Faculty of Arts and Science
Science Curriculum Committee
1 Minor Program Modification (Full Divisional Review)

Focus In Theory of Computation

<table>
<thead>
<tr>
<th>Start Session:</th>
<th>Summer 2017</th>
</tr>
</thead>
</table>

Current Completion Requirements:

Required Courses:

1. MAT137Y1/MAT157Y1/MAT237Y1 (Note: If MAT237Y1 is used here, it cannot be counted as part of the 2.0 FCEs for point 5, below.)
2. CSC463H1
3. CSC336H1/CSC350H1
4. 1.5 FCEs from the following: CSC310H1, CSC438H1, CSC448H1, MAT443H1, MAT332H1, MAT344H1. At UTM: CSC322H5/MAT302H5, CSC422H5, CSC494H1/CSC495H1 project supervised by a faculty member from the Theory group, or a relevant introductory graduate course in Theory. (Note that students must petition to take a graduate course.)
5. 2.0 FCEs from the following: APM236H1/MIE262H1, MIE263H1, APM421H1, APM461H1, MAT224H1/MAT247H1, MAT237Y1/MAT257Y1, MAT244H1/MAT267H1, MAT301H1/MAT347Y1, MAT315H1, MAT327H1, MAT334H1/MAT354H1, MAT337H1/MAT357H1, any 400-level MAT course (except MAT443H1), STA248H1/STA261H1, STA347H1

Recommended Courses:

1. Students are strongly encouraged to take the enriched theory courses: CSC240H1 and CSC265H1, rather than their regular counterparts: CSC165H1/CSC236H1 and CSC263H1, respectively.

Suggested Related Courses:

1. BCB410H1
2. CSC320H1/CSC418H1/CSC420H1, CSC321H1/CSC384H1/CSC411H1/CSC485H1, CSC343H1/CSC433H1, CSC351H1/CSC456H1, CSC358H1/CSC458H1, CSC412H1/CSC465H1/CSC486H1, CSC473H1, CSC488H1

New Completion Requirements:

Required Courses:

1. MAT137Y1/MAT157Y1/MAT237Y1 (Note: If MAT237Y1 is used here, it cannot be counted as part of the 2.0 FCEs for point 4, below.)
2. CSC463H1
3. 2.0 FCEs from the following: CSC304H1, CSC310H1, CSC336H1, CSC438H1, CSC448H1, CSC473H1, MAT309H1, MAT332H1, MAT344H1; at UTM: CSC322H5/MAT302H5, CSC422H5; graduate courses: CSC2221H1, CSC2401H1, CSC2410H1, CSC2420H1, CSC2426H1 (note that students must petition to take a graduate course)
4. 2.0 FCEs from the following: APM236H1/MIE262H1, MIE263H1, APM421H1, APM461H1, MAT224H1/MAT247H1, MAT237Y1/MAT257Y1, MAT244H1/MAT267H1, MAT301H1/MAT347Y1, MAT315H1, MAT327H1, MAT334H1/MAT354H1, MAT335H1, MAT337H1/MAT357H1, any 400-level MAT course, STA248H1/STA261H1, STA347H1

Notes:

1. Students who complete an independent study project (CSC494H1/CSC495H1) under the supervision of a faculty member from the Theory group may request to substitute one of CSC494H1/CSC495H1 for one of the courses in...
2. Students who complete a graduate Topics course in Theory may request to count it towards the completion of list 3 above. This request must be made directly to the department's Undergraduate Office.

Recommended Courses:

1. Students are strongly encouraged to take the enriched theory courses: CSC240H1 and CSC265H1, rather than their regular counterparts: CSC165H1/CSC236H1 and CSC263H1, respectively.

Program Delivery:

**Method:** In Class

**Brief Description of the Proposal:**

Housekeeping: removing courses that have not been offered for many years (MAT443H1); adding new courses that were missing (CSC304H1, CSC473H1, MAT309H1); moving CSC336H1 from required to optional (focus of CSC336H1 is not theoretical but its theoretical counterpart, CSC350H1, is no longer offered); listing graduate courses explicitly, adding notes about exceptions that students can request.

**Consultation:**
# Major Program Modification

## Environmental Geosciences Specialist (Science Program)

### Start Session:

Summer 2017

### Current Calendar Description:


### New Calendar Description:

The Environmental Geosciences specialist program explains the interconnectedness within the Earth system (biosphere, hydrosphere, atmosphere, and geosphere), measures and models processes related to groundwater and biochemical activities, and assesses the effects of human activities on our geological surroundings.

### Current Completion Requirements:

Jointly sponsored by the School for the Environment and the Department of Earth Sciences. Topics include earth materials, sedimentary geology, aqueous geochemistry, hydrogeology and biogeochemistry. For more information, please contact the Department of Earth Sciences, undergradchair@es.utoronto.ca. Students should note that under the Professional Geoscientists Act of 2000, individuals practicing Environmental Geoscience in Ontario require education that fulfills APGO knowledge requirements or a P.Eng.  

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

Environmental Geosciences Specialist  
First Year: CHM151Y1/CHM135H1, CHM136H1 (CHM138H1, CHM139H1); (MAT135H1, MAT136H1) / MAT137Y1; PHY131H1, PHY132H1  
First or Second Year: BIO120H1  
Second to Fourth Years: ENV233H1, ESS221H1, ESS222H1, ESS241H1; GGR201H1; ENV234H1/ESS261H1/EEB214H1; CHM210H1; MAT235Y1/(MAT221H1/MAT223H1, ESS345H1); STA220H1/GGR270H1; ESS311H1, ESS312H1, ESS313H1; ESS425H1/ENV315H1; ESS461H1, ESS410H1  
2.0FCE from: JGA305H1, ESS381H1, ESS450H1, ESS441H1, ESS445H1, ESS481H1, ESS491H1, ESS492Y1

### New Completion Requirements:

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3
Jointly sponsored by the School for the Environment and the Department of Earth Sciences. Topics include earth materials, sedimentary geology, aqueous geochemistry, hydrogeology and biogeochemistry. For more information, please contact the Department of Earth Sciences, undergradchair@es.utoronto.ca. Students should note that under the Professional Geoscientists Act of 2000, individuals practicing Environmental Geoscience in Ontario require education that fulfills APGO knowledge requirements (see note below) or a P.Eng.

(12 full courses or their equivalent which includes fulfillment of the Faculty’s Distribution requirement, including at least 1.0 FCE from 400-series courses)

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

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

2nd year required courses (2 FCE): ESS241H1, ENV233H1, ESS262H1, GGR201H1

2nd year elective courses: 1 FCE from ESS221H1, ESS222H1, ESS261H1, STA220H1/GGR270H1, CHM210H1, MAT221H1/MAT223H1; up to 0.5 FCE of this requirement can be satisfied by taking one of the following ethics courses: IMC200H1/PRL273H1/PRL275H1/ABS201Y1

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

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

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: ESS221H1, ESS241H1, ESS330H1, ESS331H1
Group 2B: ENV233H1, 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.

**Brief Description of the Proposal:**

Reduction of overall FCE requirements from 14.5 to 12 FCE, reducing the number of required courses from 11.5 to 6 FCE, and increasing the number of electives from 2 to 6 FCE.

**Rationale:**

The rationale for this change can be seen from both the students' and the faculty perspective:

**Student perspective:**

Not all students taking the Environmental Geoscience Specialist aim to become certified as professional geoscientists. In fact, the current requirement are restrictive and make it hard to complete the program in time. Changing the course designations from required to elective provides more flexibility, and reducing the total FCE requirements will enable students to complete an additional minor or major program in another discipline without compromising the program for those students who want to get APGO certified. All courses which are required to get APGO certification are listed in the calendar. This proposal gives students the choice whether they want to obtain this certification or not, depending on their career aspirations. Program learning outcomes are not diminished by reducing the number of required FCE from 11.5 to 6.0 FCE (see note below). The 6.0 FCE core courses provide depth of knowledge as well as an introduction and practice of competencies, and both required 400-level courses include an integrative, inquiry-based activity. Elective courses reinforce the learning of competencies. Increasing the number of elective courses from 2.0 to 6.0 FCE allows students to match courses to their interest. For example, by choosing programming, introductory geophysics, and a geophysics field course they will be able to link chemical aspects of groundwater to subsurface imaging and modeling methods. Or they may be interested in the biological aspects that would be covered by a combination of introductory biology, atmosphere-biosphere interactions, and global geochemical cycles. The list of electives is 15.0 FCE, large enough to offer choice but not too large to make it confusing.

**Faculty perspective:**

The external review in 2013 states: "The Environmental Geosciences specialist program is in need of revision, considering
This proposal responds to the reviewers’ suggestion. The proposed revision, if approved, will offer a distinct environmental specialist degree that builds on the strength and expertise of our faculty. It includes new courses developed for the Earth and Environmental Systems Major POST, which reinforce the learning outcomes by providing a wider context. It builds a solid foundation for students who aspire to work in other professions (for example teaching, law, NGOs, and science reporting).

Program learning outcomes:
Graduates of the Environmental Geoscience Specialist program will continue to acquire essential knowledge and skills they need to assess environmental concerns related to geosciences and to contribute to the well-being of our society.

Specifically, graduates of the Environmental Geosciences Specialist program will be able to accomplish the following (relevant courses noted in brackets):
- explain biological [ESS262, ESS461], chemical [CHM151Y or CHM135+136, ENV233], and physical [PHY131] principles that form the basis for understanding environmental issues, including the actions of biological agents in geologic settings [ESS262],
- collect meaningful data both in the field and in a laboratory setting [ESS410, ESS461],
- integrate their own field observations into a meaningful map and coherent report [ESS241, ESS410, ESS461],
- infer from chemical, hydrologic, and geologic data possible solutions to issues of environmental concerns [ESS311, ESS312],
- interpret environmental data, and suggest possible and practical solutions [ESS312, ESS410],
- integrate geological knowledge with broader environmental issues [ESS262, ESS311, ESS410],
- discuss the availability of and threat to water resources [ESS311], and assess the fate of waste products [ESS312],
- evaluate the effects of natural processes and human actions on the environment [ESS262, ESS311], and
- appreciate the interconnectedness and quantify processes within the Earth system (biosphere, hydrosphere, atmosphere, and geosphere) [ESS262, ESS461].

In addition, our students will be able to
- organize their thoughts into coherent geological arguments [ESS241, ESS410, ESS461],
- communicate effectively to a variety of audiences in written work and oral presentations [WIT course ESS241, ESS461], and contribute as a competent member to the success of a team [ESS410 field course],
- locate and retrieve necessary information from a wide range of sources and evaluate its relevance and reliability [ESS241, ESS461],
- construct arguments based on statistics, calculus, algebra, geometry, and modelling as appropriate for a given problem [ESS262, ESS410], and
- reflect on the ethical implications of their actions [ESS312, ESS410].

Elective courses reinforce these learning outcomes and provide additional perspectives. We note that these learning outcomes are effectively unchanged from the previous specialist; while fewer courses are now explicitly required, those courses were always part of the program and in essence served as its invisible backbone; highlighting them as required, and not elective, really makes this explicit. Courses no longer required are listed as electives, these courses allow for additional hands-on experience in field work and data collection for example via a capstone field trip or a thesis project. Other elective courses were created for the new Earth and Environmental Systems Major program and add a range of academic questions concerning the systems approach, which are actively being researched in the department (including chemical and biological processes in the oceans, determining and modeling past climate, human effects on the environment, and ways how we can monitor such processes), but are not required for registration by the professional societies in Canada. The current program automatically leads into such registration, our proposed revision will give students the choice. By offering more courses as electives, and advising students about prerequisite structures, we can better balance sufficient breadth of material of the overall field with depth of knowledge in those areas that match an individual student's interest.

Impact that the proposal may have on students or other academic units/divisions:
For those students aiming at APGO certification, there is no impact because we are not removing courses from our offerings. For other students in the program there is considerably more flexibility and a reduced course load without impact on overall learning outcomes. Currently the number of students in this program is very low, and we expect that more students will be attracted to the revised program. There is no expected impact on other units.

