequence required for Statistics Major or Specialist programs.

**Consultation:**

The Statistics Undergraduate Committee was consulted.
### Resources:
Academic unit will provide the resources required for this course from existing budget.

### Budget Implications:
The academic unit will provide the resources required for this course from existing budget.

### Overlap with Existing Courses:
There is currently no course in visualization at the undergraduate level at FAS.

There is a related graduate course in DoSS/DCS: “STA2555/CSC2537 – Information Visualization”. There will be some overlap between the contents of the proposed undergraduate course and the first few lectures of STA2555. STA2555 is however targeted at graduate students, and follows a seminar-based format, which is less feasible at the undergraduate level; especially in large enrolment courses.

Related undergraduate courses in DCS are “CSC318 The Design of Interactive Computational Media” and “CSC428 Human-Computer Interaction”. Data visualization is an important sub-discipline within Human-Computer Interaction.

While the Data visualization course relates to CSC318/CS428, neither of these existing courses focuses on visualization in depth. The overlap is therefore minimal. At the graduate level, the course is highly complementary to other HCI courses, such as CSC2524, 2514, and 2526.

### Programs of Study for Which This Course Might be Suitable:
- Specialist in Statistical Science: Methods and Practice (ASSPE2270)
- Specialist in Statistical Science: Theory and Methods (ASSPE2290)
- Statistics Major (ASMAJ2289)
- Statistics Minor (ASMIN2289)

### Estimated Enrolment:
100

### Instructor:
Dr. Fanny Chevalier, Assistant Professor, Department of Computer Science and Department of Statistical Sciences

## 1 Course Modification:

### STA238H1: Probability, Statistics and Data Analysis II

#### Exclusions:
```
ECO220Y1/ECO227Y1/GGR270Y1/PSY201H1/SOC300H1/SOC202H1/SOC252H1/STA220H1/STA221H1/
STA248H1; STA255H1/STA248H1/; STA261H1/STA288H1/EEB225H1/STAB22H3/STAB27H3/; ECO227Y1;
```

#### Rationale:
STA238 and STA248 are similar in terms of difficulty level and level of Statistical rigour, so the exclusions should be the same. Note that the exclusions listed here are not equivalent courses, but there is considerable overlap so students should not be able to earn credit for STA238 or STA248 after taking any of these other courses. This will align two similar STA courses in terms of their exclusions.

#### Consultation:
The Statistics Undergraduate Committee was consulted.

#### Resources:
- Instructor

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2 Minor Program Modifications:

Cognitive Science Major - Arts

Enrolment Requirements:

This is a limited enrolment Type 2 program that can only accommodate a certain number of students. Admission enrolment is limited and admission requires either

(1) the completion of either COG250Y1 with a minimum threshold grade

or

(2) the completion of a combination of 1.5 FCEs FCE in CSC, LIN, PHL, or PSY (with no more than 1 FCE from a single department) with a minimum threshold grade based on the average across the 1.5 FCEs. (If more than Please note that meeting the required number minimum admission requirements does not guarantee one a spot in any of FCEs has been completed our programs, the minimum threshold grade will be based depending on the average number of the higher course grades program spaces available.)

Note Students are responsible for checking co- and prerequisites for all courses. Please note that the minimum threshold grade changes each enrolment period based not all courses are offered on student demand and number a regular basis. A list of spaces available in approved Cognitive Science courses can be found on the website: www.uc.utoronto.ca/requirements. For any questions; consult the program Cognitive Science Program Office; UC173; University College; 416-946-4025. Email: cecille.sioulis@utoronto.ca or the Program Director at: cogsci.director@utoronto.ca

Completion Requirements:

(8 FCEs)

Where noted below, please consult the Faculty of Arts & Science Course Calendar on prerequisites.

First Year:

CSC108H1/CSC120H1; LIN102H1 (note: LIN200H1 does not serve as prerequisite for upper year LIN courses)

Second Year:

COG250Y1 (may be taken in Year 1); STA220H1/PSY201H1; PSY270H1

Second Year and Higher:

PHL342H1; PSY493H1 or PSY473H1 (for those with the appropriate prerequisites) ; COG341H1/COG342H1, PHL342H1, PSY290H1 ; and 3 FCEs from one of Stream 1, 2, or 3:

Stream 1: Perception and Attention

PHL232H1; PSY280H1; and 2 FCEs of any of the following: COG260H1/COG341H1/COG342H1/COG343H1/ COG415H1/COG498H1/COG499H1/PSY210H1/JLP374H1 PSY312H1/NEW333H1 PSY380H1/NEW438H1 PSY475H1/PHL340H1/PHL405H1/PSY210H1 JLP374H1/PSY312H1 NEW333H1/PSY380H1/PSY473H1/PSY475H1/PSY493H1/ NEW438H1

For those with the appropriate prerequisites: CSC207H1/CSC320H1/CSC420H1
Stream 2: Language and Cognition