Consultation:
This proposal was developed by the department's Undergraduate Affairs Committee in fall 2016, and voted on at the department council on 27 January 2017. We shared it with Kimberly Strong (director) and Sarah Finkelstein (academic associate director) at the School of the Environment who see the change as positive, in particular as it will allow students to add a major or minor in Environmental Science or a minor in Environmental Studies. Seven students currently enrolled in the Environmental Geosciences Specialist program received an email outlining these changes and were given the opportunity to comment and/or come talk in person; they welcome the idea of getting more choice in the selection of courses.
**Resource Implications:**

There are no resource implications.
1 New Course (Proposal Details Below)

EEB430H1: Theoretical Ecology

Proposal Details for 1 New Course

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<th>EEB430H1: Theoretical Ecology</th>
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<td>Abbreviated Title</td>
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<td>Resource Implications</td>
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<td>Resource Budget</td>
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# 1 New Course (Proposal Details Below)

ECO423H1: Economics and Biosocial Data

## Proposal Details for 1 New Course

### ECO423H1: Economics and Biosocial Data

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<thead>
<tr>
<th>Calendar Title</th>
<th>Economics and Biosocial Data</th>
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<tr>
<td>Abbreviated Title</td>
<td>Economics and Biosocial Data</td>
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<tr>
<td>Division</td>
<td>Arts and Science, Faculty of</td>
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<tr>
<td>Unit</td>
<td>Economics, Department of</td>
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<tr>
<td>College</td>
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<td>Associated with (Division)</td>
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<td>Associated with (Unit)</td>
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### Contact Hours

| Lecture: 24 | Seminar: | Practical: | Tutorial: 12 |

### Description

This course introduces and critically assesses economic research that uses genetic, neuroscientific, and other biosocial data. We will address questions such as: What are the effects of brain neurochemistry on economic decision-making? What role do nature and nurture play in economic behaviour and outcomes? What can we learn from genoeconomics? What are the policy implications (or lack thereof) of related findings? No previous background in biology or genetics is required.

### Prerequisites

ECO200Y1/ECO204Y1/ECO206Y1; ECO220Y1/ECO227Y1/(STA220H1,STA255H1)/(STA257H1,STA261H1) ; at least 1.0 ECO FCE at the 300+ level; or permission of the instructor.

### Exclusions

ECO422H1S (winter 2017)

### Recommended Preparation

ECO374H1/ECO375H1

### Competency Levels

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

### Experiential Learning

- **Research**: none
- **Other**: none
- **Nature of "Other" Experiential Learning**: None selected

### Distribution Requirements

- Social Science

### Breadth Requirements

- Society and its Institutions (3)

### Credit Value

- Fixed: 0.5

### Student May Select Credit/No Credit

- Yes

### Rationale

This course was first introduced in 2016-2017 under a Special Topics number, ECO 422H1S, by a new faculty member and is now receiving its own number. This course exposes students to a relatively new and important field of research in economics. The increasing availability of biosocial data and their addition to many commonly-used socioeconomic datasets has led many economists and social scientists to seek ways to integrate these data in their research. Major research funders, including the US NIH, the NIA, the NSF, and the European...
Research Council, have supported these efforts. Numerous initiatives, such as the The Foundations of Human Behavior and the Mind Brain Behavior initiatives at Harvard and the Russell Sage Foundations Special Initiative on Integrating Biology and Social Science Knowledge, have sprouted to encourage social scientists to seek ways to integrate biosocial data in their research. Genetic and biosocial data are also becoming more and more pervasive in today's society, with personal genomic companies rapidly expanding and the popular media frequently discussing recent scientific advances and their implications. It is thus increasingly important to give students, who are future economists, social scientists, and policy makers, the opportunity to critically discuss and engage with genetic and other biosocial data in an academic setting.

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<th>Consultation</th>
<th>Resource Implications</th>
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<tbody>
<tr>
<td>Resource Budget</td>
<td>Academic Unit will provide the resources required for this course from their existing budget.</td>
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### Proposal Details for 1 New Course

**MAT245H1: Mathematical Methods in Data Science**

<table>
<thead>
<tr>
<th>Calendar Title</th>
<th>Mathematical Methods in Data Science</th>
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<tbody>
<tr>
<td>Abbreviated Title</td>
<td>Math. Methods in Data Science</td>
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<td>Arts and Science, Faculty of</td>
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<td>Unit</td>
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<td>College</td>
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<td>(Unit)</td>
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<tr>
<td>Contact Hours</td>
<td>Lecture: 36</td>
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<td>Description</td>
<td>An introduction to the mathematical methods behind scientific techniques developed for extracting information from large data sets. Elementary probability density functions, conditional expectation, inverse problems, regularization, dimension reduction, gradient methods, singular value decomposition and its applications, stability, diffusion maps. Examples from applications in data science and big data.</td>
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<tr>
<td>Prerequisites</td>
<td>MAT137Y1/MAT157Y1, MAT223H1/MAT240H1, MAT224H1/MAT247H1</td>
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<td>Corequisites</td>
<td>MAT237Y1/MAT257Y1</td>
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<td>Exclusions</td>
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**Recommended Preparation**

**Competency Levels**

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

**Experiential Learning**

- **Research:** none
- **Other:** none

**Nature of "Other" Experiential Learning:** None selected

**Distribution Requirements**

- Science

**Breadth Requirements**

- The Physical and Mathematical Universes (5)

**Credit Value**

- Fixed: 0.5

**Student May Select Credit/No Credit**

- Yes

**Rationale**

The course is aimed at math students who take MAT137 and MAT157. Some of these students are not interested in real-world applications of mathematics and so do not take courses like STA257 or STA261 because those courses aren't "mathy" enough. At the same time, these students find that there aren't enough 200-level math courses they want to take. One of the goals of the course is to introduce these students to some of the mathematics used in data science, providing them with additional breadth and skills. Also, there will be a lab component for the course, using a computer lab. This is non-standard for our math courses and will create more math students who can program and analyze data.
<table>
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<th>Consultation</th>
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<tr>
<td>On Monday Dec 12, we met with Alison Gibson and Nathan Taback from Statistics about the course proposal. They are fine with the course's coming into existence and will not list it as an exclusion to STA257 or STA261 as long as the three weeks of material doesn't expand to be more than three weeks. We will contact them should any such topic-creep into those courses start to happen.</td>
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<td>1 instructor, 1 or 2 TAs (depending on enrolment), computer lab with python installed.</td>
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<th>Resource Budget</th>
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<td>Academic Unit will provide the resources required for this course from their existing budget.</td>
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### Proposals Pertaining to Free-Standing Programs

**7 Major Program Modifications (Significant Alterations to Existing Program Component)**

**Fundamental Genetics and its Applications Major**

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<th><strong>Current Admission Requirements:</strong></th>
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<th><strong>New Admission Requirements:</strong></th>
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<td>No changes</td>
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<th><strong>Current Enrolment Requirements:</strong></th>
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<td>This is a Type 1 open enrolment program. Students are permitted to enrol in the major during the program enrolment cycle as soon as they have earned 4.0 FCE. It is recommended students complete their first year life science requirements before entering the program.</td>
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**Required Courses (8.0 FCE)**

**First-Year Life Sciences**

1. BIO120H1, BIO130H1
2. (CHM135H1, CHM136H1) / (CHM138H1, CHM139H1) / CHM151Y1 (transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion to a pre-approved chemistry course)
3. MAT135H1 / PHY131H1 / PHY151H1

**Year 2: Foundations in genetics and its applications**

4. HMB201H1
5. BIO230H1 / BIO255H1, BIO220H1
6. HMB265H1 / BIO260H1
7. BCH210H1
8. statistics: STA220H1 / PSY201H1 / HMB325H1

**Year 3: Selected topics in genetics with greater depth and self-directed learning**

9. 1.5 FCE from selected depth courses in molecular genetics and its applications: HMB301H1 / HMB311H1 / HMB321H1 / HMB342H1 / HMB360H1 / BCH311H1 / CSB349H1 / PSL350H1 / CSB328H1 / CSB331H1 / CSB340H1 / CSB352H1 / CSB351Y1 / CSB353H1 / BCH340H1 / EEB318H1 / EEB323H1 / EEB325H1 / EEB362H1 / EHH352H1 / MGY377H1 / MGY378H1

**Year 4: Advanced topics in genetics with emphasis on primary research and critical analysis:**

10. 0.5 FCE from courses with advanced topics in applied genetics: HMB401H1 / HMB431H1 / HMB435H1 / HMB436H1 / HMB437H1 / HMB441H1 / HMB489H1 / BCH441H1 / BCH447H1 / CSB458H1 / CSB459H1 / CSB472H1 / CSB473H1
11. 0.5 FCE from courses with advanced topics in fundamental genetics: HMB421H1/ BCH425H1/ BCH426H1/ BCH440H1/ BCH445H1/ CSB428H1/ CSB429H1

n.b. At least 0.5 FCE must be at the 400-level; students are not permitted to be enrolled in more than one Human Biology major program

**New 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. BIO220H1

6. BIO230H1/ BIO255H1

**Courses in Fundamental Genetics**

7. HMB265H1/ BIO260H1

8. HMB321H1

9. 0.5 FCE from: HMB360H1/ HMB421H1/ HMB435H1/ HMB437H1/ HMB474H1/ BCH311H1/ BCH425H1/ BCH426H1/ BCH440H1/ BCH445H1/ BCH448H1/ CSB328H1/CSB331H1/ CSB340H1/CSB349H1/ CSB351Y1/ CSB353H1/ CSB428H1/ CSB429H1/ EEB318H1/ EEB323H1/ EEB365H1/ EEB366H1/ EEB367H1/ MGY314H1/ MGY315H1/ MGY340H1/ MGY428H1/MGY452H1/ MGY470H1/ MGY471H1/ PSL350H1

**Courses in Applied Genetics**

10. HMB201H1

11. HMB301H1/ ECO369H1

12. 0.5 FCE from: HMB401H1/ HMB431H1/HMB436H1/ HMB441H1/ HMB489H1/ BCH340H1/ BCH350H1/ BCH441H1/ BCH447H1/ CSB352H1/ CSB458H1/ CSB459H1/ CSB472H1/ CSB473H1/ CSB474H1/ EEB432H1/ EEB459H1/ EEB460H1/ NFS487H1/ PHL384H1/ PSL404H1/ PSY390H1

**Data Analysis and Research-Based Courses**

13. 0.5 FCE in statistics: HMB325H1/ EEB225H1/ STA220H1/ STA288H1

14. 0.5 FCE from a research-based or lab course: HMB311H1/ HMB314H1/ MGY315H1/ HMB342H1/ HMB360H1/ HMB496Y1/* HMB499Y1/* HST373H1/ MGY314H1/ MGY377H1/ MGY378H1

* 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 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 Fundamental Genetics and its Applications majors. Students are responsible for checking priority of courses and meeting course prerequisites for courses they wish to take.

3. The Fundamental Genetics and its Applications major cannot be paired with any other Human Biology Program managed major program.
**Academic Context:**

While advances in the application of genetics has dramatically benefited human society, there is considerable interest among academics and the public sector in understanding how knowledge of genetics influences its application and whether genetic modifications pose a risk to our health and our environment.

In 2015, the Fundamental Genetics and its Applications major program was revised to emphasize fundamental concepts in genetics and how these concepts influence the application of genetics in society. The field of genetics is multidisciplinary, ranging from genomics and heredity to biodiversity and evolution. The application of genetics is equally diverse, encompassing medical diagnosis and genetic counseling, as well as biotechnology, wild life conservation, and many other areas.

The current proposal is a further revision of the program re-orientation that was initiated in 2015. The proposed program is designed to provide students with a firm foundation in both general and applied genetics through courses in HMB as well as courses offered throughout the Faculty of Arts & Science.

Students graduating with a major in the Fundamental Genetics and its Applications program will be able to communicate effectively on principles of genetic research and its application to society, and will also be equipped to pursue further studies in any focus of genetics.

**Learning Outcomes:**

Students enter the program at the end of their first year after establishing a foundation in organic biology and chemistry as well as physical chemistry. Students will also take a course in calculus, physics, or computer science, any of which offers in mathematics that is crucial to many aspects of the study of genetics and where research in genetics is today.

Students build on this foundation with core courses in both fundamental genetics (HMB265H1/BIO260H1, HMB321H1) and applied genetics (HMB201H1, HMB301H1) as well as continuing to expand their knowledge of biological components to genetics (BIO230H1/BIO255H1, BIO220H1, BCH210H1) as well as gathering quantitative research skills (a statistics course and a lab/research-based course) that will help the students learn relevant context and skills to understand the complex field of genetics and utilize their education to any number of post-graduate programs or professions.

The structure of the program allow students enrolled in the major to focus on both fundamental genetic aspects (HMB265H1/BIO260H1, HMB321H1, HMB360H1), as well as see this fundamental genetics being applied in technology and research (HMB201H1, HMB401H1). By having both sides equally represented, we encourage students in the program to meld their learning in the higher year courses and their lab/research based course.

Specific learning outcomes:

- By the end of this program, students will be able to:
  1. Demonstrate an understanding of the fundamental concepts in a wide range of genetics topics and how these concepts translate into biotechnological and medical applications.
  2. Identify and analyze data from genetic research from the primary literature.
  3. Understand appropriate quantitative techniques needed to examine genetics data.
  4. Identify and evaluate contemporary ethical perspectives on genetics research and its applications.
  5. Write and speak effectively about genetics issues to both scientific and broader audiences.

In addition to the learning outcomes listed in the 2015 proposal, as HMB now has teaching labs (which allow us more autonomy to offer more frequent, and larger lab courses), and greater course capacity in some of our 300-level courses, so we also aims to ensure that all students in the Fundamental Genetics and its Applications major gain research experience in applied genetics through the collection, analysis and interpretation of scientific data.

Our objectives and outcomes remain consistent with the 2015 major program modifications, but now that HMB has its own lab space, increased staff support, and wishes to acknowledge the changing fundamental and applied genetics landscape, the required courses have been adjusted to reflect our desired outcomes and objectives, and to offer a more consistent foundation to all students in the program.

**Depth of Knowledge:**

Introductory courses are designed to expose students to fundamental concepts in genetics (HMB265H1/BIO260H1) and its applications (HMB201H1), in particular in biotechnology, and to provide a core knowledge base in these areas from which students will build. Students are then introduced to more advanced applied genetics topics in a range of courses, including biotechnology (HMB301H1), epidemiology (HMB342H1), and bioinformatics (CSB352H1). This carries students so that can further engage in advanced courses in patents in medicine (HMB401H1), the biotechnological interface between science and industry (HMB431H1), computational genomics and bioinformatics (CSB472H1), and nutrigenomics and personalized nutrition (NFS487H1). Specialized knowledge in many areas of fundamental genetics is facilitated through depth courses focusing on the structure-function relationship of genes, such
response (PCL477H1), as well as learning a systems perspective of genetics and how it relates to evolution and health, such as molecular evolution and genomics (EEB460H1), population genetics (EEB459H1), functional genomics (MGY428H1), human genetics (MGY470H1) and regenerative medicine (PSL404H1).

**Critical and Creative Thinking:**
Students engage in critical thinking early on in the program. For example, in HMB265H1 and HMB321H1 there are weekly tutorial assignments and tests that focus on the application of course concepts and information through problem-based or case-based learning, whereas written assignments and oral presentations are based on the synthesis and critical analysis of information and techniques from both primary and review articles. These methods are implemented in the context of student-centered learning using a scaffolding approach. In HMB265H1, students are asked to create a unique pedigree as a way to examine their understanding of the flow of genetic information through generations. As with all life science programs, the integration of primary research findings into all of our courses, but especially in 300-and 400-level courses, is a critical component of the student learning experience. Students are taught how to interpret and critically analyze research as well as develop the skills in synthesizing information from multiple sources.

**Information Literacy:**
Students learn effective written and oral strategies for communicating their analyses and critiques. For example, seminar courses often require students to be creative and persuasive in developing research grant proposals (HMB421H1) or engaging in team-based learning and peer evaluations, either in class or online, in several different courses (HMB321H1, HMB360H1, HMB441H1). Seminar presentations or poster presentations are common among most advanced courses and this enables students to develop key skills in explaining, discussing, critically analyzing and synthesizes research findings in an oral presentation format. Students also have opportunities to cultivate an ability to interact and debate issues in a group setting with guest speakers that are experts in their fields, preparing them with communication skills that will be useful in a professional workplace.

**Quantitative Reasoning:**
While many courses will integrate quantitative analysis and reasoning, such as genetic mapping (HMB265H1/BIO260H1), risk assessment and GWAS analysis (HMB321H1, HMB342H1), and estimating allele frequencies, mutation rates and heritability (EEB459H1), the program also requires that students take basic statistics courses (HMB325H1/STA220H1/STA288H1/PSY201H1) that will serve as a foundation for understanding concepts and analyzing research in other courses.

**Social and Ethical Responsibility:**
Several courses will introduce students to some of the bioethical and health policy issues and controversies surrounding specific topics in genetics, including prenatal diagnosis (HMB360H1), and genetic counseling (HMB321H1). The overall objective is to offer a variety of courses that challenge the way they think about the benefits of modern genetics, the limits of these benefits, and negative repercussions that genetics applications have on society, including medicine and biotechnology.

**An Integrative, Inquiry Based Activity:**
Seminar courses in 400-level courses provide a major opportunity for students to integrate knowledge from across a spectrum of genetics and other life science courses. Students in the major program are encouraged to complete a full-year research project course or a summer research project course (HMB496Y1/HMB499Y1), although this is not a requirement. Students will typically identify suitable supervisors in hospital research institutes or campus-based laboratories and research groups. Research project course oversight includes a HMB faculty advisor that facilitates the placements, guide workshops on research presentation skills or apply statistical analyses (in collaboration with Department of Statistical Sciences), as well as organize research presentation days (with research faculty to serving as assessors). Students gain invaluable first-hand experience integrating their knowledge of genetics and other related subjects, learn to apply their quantitative reasoning and analytical skills, practice effective communication and team-based learning, and learn about ethical standards in research.

**Program Delivery:**

**Method:** In Class

**Mode:** Full Time; Part Time
**Brief Description of the Proposal:**

Modification of how Calendar listing is organized, for better clarity of program requirements. Courses allowed for the program at the higher levels has been reviewed and revised to better reflect courses that are directly related to the study of fundamental genetics and applied genetics. The total number of FCE required, 8.0, has remained the same.

**Details of Proposed Change:**

Courses allowed for the program at the higher levels has been reviewed and revised to better reflect courses that are directly related to the study of fundamental genetics and applied genetics. As follows:
1. Both HMB301H1 (Introduction to Biotechnology) and HMB321H1 (Topics in Genetics) are now required courses instead of options.
2. The 0.5 FCE required in upper-year courses in applied genetics and the 0.5 FCE required in upper year fundamental genetics courses has remained, but now includes 300-level courses to allow more freedom of choice (0.5 FCE at the 400-level is still required as per degree regulations, but students have the opportunity to meet this requirement in three separate requisite lines).
3. 0.5 FCE from a pre-approved higher-year lab course or research-based course with genetics-related content (HMB311H1/ HMB314H1/ MGY315H1/ HMB342H1/ HMB360H1/ HMB496Y1/ HMB499Y1/ HST373H1/ MGY314H1/ MGY377H1/ MGY378H1) is now required.

**Rationale:**

The Human Biology Program completed a self-study in March 2014 that the program and the Faculty of Arts & Science has been steadily working on the recommendations to enhance the overall quality of the program. Many of the recommendations have already been put into effect: our smallest program (Health Care Ethics major) has been closed for further admissions and a proposal to formally close the program will be put forward in October 2017, we have signed a MOA giving the School of the Environment full ownership of the Environment and Health major and specialist (ASMAJ0365 and ASSPE0365) and have agreed to continue teaching and supporting the capstone requirement course for the specialist program: JEH455H1 (Topics in Environment & Health) and giving Environment and Health students enrolment priority in a number of our courses. One of the first acts was a revision of the Health & Disease (ASMAJ2013 & ASSPE2013), Neuroscience (ASMAJ1472 and ASSPE1472), and our then- Genes, Genetics, and Biotechnology, now Fundamental Genetics and its Applications program (ASMAJ1050 and ASSPE1050), and Human Biology (ASMAJ2035) programs to better align the programs with the teaching strengths of the unit, the resources of the unit, and the course offerings within the Faculty of Arts & Science. These modifications came into effect in 2015-2016.

This realignment of four of our five programs has benefited the program as a whole and our students greatly, and have allowed us to see more clearly where there are gaps in the program structure and program objectives, as well as allowing us to see how to better align the programs with their objectives, as outlined in 2015. Since then, we have consulted with the Dalla Lana School of Public Health on pedagogy revisions for our Global Health major and Specialist (ASMAJ25757 and ASSPE2575), and have consulted with our faculty and staff to better assess pedagogy gaps and inconsistencies in program structure and pressure points within our programs in terms of enrollment and student outcomes. Many of the gaps/alignment were due to lack of lab space, staff, support, or lack of faculty to teach core courses.

Even in the 2015 major modification proposal, it was outlined that HMB has been working closely with [the Cell Systems and Biology Department], [the Department of Ecology and Evolutionary Biology] and the [Faculty of Arts & Science] to expand and modernize lab course offerings in the planned renovations of the [Ramsay Wright] teaching labs. However, at the time of the proposal, the labs were not yet constructed. Construction began in spring 2015 and they are currently nearing completion. HMB teaching labs will be ready for full-time use by September 2017. As such, we wish to utilize these labs in our HMB courses to better meet listed course objectives for the benefit of our students.

Sine many of the recommendations from the external review have been met, and now that HMB has more staff support including 2 lab technicians, a more clear vision, our own teaching labs (which will allow us to use the space more frequently), and have been approved to hire an appointed faculty member starting in July 2017 (the search is currently ongoing) who will allow us to offer more course sections of some of our courses without overburdening teaching assignments, we would like to make further revisions to better meet objectives outlined in 2014.

The proposed restructuring of all of our programs is the next step in further defining improvements and innovations first initiated in 2015-2016.

**Impact that the proposal may have on students or other academic units/divisions:**

Impact on other units should be minimal as enrollment is not planned to increase. Currently the enrollment into the fundamental genetics and its applications major is 248, with a 2 year average of 260. We are not anticipating a large
(Molecular Genetics, Fundamental Genetics and its Applications, and Genomics), and students already appear to be self-selecting which genetics program to enrol in based on their specific interest in the diverse field of genetics. The majority of the courses required in the program are the same course requirement/ requirement options as the current Fundamental Genetics and its Applications major. Impact on our unit should also not increase as we have increased staff support.

Consultation:
Director Dr. Melanie Woodin has consulted extensively with Vice-Deans Pamela Klassen and Poppy Lockwood as well as with faculty within the Human Biology program. After consultations with Biochemistry in January 2017, we have eliminated the option to use CHM247H1 in lieu of BCH210H1. The program was reviewed by the Life Science Planning Committee in January 2017, and beyond the feedback offered by Biochemistry, no feedback was offered.

Diversity:
The re-design of the human biology major program ensures all students receive a solid foundation in the wide scope of human biology. HMB works closely with Accessibility Services, and accommodations requested are met.

Resource Implications:
Current support is adequate.

Faculty and TA Support:
Current support is adequate.

Fundamental Genetics and its Applications Specialist

Start Session:
Summer 2017

Current Admission Requirements:

New Admission Requirements:
No changes

Current Enrolment Requirements:
This is a Type 3 limited enrolment program. Meeting the following minimum criteria does not guarantee admissions to the specialist program:

- BIO120H1 with a minimum mark of 60%
- BIO130H1 with a minimum mark of 60%
- CHM135H1 and CHM136H1 or CHM138H1 and CHM139H1 or CHM151Y1 with a minimum mark of 60%
- MAT135H1 or PHY131H1 or PHY151H1 with a minimum mark of 60%

and, a composite average of at least 70% on the above 2.5 FCE.

Students may apply for this specialist program only during Round 1 of Type 3 Enrolment. Students applying for admissions to the program utilising transfer credits, or later than the end of their first year, will be considered on a case-by-case basis. For more information about Type 3 enrolment, visit the Faculty of Arts & Science Program Enrolment Instructions website.

New Enrolment Requirements:
This specialist is a Type 3 limited enrolment program. Admissions will be based on the following criteria, however
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 major 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.

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**Current Completion Requirements:**

**Required Courses (14.0 FCE)**

Prior to entering the specialist program:

1. **BIO120H1, BIO130H1**
2. (**CHM135H1, CHM136H1**)/*(CHM138H1, CHM139H1)/**CHM151Y1** (transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion to a pre-approved chemistry course)
3. **MAT135H1/PHY131H1/PHY151H1**

Year 2: Foundations in genetics and its applications

4. **HMB201H1**
5. **BIO230H1/BIO255H1, BIO220H1**
6. **HMB265H1/BIO260H1**
7. **BCH210H1**
8. statistics: **STA220H1/ PSY201H1/ HMB325H1**
9. bioethics: **PHL281H1/ HMB306H1**

Year 3: Selected topics in genetics

10. 1.5 FCE from selected depth courses on molecular genetics and its applications: **HMB301H1, HMB321H1, BCH311H1/ CSB349H1/ PSL350H1**
11. 0.5 FCE from a higher-year lab course: **HMB311H1/ BCH370H1/ CSB330H1/ CSB350H1/ MGY360H1/ MGY379H1**
12. 2.0 FCE from depth courses on fundamental and applied genetics: **HMB342H1/ HMB360H1/ CSB328H1/ CSB331H1/ CSB340H1/ CSB352H1/ CSB351Y1/ CSB353H1/ BCH311H1/ BCH340H1/ EEB318H1/ EEB323H1/ EEB325H1/ EEB362H1/ EHB352H1/ MGY377H1/ MGY378H1**

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

13. 1.5 FCE from courses with advanced topics in applied genetics: **HMB401H1/ HMB431H1/ HMB435H1/ HMB436H1/ HMB437H1/ HMB441H1/ HMB489H1/ BCH441H1/ BCH447H1/ CSB458H1/ CSB459H1/ CSB472H1/ CSB474H1/ EEB459H1/ EEB460H1/ NFS487H1/ PSL401H1**
14. 1.5 FCE from courses with advanced topics in fundamental genetics: HMB421H1/ BCH425H1/ BCH426H1/ BCH462H1/ BCH440H1/ BCH445H1/ CSB428H1/ CSB429H1/ CSB430H1/ CSB452H1/ CSB460H1/ EEB445H1/ LMP436H1/ MGY420H1/ MGY425H1/ MGY428H1/ MGY434H1/ MGY440H1/ MGY451H1/ MGY452H1/ MGY470H1/ PCL477H1