LIN232H1/LIN241H1; JLP315H1/JLP374H1; LIN232H1/LIN241H1 and 2 FCEs of any of the following (at least 0.5 FCE must be from LIN): COG260H1/COG341H1/COG342H1/COG343H1/COG415H1/COG498H1/COG499H1/LIN232H1/LIN241H1/LIN331H1/LIN341H1/JLP315H1/JLP374H1/JLP471H1/JLS472H1/JLS473H1/LIN232H1/LIN241H1/LIN331H1/LIN341H1/PHL245H1/PHL340H1/PHL345H1/PHL351H1/PHL451H1/PSY210H1/PSY312H1/PSY473H1/PSY493H1

For those with the appropriate prerequisites: CSC401H1/CSC485H1

Stream 3: Thinking and Reasoning

PHL245H1; PSY260H1; and 2 FCEs of any of the following: COG260H1/COG341H1/COG342H1/COG343H1/COG415H1/COG498H1/COG499H1/JLP374H1/JLP471H1/JLS472H1/JLS473H1/NEW333H1/NEW438H1/PHL246H1/PHL340H1/PHL347H1/PSY210H1/PSY312H1/PSY370H1/PSY371H1/PSY372H1/PSY473H1/PSY493H1

For those with the appropriate prerequisites: CSC207H1/CSC304H1/CSC311H1/CSC384H1/CSC486H1

Fourth Year: COG401H1/COG404H1

Description of Proposed Changes:

We are adding a minimum threshold grade for enrolment in our major. Instead of requiring only that students complete either COG250Y or 1.5 FCE of courses from LIN, CSC, PHL, or PSY, we will require in addition earning a minimum grade in the courses they use to qualify, as explained above. This change affects only the Enrolment Requirements section of our Calendar description.

Rationale:

If a student uses COG250Y to enroll, they must earn at least the minimum threshold grade. If they use instead 1.5 FCE of LIN, CSC, PHL, or PSY courses to enroll, the average of their highest grades in the relevant courses must at least meet the minimum threshold. We do not state any particular minimum grade because (1) we have not had time to adequately examine the relevant data and (2) we want the freedom to adjust our enrolment numbers based on student demand and room in the program.

The Memorandum of Agreement between UC, our college home, and the four stakeholder cognitive science FAS units (CSC, LIN, PHL, and PSY) specifies that the program not grow beyond its current size (approximately 400 students across two majors). We are already by far the largest program at UC, and each year we get larger. This year our growth finally put us well above the 400 cap we need to respect, and so we propose to limit our size as per the new language above.

Impact:

The change will have limited impact on students (though in any give year, of course, some students who might wish to enroll will not receive an invitation). The main impact will be on our stakeholder units: they will have confidence that the program will not grow beyond their capacity to support it.

Consultation:

UC’s Principal and Vice Principal, the Cognitive Science Advisory Committee, and the front-line administrative staff at UC were all consulted at length. Moreover, the OFR, Martha Harris and Associate Dean, Undergraduate Issues and Academic Planning, Asher Cutter were consulted.

Resource Implications:

These changes will require no additional resources.

Cognitive Science Major - Science

Enrolment Requirements:

This is a limited enrolment Type 2 program that can only accommodate a certain number of students. Admission
Enrolment is limited and admission requires either

(1) the completion of either COG250Y1 with a minimum threshold grade

or

(2) the completion of a combination of 1.5 FCEs in CSC, LIN, PHL, or PSY (with no more than 1 FCE from a single department) with a minimum threshold grade based on the average across the 1.5 FCEs. (If more than Please note that meeting the required number minimum admission requirements does not guarantee one a spot in any one of FCEs has been completed our programs, the minimum threshold grade will be based depending on the average number of the higher course grades program spaces available.)

Note Students are responsible for checking co- and prerequisites for all courses. Please note that the minimum threshold grade changes each enrolment period based not all courses are offered on student demand and number a regular basis. A list of spaces available in approved Cognitive Science courses can be found on the website: www.uc.utoronto.ca/requirements. For any questions, consult the program Cognitive Science Program Office, UC173, University College, 416-946-4025. Email: cecille.sioulis@utoronto.ca or the Program Director at: cogsci.director@utoronto.ca

Completion Requirements:

(8 FCEs)

Note that some Computer Science courses included below under Streams 1 and 2 have unlisted co- or prerequisites. Please consult the Faculty of Arts and Science Course Calendar. Those interested in the Science Major are advised to consider also registering for a Computer Science Specialist, Major, or Minor (for Stream 1) or a Human Biology Neuroscience Specialist or Major (for Stream 2).