15. HMB499Y1

n.b. At least 1.0 FCE must be at the 400-level

**New 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. BIO220H1
6. BIO230H1/ BIO255H1

**Courses in Fundamental Genetics**

7. HMB265H1/ BIO260H1
8. HMB321H1

**Courses in Applied Genetics**

10. HMB201H1
11. HMB301H1 / ECO369H1
12. 1.5 FCE from: HMB401H1/ HMB431H1/HMB436H1/ HMB441H1/ HMB489H1/ BCH340H1/ BCH441H1/ BCH447H1/ CSB352H1/ CSB458H1/ CSB459H1/ CSB472H1/ CSB473H1/ CSB474H1/ EEB325H1/ EEB459H1/ EEB460H1/ NFS487H1/ PHL384H1/ PSL404H1/ PSY390H1

**Data Analysis and Research-Based Courses**

13. 0.5 FCE in statistics: HMB325H1/ EEB225H1/ STA220H1/ STA288H1
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: 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.
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| While advances in the application of genetics has dramatically benefited human society, there is considerable interest among academics and the public sector in understanding how knowledge of genetics influences its application and whether genetic modifications pose a risk to our health and our environment.  
In 2015, the Fundamental Genetics and its Applications major and specialist programs were revised to emphasize fundamental concepts in genetics and how these concepts influence the application of genetics in society. The field of genetics is multidisciplinary, ranging from genomics and heredity to biodiversity and evolution. The application of genetics is equally diverse, encompassing medical diagnosis and genetic counseling, as well as biotechnology, wildlife conservation, and many other areas.  
The current proposal is a further revision of the program re-orientation that was initiated in 2015. The proposed program is designed to provide students with a firm foundation in both general and applied genetics through courses in HMB as well as courses offered throughout the Faculty of Arts & Science. Students graduating with a major in the Fundamental Genetics and its Applications program will be able to communicate effectively on principles of genetic research and its application to society, and will also be equipped to pursue further studies in any focus of genetics. |

<table>
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<th>Learning Outcomes:</th>
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| Students enter the program at the end of their first year after establishing a foundation in organic biology and chemistry as well as physical chemistry. Students will also take a course in calculus, physics, or computer science, any of which offers in mathematics that is crucial to many aspects of the study of genetics and where research in genetics is today.  
Students build on this foundation with core courses in both fundamental genetics (HMB265H1/BIO260H1, HMB321H1) and applied genetics (HMB201H1, HMB301H1) as well as continuing to expand their knowledge of biological components to genetics (BIO230H1/BIO255H1, BIO220H1, BCH210H1) as well as gathering quantitative research skills (a statistics course and a lab/research-based course) that will help the students learn relevant context and skills to understand the complex field of genetics and utilize their education to any number of post-graduate programs or professions.  
The structure of the program allow students enrolled in the specialist to focus on both fundamental genetic aspects (HMB265H1/BIO260H1, HMB321H1, HMB360H1), as well as see this fundamental genetics being applied in technology and research (HMB201H1, HMB401H1). By having both sides equally represented, we encourage students in the program to meld their learning in the higher year courses and their lab/research based course.  
Specific learning outcomes: By the end of this program, students will be able to:  
1. Demonstrate an understanding of the fundamental concepts in a wide range of genetics topics and how these concepts translate into biotechnological and medical applications.  
2. Identify, analyze, and critically evaluate data from genetic research from the primary literature.  
3. Gain research experience in applied genetics through the collection, analysis and interpretation of scientific data.  
4. Understand and apply appropriate quantitative techniques needed to examine genetics data.  
5. Gain lab experience and relevant skills in genetics related labs  
6. Identify and critically evaluate contemporary ethical perspectives on genetics research and its applications.  
7. Write and speak effectively about genetics issues to both scientific and broader audiences.  
These learning objectives are subtly revised from the Winter 2015 proposed learning outcomes. This is due to revisions in the clarifying process that was initiated in December 2015 that lead to the current program modification proposals. For example "Acquire basic laboratory skills in the life sciences" was revised to "Gain lab experience and relevant skills in genetics related labs." The core pedagogical foundation of the learning objective remains the same, however, we have clarified it, to better explain why the lab courses listed in the relevant requisite line are the approved lab courses for this line. |

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Students engage in critical thinking early on in the program. For example, in HMB265H1 and HMB321H1 there are weekly tutorial assignments and tests that focus on the application of course concepts and information through problem-based or case-based learning, whereas written assignments and oral presentations are based on the synthesis and critical analysis of information and techniques from both primary and review articles. These methods are implemented in the context of student-centered learning using a scaffolding approach. In HMB265H1, students are asked to create a unique pedigree as a way to examine their understanding of the flow of genetic information through generations. As with all life science programs, the integration of primary research findings into all of our courses, but especially in 300-and 400-level courses, is a critical component of the student learning experience. Students are taught how to interpret and critically analyze research as well as develop the skills in synthesizing information from multiple sources.

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In order to complete written and oral assignments, students are required to learn to use Internet based search engines (e.g. PubMed, Google Scholar, Ensembl, etc.) to acquire relevant information from the primary literature and genome databases. Students are typically evaluated on their effective gathering and use of this information through enhanced citations, and the ability to use PowerPoint, Keynote, blogs and other presentation formats.

Quantitative Reasoning:

While many courses will integrate quantitative analysis and reasoning, such as genetic mapping (HMB265H1/BIO260H1), risk assessment and GWAS analysis (HMB321H1, HMB342H1), and estimating allele frequencies, mutation rates and heritability (EEB459H1), the program also requires that students take basic statistics courses (HMB325H1/STA220H1/STA288H1/PSY201H1) that will serve as a foundation for understanding concepts and analyzing research in other courses.

Social and Ethical Responsibility:

Several courses will introduce students to some of the bioethical and health policy issues and controversies surrounding specific topics in genetics, including prenatal diagnosis (HMB360H1), and genetic counseling (HMB321H1, HMB452H1). The overall objective is to offer a variety of courses that challenge the way they think about the benefits of modern genetics, the limits of these benefits, and negative repercussions that genetics applications have on society, including medicine and biotechnology.

An Integrative, Inquiry Based Activity:

Seminar courses in 400-level courses provide a major opportunity for students to integrate knowledge from across a spectrum of genetics and other life science courses. Students in the specialist program are required to complete a full-year research project course or a summer research project course (HMB496Y1/HMB499Y1). Students will typically identify suitable supervisors in hospital research institutes or campus-based laboratories and research groups. Research project course oversight includes a HMB faculty advisor that facilitates the placements, guide workshops on research presentation skills or apply statistical analyses (in collaboration with Department of Statistical Sciences), as well as organize research presentation days (with research faculty to serving as assessors). Students gain invaluable first-hand experience integrating their knowledge of genetics and other related subjects, learn to apply their quantitative reasoning and analytical skills, practice effective communication and team-based learning, and learn about ethical standards in research.

Program Delivery:
Brief Description of the Proposal:
Modification of how Calendar listing is organized, for better clarity of program requirement. The total number of FCE required has been reduced to 12.0 FCE from 14.0 FCE.

Details of Proposed Change:
The total number of FCE required has been reduced to 12.0 FCE from 14.0 FCE to make the program more manageable in four years to students enrolled in the program, and to promote students enrolled in the program to undertake at least one minor program to enhance their trans-disciplinary education.

Courses allowed for the program at the higher levels has been reviewed and revised to better reflect courses that are directly related to the study of fundamental genetics and applied genetics, but the language of the requirement lines did not change here.

- 0.5 FCE from pre-approved research-based courses now required (HMB342H1/HMB360H1/HST373H1/MGY377H1/MGY378H1)

Update of specialist enrolment criteria (i.e. admissions to the program) to better demonstrate and offer more transparency on criteria already being used for specialist enrolment, and to acknowledge many students enter the program after second year, and we do not assess their 100-level courses for admissions if they are not a first year student.

Rationale:
The Human Biology Program completed a self-study in March 2014 that the program and the Faculty of Arts & Science has been steadily working on the recommendations to enhance the overall quality of the program. Many of the recommendations have already been put into effect; our smallest program (Health Care Ethics major) has been closed for further admissions and a proposal to formally close the program will be put forward in October 2017, we have signed a MOA giving the School of the Environment full ownership of the Environment and Health major and specialist (ASMAJ0365 and ASSPE0365) and have agreed to continue teaching and supporting the capstone requirement course for the specialist program: JEH455H1 (Topics in Environment & Health) and giving Environment and Health students enrolment priority in a number of our courses.

One of the first acts was a revision of the Health & Disease (ASMAJ2013 & ASSPE2013), Neuroscience (ASMAJ1472 and ASSPE1472), and our then- Genes, Genetics, and Biotechnology, now Fundamental Genetics and its Applications program (ASMAJ1050 and ASSPE1050), and Human Biology (ASMAJ2035) programs to better align the programs with the teaching strengths of the unit, the resources of the unit, and the course offerings within the Faculty of Arts & Science. These modifications came into effect in 2015-2016.

This realignment of four of our five programs has benefited the program as a whole and our students greatly, and have allowed us to see more clearly where there are gaps in the program structure and program objectives, as well as allowing us to see how to better align the programs with their objectives, as outlined in 2015.

Since then, we have consulted with the Dalla Lana School of Public Health on pedagogy revisions for our Global Health major and Specialist (ASMAJ25757 and ASSPE2575), and have consulted with our faculty and staff to better assess pedagogy gaps and inconsistencies in program structure and pressure points within our programs in terms of enrollment and student outcomes. Many of the gaps/alignment were due to lack of lab space, staff, support, or lack of faculty to teach core courses.

Even in the 2015 major modification proposal, it was outlined that HMB has been working closely with [the Cell Systems and Biology Department], [the Department of Ecology and Evolutionary Biology] and the [Faculty of Arts & Science] to expand and modernize lab course offerings in the planned renovations of the [Ramsay Wright] teaching labs. However, at the time of the proposal, the labs were not yet constructed. Construction began in spring 2015 and they are currently nearing completion. HMB teaching labs will be ready for full-time use by September 2017. As such, we wish to utilize these labs in our HMB courses to better meet listed course objectives for the benefit of our students.

Sine many of the recommendations from the external review have been met, and now that HMB has more staff support including 2 lab technicians, a more clear vision, our own teaching labs (which will allow us to use the space more frequently), and have been approved to hire an appointed faculty member starting in July 2017 (the search is currently ongoing) who will allow us to offer more course sections of some of our courses without overburdening teaching assignments, we would like to make further revisions to better meet objectives outlined in 2014.

The proposed restructuring of all of our programs is the next step in further defining improvements and innovations first initiated in 2015-2016.

Impact that the proposal may have on students or other academic units/divisions:
Currently this program is a Type 3 program restricted to 44 students per cohort year, with 29 students total currently enrolled, with an average of 10 students per cohort year. The two year total enrolment average of the program is 23. Impact on other units should be minimal as enrolment is not planned to increase. The majority of the courses required in the program are the same course requirement/requirement options as the current neuroscience major. Impact on our unit should also not increase as we have increased staff support.

**Consultation:**

Director Dr. Melanie Woodin has consulted extensively with Vice-Deans Pamela Klassen and Poppy Lockwood as well as with faculty within the Human Biology program. It should be noted that the Provost has inquired on what consultation has been done with units whose courses are listed in the current proposal. The proposal was reviewed at the Life Science Planning Committee in November 2016, and no feedback was received.

**Diversity:**

The re-design of the human biology major program ensures all students receive a solid foundation in the wide scope of human biology. HMB works closely with Accessibility Services, and accommodations requested are met. This will not change. Further, many of our faculty work to offer a variety of assignments that better provide to a variety of learners in their courses.

**Resource Implications:**

Current support is adequate.

**Faculty and TA Support:**

Current support is adequate.

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**Human Biology Major**

**Start Session:**

Summer 2017

**Current Calendar Description:**

New Calendar Description:

**HMB: Human Biology**

Human Biology is a transdisciplinary field concerned with the study of human health from a biological, sociological, and evolutionary perspective. Research in human biology focuses on impact that genetic variations, development, physical fitness, and nutrition have on the general health of populations and how this compares across cultures and through history. The objective of the HMB: Human Biology major program is to provide students with a solid foundation in the life sciences as it relates to human biology and to facilitate the integration of concepts from across the social sciences and humanities, and to equip them with quantitative skills essential to research and success in this field.

**Current Admission Requirements:**

**New Admission Requirements:**

**Current Enrolment Requirements:**

This is a Type 1 open enrolment program. Students are permitted to enrol in the major during the program enrolment cycle as soon as they have earned 4.0 FCE. It is recommended students complete their first year life science requirements before entering the major.

**New Enrolment Requirements:**
This is a Type 1 open enrolment program. Students are permitted to enrol in the major during the program enrolment cycle when they have earned 4.0 FCE. It is recommended that students complete the programs required 100-level courses before entering the major program.

**Current Completion Requirements:**

**Required Courses (8.0 FCE)**

First-Year Life Sciences

1. **BIO120H1, BIO130H1**
2. \((CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1\) (transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion to a pre-approved chemistry course)
3. **MAT135H1/ PHY131H1/ PHY151H1**

Year 2: Foundations in human biology

4. **HMB204H1**
5. **BIO230H1/BIO255H1, BIO220H1**
6. **BCH210H1**
7. **HMB265H1/BIO260H1**

Year 3: Selected topics in human biology with greater depth and self-directed learning

8. 1.5 FCE from courses that focus on the structure and function of the human body: **HMB302H1/ ANA300Y1/ IMM340H1/ IMM350H1/ MGY377H1/ MGY378H1/ CSB351Y1/ PSL300H1/ PSL301H1**

9. 0.5 FCE from courses that focus on the social, economic and political perspectives of human biology: **HMB303H1/ HMB306H1/HMB325H1/ ANT208H1/HST209H1/HST211H1/HST440H1/ JSU237H1/ JNH350H1/ NEW335H1/ NFS284H1/ PHL281H1/ PSY201H1/ SOC243H1/ SOC244H1/ SOC246H1/ SOC309Y1/ SOC363H1/STA220H1/ UNI103Y1**

Year 4: Advanced topics in human biology that emphasize primary research and critical analysis

10. 0.5 FCE from depth courses related to human biology: **HMB314H1/ HMB322H1/HMB323H1/ HMB325H1/ HMB342H1/ ANA301H1/ BIO270H1/ BCH311H1/BCH340H1/BCH421H1/BIO271H1/CSB325H1/CSB345H1/CSB346H1/EEB255H1/EEB318H1/EEB319H1/EEB323H1/EEB324H1/EEB325H1/EEB365H1/EEB375H1/EHJ352H1/IMM350H1/LMP363H1/NFS284H1/NFS382H1/PCL362H1/PSY371H1/PSY372H1**


*n.b. At least 0.5 FCE must be at the 400-level; students are not permitted to be enrolled in more than one Human Biology major program*

**New 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**
2. **CHM138H1, CHM139H1**
3. **CHM151Y1**
4. 0.5 FCE from chemistry courses that focus on the structure and function of the human body: **HMB302H1/ ANA300Y1/ IMM340H1/ IMM350H1/ MGY377H1/ MGY378H1/ CSB351Y1/ PSL300H1/ PSL301H1**
5. 0.5 FCE from chemistry courses that focus on the social, economic and political perspectives of human biology: **HMB303H1/ HMB306H1/HMB325H1/ ANT208H1/HST209H1/HST211H1/HST440H1/ JSU237H1/ JNH350H1/ NEW335H1/ NFS284H1/ PHL281H1/ PSY201H1/ SOC243H1/ SOC244H1/ SOC246H1/ SOC309Y1/ SOC363H1/STA220H1/ UNI103Y1**

*n.b. At least 0.5 FCE must be at the 400-level; students are not permitted to be enrolled in more than one Human Biology major program*
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. BIO220H1

7. BIO230H1/ BIO255H1

8. HMB265H1/ BIO260H1

9. PSL300H1, PSL301H1

10. 1.0 FCE from: HMB302H1/ANA300Y1/ANA301H1/CSB351Y1/IMM340H1/IMM350H1/MGY377H1/MGY378H1


*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.

Academic Context:

The Human Biology major program has been revised to emphasize fundamental concepts in human biology. The program takes an interdisciplinary approach that integrates genetics, physiology, and psychology through courses in HMB as well as courses that are offered through other departments and programs. Students graduating with a major in the Human Biology program will be able to communicate effectively with the public, NGOs, private sector, and government on the basic principles of health and disease and issues surrounding its societal implications. Students will also be able to specialize by pursuing research through graduate studies, further training as health care professionals, or pursuing advanced degrees in social work, public policy, business, or law.

Learning Outcomes:

Students enter the program at the end of their first year after establishing a foundation in organic biology and chemistry as well as physical chemistry. Students will build on this foundation with foundation courses (HMB204H1, HMB265H1, BIO230H1, BCH210H1, PSL300H1, and PSL301H1) that are designed to provide a broad overview of their respective subject areas, all of which supply the foundation to the study of human biology. As students progress through their studies, they will take a more in-depth courses that will cover a wide range of topics relevant to studies of human biology: histology (HMB302H1) topics related to health systems (HMB322H1), and higher-year course of the students choosing relating to health systems and/or disease systems (all of which have heavy critical analysis components surrounding current primary research and feature assessments such as grant proposals and literature reviews). These courses focus on particular aspects relevant to human biology and build on knowledge gains in foundation courses and work to present to students a comprehensive analysis of the field of human biology. Specific learning outcomes remain as they were proposed in the 2015 major modifications:

By the end of this program, students will be able to:
2. Identify and analyze data from human biology research from the primary literature.
3. Understand and apply appropriate quantitative techniques needed to examine human biology related data.
4. Identify and evaluate contemporary sociological and ethical perspectives on human biology research.
5. Write and speak effectively about human biology issues to both scientific and broader audiences.

The current proposal is to further clarify how these outcomes are delivered to students enrolled in the Human Biology major.

### Depth of Knowledge:

Introductory courses are designed to expose students to fundamental concepts in genetics (HMB265H1/BIO260H1) and other life sciences, human biology (HMB204H1), molecular biology (BIO230H1/BIO255H1) and biochemistry (BCH210H1). These courses provide a core knowledge base in these areas from which students will build. Students are then introduced to more advanced courses and take a full year of courses on human structure (HMB302H1, ANA300Y1, CSB351Y1) and function (PSL300H1, PSL301H1). Further depth in these subjects is available in 300-level in courses that focus on epidemiology (HMB342H1), or principles of pathobiology (LMP363H1). Other advanced courses complement these specialized topics by integrating concepts from other fields, such as global health and human rights (HMB303H1). Students are also encouraged to engage in specialized courses in the genetics of human disease (HMB441H1), advanced nutrition (NFS484H1), inflammation and infection (LMP402H1), and exercise and mental health (HMB473H1).

### Critical and Creative Thinking:

Students engage in critical thinking early on in the program. For example, in HMB265H1/BIO260H1 and HMB204H1, there are assignments and tests that focus on the application of course concepts and information through problem-based or case-based learning, whereas written assignments and oral presentations are based on the synthesis and critical analysis of information and techniques from both primary and review articles. As with all life science programs, the integration of primary research findings into all of our courses, but especially in 300- and 400-level courses, is a critical component of the student learning experience. Students are taught how to interpret and critically analyze research as well as develop the skills in synthesizing information from multiple sources. The program also uses creative ways to facilitate reflective thinking. For example, in HMB471H1, students engage in a semester-long self-test lab to assess the effects of stress control techniques on performance. Moreover, HMB440H1 integrates community engaged learning as a primary method for teaching students about neurobiology of dementia and its societal implications.

### Information Literacy:

Students learn effective written and oral strategies for communicating their analyses and critiques. For example, seminar courses often require students to be creative and persuasive in developing research grant proposals in translational medicine (HMB402H1). Team-based learning and peer evaluations, either in class or online, are also integrated in several different courses, such as HMB302H1 where students work in pairs or small groups where students engage in peer learning and evaluation. Seminar presentations or poster presentations are common among most advanced courses and this enables students to develop key skills in explaining, discussing, critically analyzing and synthesizing research findings in an oral presentation format. Students also have opportunities to cultivate an ability to interact and debate issues in a group setting with guest speakers that are experts in their fields, preparing them with communication skills that will be useful in a professional workplace.

In order to complete written and oral assignments, students are required to learn to use Internet based search engines (e.g. PubMed, Google Scholar, Ensembl, Allen Brain Atlas, etc.) to acquire relevant information from the primary literature, and genome and gene expression databases. In HMB302H1, students engage in peer teaching and evaluation facilitated by social media and access to an online image database. Students are typically evaluated on their effective gathering and use of this information through enhanced citations, and the ability to use PowerPoint, Keynote, blogs and other presentation formats.

### Quantitative Reasoning:

While many courses will integrate quantitative analysis and reasoning, such as genetic mapping and allele frequencies in populations (HMB265H1), or statistically analyzing altered physical parameters due to exercise (HMB471H1).

### Social and Ethical Responsibility:

Several courses will introduce students to some of the bioethical, social and health policy issues and controversies surrounding specific topics in health and disease, including prenatal diagnosis (HMB360H1) and AIDS (HAJ453H1).
An Integrative, Inquiry Based Activity:

Seminar courses at the 400-level provide a major opportunity for students to integrate knowledge from across a spectrum of health and disease related courses. Students in the major program are encouraged to complete a full-year research project course or a summer research project course (HMB496Y1/ HMB499Y1), although this is not a requirement. Students will typically identify suitable supervisors in hospital research institutes or campus-based laboratories and research groups. Research project course oversight includes a HMB faculty advisor that facilitates the placements, guide workshops on research presentation skills or apply statistical analyses (in collaboration with Department of Statistical Sciences), as well as organize research presentation days (with research faculty to serving as assessors). Students gain invaluable first-hand experience integrating their knowledge of health and disease and other related subjects, learn to apply their quantitative reasoning and analytical skills, practice effective communication and team-based learning, and learn about ethical standards in research.

Program Delivery:

Method: In Class; Online

Mode: Full Time; Part Time

Brief Description of the Proposal:

Modification of how Calendar listing is organized, for better clarity of program requirements. The total number of FCE has remained the same. Courses allowed for the program at the higher levels has been reviewed and revised to better reflect courses that are directly related to the study of human biology as opposed to general life sciences.

Details of Proposed Change:

1.0 FCE in function (PSL300H1 and PSL301H1) and 1.0 FCE in structure (HMB302H1/ ANA300Y1/ ANA301H1/ CSB351Y1/ IMM340H1/ IMM350H1/ MGY377H1/ MGY378H1) is now required. Previously, students could do 1.5 FCE in either/or. As it is the units view that a student studying general human biology should be well-versed in both function and structure of the human body, we wish to ensure all students have this background. Further, many upper-year HMB courses where Human Biology students receive priority enrolment required PSL300H1 and/or PSL301H1, but it was not a required prerequisite, making pre-requisite checks difficult based on the student argument that as a non-required course, unfair to not accept IMM350H1 or ANA301H1 in lieu of PSL301H1, etc. This modification will allow us to resolve this unintentional hidden pre-requisite issue.

Beyond this, the only two changes were to merge the the final two requisite lines (0.5 FCE each of higher year life science courses) and to delete the requisite that required "0.5 FCE from courses that focus on the social, economic and political perspectives of human biology: HMB303H1/ HMB306H1/HMB325H1/ ANT208H1 HST209H1/ HST211H1/HST440H1/ JSU237H1/ JNH350H1/ NEW335H1/ NFS284H1/ PHL281H1/ PSY201H1/ SOC243H1/ SOC244H1/ SOC246H1/ SOC309Y1/ SOC363H1/STA220H1/ UN103Y1.". This was done to accommodate for the 0.5 FCE required for function (as before function/structure was 1.5 either/or, and with this proposal it would now be 1.0 FCE in structure and function totaling 2.0 FCE).

Rationale:

The Human Biology Program completed a self-study in March 2014 that the program and the Faculty of Arts & Science has been steadily working on the recommendations to enhance the overall quality of the program. Many of the recommendations have already been put into effect: our smallest program (Health Care Ethics major) has been closed for further admissions and a proposal to formally close the program will be put forward in October 2017, we have signed a MOA giving the School of the Environment full ownership of the Environment and Health major and specialist (ASMAJ0365 and ASSPE0365) and have agreed to continue teaching and supporting the capstone requirement course for the specialist program: JEH455H1 (Topics in Environment & Health) and giving Environment and Health students enrolment priority in a number of our courses.

One of the first acts was a revision of the Health & Disease (ASMAJ2013 & ASSPE2013), Neuroscience (ASMAJ1472 and ASSPE1472), and our then- Genes, Genetics, and Biotechnology, now Fundamental Genetics and its Applications program (ASMAJ1050 and ASSPE1050), and Human Biology (ASMAJ2035) programs to better align the programs with the teaching strengths of the unit, the resources of the unit, and the course offerings within the Faculty of Arts & Science. These modifications came into effect in 2015-2016.