First Year:

CSC108H1/CSC120H1 (recommended option); CSC148H1; MAT135H1 and MAT136H1 (or MAT137Y1)

Second Year:

COG250Y1 (may be taken in Year 1); STA220H1/STA257H1/PSY201H1; PSY270H1

Second Year and Higher:

PSY290H1, PHL342H1 ; PSY493H1 or PSY473H1 (for those with the appropriate prerequisites) ; and 2.5 FCEs from one of Stream 1 or 2:

Stream 1: Computational Cognition

Computational cognition is the interdisciplinary study of the information-processing underpinnings of cognitive mental processes. It seeks an understanding of cognition in mathematical terms and to apply this understanding to debates in artificial intelligence, cognitive psychology, and beyond.

No more than 1.5 FCEs of the 2.5 FCEs required from this list of options may come from any single 3-letter course designator, except for CSC courses. For CSC courses, a minimum of 1 FCE and up to 2 FCEs may be chosen. At least 1 FCE of the 2.5 FCEs must be at the 300-level. COG260H1/COG341H1/COG342H1/COG343H1/COG415H1/COG498H1/COG499H1/CSC207H1/CSC304H1/CSC311H1/CSC324H1/CSC384H1/CSC401H1/CSC413H1/CSC420H1/CSC458H1/CSC486H1/JLP315H1/JLP374H1/JLP471H1/LIN102H1/LIN228H1/LIN232H1/LIN241H1/LIN323H1/LIN331H1/LIN341H1/NEW333H1/NEW438H1/PHL240H1/PHL245H1/PHL246H1/PHL345H1/PHL348H1/PHL349H1/PHL355H1/PSY210H1/PSY220H1/PSY230H1/PSY260H1/PSY270H1/PSY280H1/PSY290H1/PSY312H1/PSY305H1/PSY316H1/PSY330H1/PSY331H1/PSY362H1/PSY370H1/PSY371H1/PSY372H1/PSY378H1/PSY379H1/PSY380H1/PSY414H1/PSY475H1

Stream 2: Cognition and the Brain
Today’s cognitive scientists are more interested than ever before in the way the brain implements the information-processing underpinnings of cognitive mental processes. The study of cognition and the brain is the study, grounded in cognitive neuroscience, of those aspects of brain activity directly relevant to the performance of cognitive functions.

At BIO130H1 and 2.0 FCEs of the following courses, with at least 1.5 + FCE must come coming from PSY courses and 1:

At least 0.5 FCE of the 2.5 2.0 FCEs must be at the 300-level. COG260H1/COG341H1/COG342H1/COG343H1/COG415H1/COG498H1/COG499H1/JLP315H1/CSC207H1/JLP374H1/CSC311H1/JLP471H1/JLS472H1/JLS473H1/NEW333H1/NEW438H1/PHL355H1/PHL357H1/PSY210H1/PSY260H1/PSY270H1/PSY280H1/PSY290H1/PSY312H1/PSY313H1/PSY316H1/PSY326H1/PSY330H1/PSY331H1/PSY362H1/PSY370H1/PSY371H1/PSY372H1/PSY380H1/PSY390H1/PSY395H1/PSY396H1/PSY397H1/PSY414H1/PSY417H1/PSY425H1/PSY450H1/PSY473H1/PSY474H1/PSY475H1/PSY492H1/PSY493H1/PSY494H1/PSY495H1/PSY496H1/PSY497H1

Fourth Year:

COG402H1/COG403H1/COG404H1

**Description of Proposed Changes:**

We are adding a minimum threshold grade for enrolment in our major. Instead of requiring only that students complete either COG250Y or 1.5 FCE of courses from LIN, CSC, PHL, or PSY, we will require in addition earning a minimum grade in the courses they use to qualify, as explained above. This change affects only the Enrolment Requirements section of our Calendar description.

**Rationale:**

If a student uses COG250Y to enroll, they must earn at least the minimum threshold grade. If they use instead 1.5 FCE of LIN, CSC, PHL, or PSY courses to enroll, the average of their highest grades in the relevant courses must at least meet the minimum threshold. We do not state any particular minimum grade because (1) we have not had time to adequately examine the relevant data and (2) we want the freedom to adjust our enrolment numbers based on student demand and room in the program.

The Memorandum of Agreement between UC, our college home, and the four stakeholder cognitive science FAS units (CSC, LIN, PHL, and PSY) specifies that the program not grow beyond its current size (approximately 400 students across two majors). We are already by far the largest program at UC, and each year we get larger. This year our growth finally put us well above the 400 cap we need to respect, and so we propose to limit our size as per the new language above.

**Impact:**

The change will have limited impact on students (though in any give year, of course, some students who might wish to enroll will not receive an invitation). The main impact will be on our stakeholder units: they will have confidence that the program will not grow beyond their capacity to support it.

**Consultation:**

UC’s Principal and Vice Principal, the Cognitive Science Advisory Committee, and the front-line administrative staff at UC were all consulted at length. Moreover, the OFR, Martha Harris and Associate Dean, Undergraduate Issues and Academic Planning, Asher Cutter were consulted.

**Resource Implications:**

These changes will require no additional resources.