This realignment of four of our five programs has benefited the program as a whole and our students greatly, and
allowing us to see how to better align the programs with their objectives, as outlined in 2015.
Since then, we have consulted with the Dalla Lana School of Public Health on pedagogy revisions for our Global Health major and Specialist (ASMAJ25757 and ASSPE2575), and have consulted with our faculty and staff to better assess pedagogy gaps and inconsistencies in program structure and pressure points within our programs in terms of enrollment and student outcomes. Many of the gaps/misalignment were due to lack of lab space, staff, support, or lack of faculty to teach core courses.
Even in the 2015 major modification proposal, it was outlined that HMB has been working closely with [the Cell Systems and Biology Department], [the Department of Ecology and Evolutionary Biology] and the [Faculty of Arts & Science] to expand and modernize lab course offerings in the planned renovations of the [Ramsay Wright] teaching labs. However, at the time of the proposal, the labs were not yet constructed. Construction began in spring 2015 and they are currently nearing completion. HMB teaching labs will be ready for full-time use by September 2017. As such, we wish to utilize these labs in our HMB courses to better meet listed course objectives for the benefit of our students.
Sine many of the recommendations from the external review have been met, and now that HMB has more staff support including 2 lab technicians, a more clear vision, our own teaching labs (which will allow us to use the space more frequently), and have been approved to hire an appointed faculty member starting in July 2017 (the search is currently ongoing) who will allow us to offer more course sections of some of our courses without overburdening teaching assignments, we would like to make further revisions to better meet objectives outlined in 2014.
The proposed restructuring of all of our programs is the next step in further defining improvements and innovations first initiated in 2015-2016.

Impact that the proposal may have on students or other academic units/divisions:
Impact on other units should be minimal as enrolment is not planned to increase. The majority of the courses required in the program are the same course requirement/requirement options as the current neuroscience major. Impact on our unit should also not increase as we have increased staff support. Currently the enrolment into the fundamental genetics and its applications major is 768, with a two year average of 765. We are not anticipating a large change in enrollment.

Consultation:
Director Dr. Melanie Woodin has consulted extensively with Vice-Deans Pamela Klassen and Poppy Lockwood as well as with faculty within the Human Biology program.
After consultations with Biochemistry in January 2017, we have eliminated the option to use CHM247H1 in lieu of BCH210H1.
After the Life Science Planning Meeting in January 2017, we have added EHJ352H1 to the list of upper year Human Biology courses students may take toward this program completion. This was accidental oversight which has now been rectified. This was the only feedback received at this meeting.

Diversity:
The re-design of the human biology major program ensures all students receive a solid foundation in the wide scope of human biology. HMB works closely with Accessibility Services, and accommodations requested are met. This will not change. Further, many of our faculty work to offer a variety of assignments that better provide to a variety of learners in their courses.

Resource Implications:
Current support is adequate.

Faculty and TA Support:
Current support is adequate.

Global Health Major

Start Session:
Summer 2017

Current Calendar Description:

New Calendar Description:
HMB: Global Health
The objective of the HMB: Global Health program is to provide students with instruction in fundamental biological sciences and to integrate a broad understanding of the socio-economic and cultural determinants of health to populations around the world.

Current Admission Requirements:

New Admission Requirements:
No changes

Current Enrolment Requirements:

This is a Type 1 open enrolment program. Students are permitted to enrol in the major during the program enrolment cycle as soon as they have earned 4.0 FCE. It is recommended students complete their first year life science requirements before entering the major program.

New Enrolment Requirements:
No changes

Current Completion Requirements:

Required Courses (8.0 FCE)

First Year Life Science

1. BIO120H1, BIO130H1
2. (CHM135H1, CHM136H1) / (CHM138H1, CHM139H1) / CHM151Y1 (transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion to a pre-approved chemistry course)
3. MAT135H1, MAT136H1, PHY131H1, PSY100H1 (transfer credits from AP and IB Psychology are not accepted)

Year 2: Foundations in global health

4. HMB203H1
5. BCH210H1 / CHM247H1
6. BIO230H1, BIO255H1, BIO220H1
7. HMB265H1, BIO260H1

Year 3: Selected topics in global health

8. HMB303H1, HMB323H1
9. (PSL300H1, PSL301H1) / (BIO270H1, BIO271H1)

10. 1.0 FCE from global health relevant courses: HMB303H1, HMB304H1, HMB305H1, HMB312H1, HMB314H1, HMB323H1, HMB325H1, HMB342H1, HMB390H1, HMB346H1, HMB440H1, HMB462H1, ANA300Y1, ANA301H1, BCH311H1, CSB349H1, PSL350H1, BCH370H1, CSB325H1, CSB327H1, CSB328H1, CSB330H1, CSB331H1, CSB346H1, CSB351Y1, CSB431H1, CSB483H1, EEB318H1, EEB319H1, EEB321H1, EEB328H1, EEB362H1, EEB375H1, EEB428H1, EEB460H1, HST440H1, HST464H1, LMP301H1, LMP363H1, LMP406H1, MGY350H1, MGY377H1, MGY378H1, NFS382H1, NFS386H1, NFS487H1, PCL389H1, PHC320H1, PSL372H1, PSL420H1, PSL421H1, PSY321H1

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

11. HMB433H1, HMB434H1, HMB437H1, HMB443H1, HMB449Y1, HAJ453H1

n.b. At least 0.5 FCE must be at the 400-level; students are not permitted to be enrolled in more than one Human Biology major program
New 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

**Biological Foundations of Living Systems**
3. BO120H1, BIO130H1
4. BIO230H1/ BIO255H1
5. HMB265H1/ BIO260H1
6. PSL300H1, PSL301H1
7. 1.0 FCE from HMB302H1/ HMB322H1/ ANA300Y1/ ANA301H1/ CSB351Y1/ IMM340H1/ IMM350H1/ MGY377H1/ MGY378H1

**Global Health Concentration Courses**
8. 0.5 FCE from: PHS100H1 / PSY100H1/ABS201Y1/ ANT100Y1/ SOC101Y1/ ECO100Y1

Transfer credits from AP and IB psychology are not accepted.
9. HMB203H1
10. 0.5 FCE from courses on the biological dimensions of Global Health: HAJ453H1 /HMB323H1/ HMB342H1/ HMB433H1/ HMB436H1/ HMB437H1/ HMB440H1/ HMB443H1/ HMB462H1 / HMB473H1/ HMB474H1/ HMB496Y*/ HMB499Y1/ CSB351Y1 /EEB325H1/ EHH352H1/ HST373H1/ MGY350H1/ MGY377H1/ MGY378H1/ MIJ485H1
11. 0.5 FCE from courses on the social and ecological dimensions of Global Health: HMB303H1/ HMB306H1/ HMB406H1/ ABS240Y1/ ABS250Y1/ ABS350H1/ABS355H1/ ANT345H1/ANT348H1/ ANT358H1/ ANT458H1/ ANT460H1/ BIO220H1/ EEB428H1/ ENV341H1/ ENV430H1/ ENV432H1 / GGR433H1/ GGR434H1/ JEH455H1/ ECO314H1/ HST410H1/ HST440H1/ HST464H1 / JNH350H1/ NEW352H1/ NEW353H1/ NEW453H1/ NFS490H1/ PHS300H1/ PSY320H1/ PSY321H1/ ECO324H1/ ECO333H1/ ECO334H1/ ECO342H1/ ECO369H1/ ECO402H1

**Data Analysis Courses**
12. 0.5 FCE in statistics: HMB325H1 / STA220H1/ STA288H1/ PSY201H1

*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 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 enrollment for Global Health majors. Students are responsible for checking priority of courses and meeting course prerequisites for courses they wish to take.
3. The Global Health major cannot be paired with any other Human Biology Program managed major program.

**Academic Context:**
Global Health encompasses the field of studies focus on health systems in the human body, and social and cultural constructs affecting human and human health. The Global health program in the Faculty of Arts & Science exists to provide students with a firm foundation in human biology and introduce them to the field of public health though courses offered through the collaborative program in Human Biology and other courses offered within the Faculty of Arts & Science.
The Global Health major program has been revised to emphasize fundamental concepts in human biology.
HMB as well as courses that are offered through other departments and programs.

Students graduating with a major in the Global Health major program will be able to communicate effectively with the public, NGOs, private sector, and government on the basic principles of health and disease and issues surrounding its societal implications. Students will also be able to specialize by pursuing research through graduate studies, further training as health care professionals, or pursuing advanced degrees in social work, public policy, business, or law.

Learning Outcomes:

Students enter the program at the end of their first year after establishing a foundation in organic biology and chemistry as well as physical chemistry. Students will build on this foundation with foundational courses (HMB203H1, HMB265H1, BIO230H1, , PSL300H1, and PSL301H1, and a social introductory course of their choosing: PHS100H1/ GGR112H1/PSY100H1/ABS201Y1/ ANT100Y1/ SOC101Y1/ ECO100Y1/ SOC102H1) that are designed to provide a broad overview of their respective subject areas, all of which supply the foundation to the study of human biology and global health. Students will also learn quantitative analysis skills in a statistics course, which will become immediately applied to a higher-year lab course or research based course in which students will learn lab skills and/or research skills relevant to further studies in health and disease and cellular molecular biology.

As students progress through their studies, they will take a series of core global health concentration courses that will cover a wide range of topics relevant to studies in global health including: epidemiology (HMB342H1/ HST373H1) topics related to global health research (HMB323H1), and higher-year course of the students choosing relating to global health (all of which have heavy critical analysis components surrounding current primary research and feature assessments such as grant proposals and literature reviews). These courses focus on particular aspects of global health and build on knowledge gains in foundational courses and work to present to students a comprehensive analysis of human health and social systems.

Specific learning outcomes:
By the end of this program, students will be able to:
1. Demonstrate an understanding of the fundamental concepts in global health and how these concepts are applied.
2. Identify and analyze data from global health research from the primary literature.
3. Understand appropriate quantitative techniques needed to examine global health related techniques.
4. Write and speak effectively about global health issues in both scientific and broader audiences.

As Global Health did not go under major modifications in 2015, these outcomes are new for the program. However, it should be noted that they are similar and in line with the learning outcomes for all of the other HMB programs, which did go under major modification in 2015 and were approved with learning outcomes aligned with the above indicated specific learning outcomes.

The Human Biology Program thinks it is important that all of our programs are advanced and progress to better reflect the changing scientific landscape so that our students are prepared to enter their chosen field either as an academic or a professional, and as such the objectives as outlined in the below questions regarding learning objectives are in line with the other HMB programs.

Depth of Knowledge:

Introductory courses are designed to expose students to fundamental concepts in genetics (HMB265H1/BIO260H1), global health (HMB202H1), as well as molecular biology (BIO230H1/BIO255H1). These courses provide a core knowledge base in these areas from which students will build. Students are then introduced to more advanced health and disease courses that highlight anatomy and physiology (ANA300Y1, PSL300H1, PSL301H1), histology (HMB302H1), and social constructs affecting human health and development (PHS100H1/ PSY100H1/ABS201Y1/ ANT100Y1/ SOC101Y1/ ECO100Y1). Further depth in these subjects is available in courses that focus on environmental impacts of health (JEH455H1), global health policy (HMB303H1), or principles of heavy metals in the body (HMB437H1).

Critical and Creative Thinking:

Students engage in critical thinking early on in the program. For example, in HMB265H1 there are assignments and tests that focus on the application of course concepts and information through problem-based learning, whereas written assignments and oral presentations are based on the synthesis and critical analysis of information and techniques from both primary and review articles. As with all life science programs, the integration of primary research findings into all of our courses, but especially in 300- and 400-level courses, is a critical component of the student learning experience. Students are taught how to interpret and critically analyze research as well as develop the skills in synthesizing information from multiple sources. The program also uses creative ways to facilitate reflective thinking. For example, HMB443H1 integrates community engaged learning as a primary method for teaching students about micronutrient deficiencies and food security.
**Information Literacy:**

Students learn effective written and oral strategies for communicating their analyses and critiques. For example, seminar courses often require students to be creative and persuasive in developing research grant proposals in translational medicine (HMB402H1). Team-based learning and peer evaluations, either in class or online, are also integrated in several different courses, such as HMB302H1 where students work in pairs or small groups where students engage in peer learning and evaluation. Seminar presentations or poster presentations are common among most advanced courses and this enables students to develop key skills in explaining, discussing, critically analyzing and synthesizing research findings in an oral presentation format. Students also have opportunities to cultivate an ability to interact and debate issues in a group setting with guest speakers that are experts in their fields, preparing them with communication skills that will be useful in a professional workplace.

In order to complete written and oral assignments, students are required to learn to use Internet based search engines (e.g. PubMed, Google Scholar, Ensembl, Allen Brain Atlas, etc.) to acquire relevant information from the primary literature, and genome and gene expression databases. In HMB302H1, students engage in peer teaching and evaluation facilitated by social media and access to an online image database. Students are typically evaluated on their effective gathering and use of this information through enhanced citations, and the ability to use PowerPoint, Keynote, blogs and other presentation formats.

**Quantitative Reasoning:**

While many courses will integrate quantitative analysis and reasoning, such as genetic mapping (HMB265H1), or statistically analyzing health data (HMB342H1), the program also requires that students take basic statistics courses (HMB325H1/ STA220H1/ STA288H1/ PSY201H1) that will serve as a foundation for understanding concepts and analyzing research in other courses.

**Social and Ethical Responsibility:**

Several courses will introduce students to some of the bioethical, social and health policy issues and controversies surrounding specific topics in health and disease, such as AIDS (JNH350H1, HAJ453H1), and dementia (HMB440H1). The overall objective is to challenge students to think about the benefits of health and disease research, and the limits of these benefits, on society, including medicine, law and biotechnology.

**An Integrative, Inquiry Based Activity:**

Seminar courses at the 400-level provide a major opportunity for students to integrate knowledge from across a spectrum of health and disease related courses. Students in the major program are encouraged to complete a full-year research project course or a summer research project course (HMB496Y1/HMB499Y1), although this is not a requirement. Students will typically identify suitable supervisors in hospital research institutes or campus-based laboratories and research groups. Research project course oversight includes a HMB faculty advisor facilitates the placements, guide workshops on research presentation skills or apply statistical analyses (in collaboration with Department of Statistical Sciences), as well as organize research presentation days (with research faculty to serving as assessors). Students gain invaluable first-hand experience integrating their knowledge of health and disease and other related subjects, learn to apply their quantitative reasoning and analytical skills, practice effective communication and team-based learning, and learn about ethical standards in research.

**Program Delivery:**

- **Method:** In Class; Online
- **Mode:** Full Time; Part Time

**Brief Description of the Proposal:**

Modification of how the Calendar listing is organized, for better clarity of program requirements. The total number of FCE required remains the same, and courses allowed for the program at the higher levels has been reviewed and revised to better reflect courses that are directly related to the study of global health. Some new requirements are added, and some old requirements are deleted or merged with other requirements to accommodate the 8.0 FCE cap on major programs.

**Details of Proposed Change:**

0.5 FCE of statistics is now required (HMB325H1/ STA220H1/ STA288H1/ PSY201H1).
required, as statistics is instrumental to the study of Global Health as seen in epidemiology and the assessment and analysis of quantitative data.

1.0 FCE from courses focusing on human structure is now required: HMB302H1/ HMB322H1/ ANA300Y1/ ANA301H1/ CSB351Y1/ IMM340H1/ IMM350H1/ MGY377H1/ MGY378H1 as both structure and function are important to the study of human biology, and global health students encounter both in higher years of undergraduate study as well as graduate study and professional work in the global health field.

0.5 FCE from a social-aspect course is now required: PHS100H1/ PSY100H1/ ABS201Y1/ ANT100Y1/ SOC101Y1/ ECO100Y1.

BIO220H1 is no longer required to allow space within the 8.0 FCE cap for the requisite of an introductory course from a social-aspect point of view which students need to satisfy their higher level of 0.5 FCE from courses on the social dimensions of Global Health; resolving hidden pre-requisite concern. However, it is allowed for the program under Requisite line 11: courses on the social and ecological dimensions of Global Health."

The number of Global Health relevant courses has been adjusted to ensure students take at least 0.5 FCE of higher-year sciences courses pertaining to Global Health and at least 0.5 FCE of higher-year social courses pertaining to Global Health, but to also allow for a full 1.0 FCE of structure courses to be required (the full 1.0 FCE of function-PSL300H1 and PSL301H1 remain required).

Rationale:

The Human Biology Program completed a self-study in March 2014 that the program and the Faculty of Arts & Science has been steadily working on the recommendations to enhance the overall quality of the program. Many of the recommendations have already been put into effect: our smallest program (Health Care Ethics major) has been closed for further admissions and a proposal to formally close the program will be put forward in October 2017; we have signed a MOA giving the School of the Environment full ownership of the Environment and Health major and specialist (ASMAJ0365 and ASSPE0365) and have agreed to continue teaching and supporting the capstone requirement course for the specialist program: JEH455H1 (Topics in Environment & Health) and giving Environment and Health students enrolment priority in a number of our courses.

One of the first acts was a revision of the Health & Disease (ASMAJ2013 & ASSPE2013), Neuroscience (ASMAJ1472 and ASSPE1472), and our then- Genes, Genetics, and Biotechnology, now Fundamental Genetics and its Applications program (ASMAJ1050 and ASSPE1050), and Human Biology (ASMAJ2035) programs to better align the programs with the teaching strengths of the unit, the resources of the unit, and the course offerings within the Faculty of Arts & Science. These modifications came into effect in 2015-2016.

This realignment of four of our five programs has benefitted the program as a whole and our students greatly, and have allowed us to see more clearly where there are gaps in the program structure and program objectives, as well as allowing us to see how to better align the programs with their objectives, as outlined in 2015.

Since then, we have consulted with the Dalla Lana School of Public Health on pedagogy revisions for our Global Health major and Specialist (ASMAJ25757 and ASSPE2575), and have consulted with our faculty and staff to better assess pedagogy gaps and inconsistencies in program structure and pressure points within our programs in terms of enrollment and student outcomes. Many of the gaps/ misalignment were due to lack of lab space, staff, support, or lack of faculty to teach core courses.

Even in the 2015 major modification proposal, it was outlined that HMB has been working closely with [the Cell Systems and Biology Department], [the Department of Ecology and Evolutionary Biology] and the [Faculty of Arts & Science] to expand and modernize lab course offerings in the planned renovations of the [Ramsay Wright] teaching labs. However, at the time of the proposal, the labs were not yet constructed. Construction began in spring 2015 and they are currently nearing completion. HMB teaching labs will be ready for full-time use by September 2017. As such, we wish to utilize these labs in our HMB courses to better meet listed course objectives for the benefit of our students.

Sine many of the recommendations from the external review have been met, and now that HMB has more staff support including 2 lab technicians, a more clear vision, our own teaching labs (which will allow us to use the space more frequently), and have been approved to hire an appointed faculty member starting in July 2017 (the search is currently ongoing) who will allow us to offer more course sections of some of our courses without overburdening teaching assignments, we would like to make further revisions to better meet objectives outlined in 2014.

The proposed restructuring of all of our programs is the next step in further defining improvements and innovations first initiated in 2015-2016. The Global Health programs did not go under major modification in 2015, but it is important to HMB that as we are revising and modifying our other programs to better clarify the program purposes as outlined in 2015, that all HMB programs are reviewed and assessed and given due diligence to ensure that our program offerings are clear and consistent with their views and broader outcomes from a pedagogical holistic view.

Impact that the proposal may have on students or other academic units/divisions:
We do anticipate enrolment to increase slightly due to the clarity of the programs expectations, but we do not anticipate growth by more than 10%. If we do experience growth by more, we may need to assess the programs Type 1 status to ensure we have sufficient space in our Global Health courses, but currently this is not a concern, and thus there will be minimal impact on other life science program enrolment. Impact on our unit will also not increase as we have increased staff support.

**Consultation:**

Director Dr. Melanie Woodin has consulted extensively with Vice-Deans Pamela Klassen and Poppy Lockwood as well as with faculty within the Human Biology program. The development of the new program structure was also done in collaboration with Dr. Andrea Cortinois from the Dalla Lana School of Public Health. We had a series of meetings from March to August 2016 to discuss and review development of both the major and specialist in the HMB: Global Health Program.

The program proposals were also sent on December 7, 2016 to the Health Studies program, The Centre for Indigenous Studies, The Department of Economics, and the Department of Anthropology to notify them that a significant number of their courses are being listed as program options, but that we are not asking for priority enrolment into these courses nor are we asking for pre-requisite waivers. All four programs have responded positively, and have consented to having their courses listed in this program.

After consultations with EEB in January 2017 following the Life Science Planning meeting, we have included BIO220H1 as an option to Requisite line 11, and renamed it courses on the social and ecological dimensions of Global Health to better describe the courses listed therein. The only other feedback received from the Life Science Planning meeting was from Biochemistry, which wanted BCH210H1 to be included in the program, but after further discussions with Biochemistry, and pointing out that BCH210H1 is required in the Global Health specialist program, Biochemistry has agreed that HMB's proposed program for the Global Health major is rationale, and they have consented that BCH210H1 is not required for the Global Health major.

**Diversity:**

The re-design of the global health major program ensures all students receive a well-rounded education in the field of global health. HMB works closely with Accessibility Services, and accommodations requested are met. This will not change. Further, many of our faculty work to offer a variety of assignments that better provide to a variety of learners in their courses.

**Resource Implications:**

Current support is adequate.

**Faculty and TA Support:**

Current support is adequate.

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**Health & Disease Major**

**Start Session:**

Summer 2017

**Current Calendar Description:**

**New Calendar Description:**

**HMB: Health & Disease**

The objective of the HMB: Health & Disease program is to provide students with a solid foundation in the biological sciences as it relates to basic human physiology and the mechanisms of disease and to facilitate the integration of concepts from across the life sciences, social sciences and humanities. In addition, students will acquire skills in laboratory science, experience with quantitative approaches, and develop effective communication skills to provide an appropriate background essential to research and problem solving in this field.

**Current Admission Requirements:**
## New Admission Requirements:
No changes

## Current Enrolment Requirements:
This is a Type 1 open enrolment program. Students are permitted to enrol in the major during the program enrolment cycle as soon as they have earned 4.0 FCE. It is recommended students complete their first year life science requirements before entering the major.

## New Enrolment Requirements:
This major is a Type 1 open enrolment program. Students are permitted to enrol in the major during the program the enrolment cycle as soon as they have earned 4.0 FCE. It is recommended students complete the programs required 100-level courses before entering the major program.

## Current Completion Requirements:

### Required Courses (8.0 FCE)

#### First-Year Life Sciences

1. BIO120H1, BIO130H1
2. (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1 (transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion to a pre-approved chemistry course)
3. MAT135H1/ PHY131H1/ PHY151H1

**Year 2:** Foundations in health and disease

4. HMB202H1
5. BIO230H1, BIO255H1, BIO220H1
6. HMB265H1/BIO260H1
7. BCH210H1

**Year 3:** Selected topics in health and disease with greater depth and self-directed learning

8. PSL300H1, PSL301H1
9. HMB302H1

10. 0.5 FCE from courses that focus on the social, economic, political and/or biological perspectives of health and disease: HMB303H1/ HMB306H1/ HMB325H1/ANT208H1/ CSB351Y1/ IMM340H1/ IMM350H1/HST209H1/ HST211H1/ HST408H1/ HST440H1/ JSU237H1/ JNH350H1/ SOC309Y1/ SOC363H1/STA220H1/ PSY201H1/UNI103Y1/ WGS367H

**Year 4:** Advanced topics in health and disease that emphasize primary research and critical analysis

11. 0.5 FCE from depth courses in health and disease: HMB312H1/HMB314H1/HMB322H1/ HMB323H1/ HMB342H1/ HMB360H1/ ANA300Y1/ ANA301H1/ BIO270H1/ BIO271H1/ BCH311H1/ BCH340H1/ CJH332H1/ CSB325H1/ CSB327H1/ CSB328H1/ CSB343H1/ CSB345H1/ CSB346H1/ EEB318H1/ EBB319H1/ EEB323H1/ EEB325H1/ EEB362H1/ EEB375H1/EHJ352H1/ LMP301H1/ LMP363H1/ NFS284H1/ NFS382H1/ NFS386H1/ PCL201H1/ PCL302H1/ PCL362H1/PSL304H1/ PSL305H1/ PSY342H1/ PSY371H1/ PSY372H1/ PSY397H1

12. 0.5 FCE from courses with advanced, research-driven, and translational and critical analysis: HAJ453H1/ HMB401H1/ HMB402H1/ HMB406H1/ HMB422H1/ HMB432H1/ HMB434H1/ HMB435H1/ HMB436H1/ HMB437H1/ HMB440H1/ HMB441H1/ HMB443H1/ HMB452H1/ HMB462H1/ HMB470H1/ HMB471H1/HMB472H1/HMB473H1/ HMB489H1/ JEH455H1/ BCH425H1/ BCH426H1/ BCH441H1/ BCH445H1/ CSB429H1/ CSB443H1/
New 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
3. BCH210H1

Biological Foundations of Living Systems
4. BIO120H1, BIO130H1
5. BIO220H1
6. BIO230H1/ BIO255H1
7. HMB265H1/ BIO260H1
8. PSL300H1, PSL301H1

Health & Disease Concentration Courses
9. HMB202H1
10. HMB302H1/HMB322H1
11. 0.5 FCE from: HAJ453H1/ HMB401H1/ HMB402H1/ HMB422H1/ HMB432H1/ HMB434H1/ HMB436H1/ HMB437H1/ HMB440H1/ HMB441H1/ HMB443H1/ HMB452H1/ HMB462H1/ HMB470H1/ HMB471H1/ HMB472H1/ HMB473H1/ HMB474H1/ EJH352H1/ JEH455H1/ ANA300Y1/ ANA301H1/ CSB345H1/ EEB325H1/ LMP301H1/ LMP363H1/ LMP403H1/ LMP406H1/ NFS485H1/ NFS486H1/ PCL362H1/ PSL404H1/ PSL421H1/ PSL425H1/ PSL462H1/ PSL470H1/ PSL472H1/ PSY440H1/ PSY460H1/ PSY470H1/ PSY471H1/PSY494H1

Data Analysis and Research-Based Courses
12. 0.5 FCE in statistics: HMB325H1/ STA220H1/ STA288H1/ PSY201H1
13. 0.5 FCE from an upper-year lab or research-based course: HMB312H1/ HMB314H1/ HMB323H1/ HMB342H1/ HST373H1/ 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.

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 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.

Academic Context:

Health and disease encompass the field of studies focused on health systems in the human body and disease systems affecting humans. The Health & Disease program in the Faculty of Arts & Science exists to provide students with a firm foundation in both systems through courses offered through the collaborative program in Human Biology and other courses offered within the Faculty of Arts & Science.

In 2015, the Health & Disease major program was revised to emphasize fundamental concepts in health and disease and how these concepts have impacted society. The program takes an interdisciplinary approach to the study of health and disease, ranging from human genetics and the mechanisms of disease to nutrition, exercise, and the social
health of disease through courses in HMB as well as courses that are offered through other departments and programs.
The current proposal is a further revision of the program re-orientation that was initiated in 2015. The proposed program is designed to provide students with a firm foundation health and disease sciences through courses in HMB as well as courses offered throughout the Faculty of Arts & Science.

Students graduating with a major from the Health & Disease program will be able to communicate effectively with the public, NGOs, private sector, and government on the basic principles of health and disease and issues surrounding its societal implications. Students will also be able to specialize by pursuing health and disease research through graduate studies, further training as health care professionals, or pursuing advanced degrees in social work, public policy, business, or law.

**Learning Outcomes:**

Students enter the program at the end of their first year after establishing a foundation in organic biology and chemistry as well as physical chemistry. Students will build on this foundation with foundation courses (HMB202H1, HMB265H1, BIO230H1, BCH210H1, PSL300H1, and PSL301H1) that are designed to provide a broad overview of their respective subject areas, all of which supply the foundation to the study of health and disease systems. Students will also learn quantitative analysis skills in a statistics course, which will become immediately applied to a higher-year lab course or research based course in which students will learn lab skills and/or research skills relevant to further studies in health and disease and cellular molecular biology.

As students progress through their studies, they will take a series of core Health & Disease concentration courses that will cover a wide range of topics relevant to studies in health and disease including: histology (HMB302H1) topics related to health systems (HMB322H1), and higher-year course of the students choosing relating to health systems and/or disease systems (all of which have heavy critical analysis components surrounding current primary research and feature assessments such as grant proposals and literature reviews). These courses focus on particular aspects to health and disease and build on knowledge gains in foundation courses and work to present to students a comprehensive analysis of human health systems and disease systems.

Specific learning outcomes remain the same as proposed in 2015:

1. Demonstrate an understanding of the fundamental concepts in human health and disease and how these concepts are applied.
2. Identify, analyze and critically evaluate data from health and disease research from the primary literature.
3. Understand and apply appropriate quantitative techniques needed to examine health and disease related data.
4. Identify and critically evaluate contemporary sociological and ethical perspectives on health and disease research.
5. Write and speak effectively about health and disease issues to both scientific and broader audiences.

Our objectives and outcomes remain consistent with the 2015 major program modifications, but now that HMB has its own lab space, increased staff support, and wishes to acknowledge the changes in the study of health sciences and disease systems, the required courses have been adjusted to reflect our desired outcomes and objectives, and to offer a more consistent foundation to all students in the program.

**Depth of Knowledge:**

Introductory courses are designed to expose students to fundamental concepts in genetics (HMB265H1/BIO260H1), health and disease (HMB202H1), as well as biochemistry (BCH210H1) and molecular biology (BIO230H1/BIO255H1). These courses provide a core knowledge base in these areas from which students will build. Students are then introduced to more advanced health and disease courses that highlight anatomy and physiology (ANA300Y1, PSL300H1, PSL301H1), histology (HMB302H1), and the immune system (IMM350H1). Further depth in these subjects is available in courses that focus on epidemiology (HMB342H1), or principles of pathobiology (LMP363H1). Students can further engage in specialized courses in the genetics of human disease (HMB441H1), and advanced nutrition (NFS484H1).

**Critical and Creative Thinking:**

Students engage in critical thinking early on in the program. For example, in HMB265H1 and HMB202H1 there are assignments and tests that focus on the application of course concepts and information through problem-based learning, whereas written assignments and oral presentations are based on the synthesis and critical analysis of information and techniques from both primary and review articles. As with all life science programs, the integration of primary research findings into all of our courses, but especially in 300- and 400-level courses, is a critical component of the student learning experience. Students are taught how to interpret and critically analyze research as well as develop the skills in synthesizing information from multiple sources. The program also uses creative ways to facilitate
students about micronutrient deficiencies and food security.

### Information Literacy:

Students learn effective written and oral strategies for communicating their analyses and critiques. For example, seminar courses often require students to be creative and persuasive in developing research grant proposals in translational medicine (HMB402H1). Team-based learning and peer evaluations, either in class or online, are also integrated in several different courses, such as HMB302H1 where students work in pairs or small groups where students engage in peer learning and evaluation. Seminar presentations or poster presentations are common among most advanced courses and this enables students to develop key skills in explaining, discussing, critically analyzing and synthesizing research findings in an oral presentation format. Students also have opportunities to cultivate an ability to interact and debate issues in a group setting with guest speakers that are experts in their fields, preparing them with communication skills that will be useful in a professional workplace.

In order to complete written and oral assignments, students are required to learn to use Internet based search engines (e.g. PubMed, Google Scholar, Ensembl, Allen Brain Atlas, etc.) to acquire relevant information from the primary literature, and genome and gene expression databases. In HMB302H1, students engage in peer teaching and evaluation facilitated by social media and access to an online image database. Students are typically evaluated on their effective gathering and use of this information through enhanced citations, and the ability to use PowerPoint, Keynote, blogs and other presentation formats.

### Quantitative Reasoning:

While many courses will integrate quantitative analysis and reasoning, such as genetic mapping (HMB265H1), or statistically analyzing altered physical parameters due to exercise (HMB471H1), the program also requires that students take basic statistics courses (HMB325H1/STA220H1/STA288H1/PSY201H1) that will serve as a foundation for understanding concepts and analyzing research in other courses.

### Social and Ethical Responsibility:

Several courses will introduce students to some of the bioethical, social and health policy issues and controversies surrounding specific topics in health and disease, such as AIDS (HAJ453H1), and dementia (HMB440H1). The overall objective is to challenge students to think about the benefits of health and disease research, and the limits of these benefits, on society, including medicine, law and biotechnology.

### An Integrative, Inquiry Based Activity:

Seminar courses at the 400-level provide a major opportunity for students to integrate knowledge from across a spectrum of health and disease related courses. Students in the major program are encouraged to complete a full-year research project course or a summer research project course (HMB496Y1/HMB499Y1), although this is not a requirement. Students will typically identify suitable supervisors in hospital research institutes or campus-based laboratories and research groups. Research project course oversight includes a HMB faculty advisor facilitates the placements, guide workshops on research presentation skills or apply statistical analyses (in collaboration with Department of Statistical Sciences), as well as organize research presentation days (with research faculty to serving as assessors). Students gain invaluable first-hand experience integrating their knowledge of health and disease and other related subjects, learn to apply their quantitative reasoning and analytical skills, practice effective communication and team-based learning, and learn about ethical standards in research.

### Program Delivery:

**Method:** In Class; Online

**Mode:** Full Time; Part Time

### Brief Description of the Proposal:

Modification of how the Calendar listing is organized for better clarity of program requirements and the purpose of each requirement. The total FCE count has remained the same. Courses allowed for the program at the higher levels have been reviewed and revised to better reflect courses that directly relate to the study of health and disease.

### Details of Proposed Change:

Students now have the option to take either HMB302H1 or HMB322H1 (change to requisite line that required only
The following consultations were due to feedback from the Life Science Planning Meeting in January 2017:

- BCH210H1

After consultations with Biochemistry in January 2017, we have eliminated the option to use CHM247H1 in lieu of BCH210H1 as with faculty within the Human Biology program.

Director Dr. Melanie Woodin has consulted extensively with Vice-Deans Pamela Klassen and Poppy Lockwood as well as with faculty within the Human Biology program.

After consultations with Biochemistry in January 2017, we have eliminated the option to use CHM247H1 in lieu of BCH210H1.

The following consultations were due to feedback from the Life Science Planning Meeting in January 2017: After consultations with EEB in January 2017, EHJ352H1 has been added as a course option for higher year Health &

### Rationale:

The Human Biology Program completed a self-study in March 2014 that the program and the Faculty of Arts & Science has been steadily working on the recommendations to enhance the overall quality of the program. Many of the recommendations have already been put into effect: our smallest program (Health Care Ethics major) has been closed for further admissions and a proposal to formally close the program will be put forward in October 2017, we have signed a MOA giving the School of the Environment full ownership of the Environment and Health major and specialist (ASMAJ0365 and ASSPE0365) and have agreed to continue teaching and supporting the capstone requirement course for the specialist program: JEH455H1 (Topics in Environment & Health) and giving Environment and Health students enrolment priority in a number of our courses.

One of the first acts was a revision of the Health & Disease (ASMAJ2013 & ASSPE2013), Neuroscience (ASMAJ1472 and ASSPE1472), and our then- Genes, Genetics, and Biotechnology, now Fundamental Genetics and its Applications program (ASMAJ1050 and ASSPE1050), and Human Biology (ASMAJ2035) programs to better align the programs with the teaching strengths of the unit, the resources of the unit, and the course offerings within the Faculty of Arts & Science. These modifications came into effect in 2015-2016.

This realignment of four of our five programs has benefited the program as a whole and our students greatly, and have allowed us to see more clearly where there are gaps in the program structure and program objectives, as well as allowing us to see how to better align the programs with their objectives, as outlined in 2015.

Since then, we have consulted with the Dalla Lana School of Public Health on pedagogy revisions for our Global Health major and Specialist (ASMAJ25757 and ASSPE2575), and have consulted with our faculty and staff to better assess pedagogy gaps and inconsistencies in program structure and pressure points within our programs in terms of enrollment and student outcomes. Many of the gaps/alignment were due to lack of lab space, staff, support, or lack of faculty to teach core courses.

Even in the 2015 major modification proposal, it was outlined that HMB has been working closely with [the Cell Systems and Biology Department], [the Department of Ecology and Evolutionary Biology] and the [Faculty of Arts & Science] to expand and modernize lab course offerings in the planned renovations of the [Ramsay Wright] teaching labs. However, at the time of the proposal, the labs were not yet constructed. Construction began in spring 2015 and they are currently nearing completion. HMB teaching labs will be ready for full-time use by September 2017. As such, we wish to utilize these labs in our HMB courses to better meet listed course objectives for the benefit of our students. Sine many of the recommendations from the external review have been met, and now that HMB has more staff support including 2 lab technicians, a more clear vision, our own teaching labs (which will allow us to use the space more frequently), and have been approved to hire an appointed faculty member starting in July 2017 (the search is currently ongoing) who will allow us to offer more course sections of some of our courses without overburdening teaching assignments, we would like to make further revisions to better meet objectives outlined in 2014.

The proposed restructuring of all of our programs is the next step in further defining improvements and innovations first initiated in 2015-2016.

### Impact that the proposal may have on students or other academic units/divisions:

Impact on other units should be minimal as enrolment is not planned to increase. The majority of the courses required in the program are the same course requirement/requirement options as the current neuroscience major. Impact on our unit should also not increase as we have increased staff support.

There is currently 765 students enrolled in the Health & Disease major program with a two year annual average enrollment of 806. We do not anticipate this number fluctuating up or down based on enrolment trends in all of our programs over the last few years.

### Consultation:

Director Dr. Melanie Woodin has consulted extensively with Vice-Deans Pamela Klassen and Poppy Lockwood as well as with faculty within the Human Biology program.

After consultations with Biochemistry in January 2017, we have eliminated the option to use CHM247H1 in lieu of BCH210H1.
more FCE complete. After consultations with Pathobiology in January 2017, LMP365H1 has been removed as a course option for higher year Health & Disease concentration courses, and replaced with LMP363H1.

**Diversity:**

The re-design of the Health & Disease program ensures all students receive a solid foundation in both health systems and disease systems in the human body. HMB works closely with Accessibility Services, and accommodations requested are met. This will not change. Further, many of our faculty work to offer a variety of assignments that better provide to a variety of learners in their courses.

**Resource Implications:**

Current support is adequate.

**Faculty and TA Support:**

Current support is adequate.

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**Health & Disease Specialist**

**Start Session:**

Summer 2017

**Current Calendar Description:**

**New Calendar Description:**

**HMB: Health & Disease**

The objective of the HMB: Health & Disease program is to provide students with a solid foundation in the biological sciences as it relates to basic human physiology and the mechanisms of disease and to facilitate the integration of concepts from across the life sciences, social sciences and humanities. In addition, students will acquire skills in laboratory science, experience with quantitative approaches, and develop effective communication skills to provide an appropriate background essential to research and problem solving in this field.

**Current Admission Requirements:**

**New Admission Requirements:**

No changes

**Current Enrolment Requirements:**

This is a Type 3 limited enrolment program. Meeting the following minimum criteria does not guarantee admissions to the specialist program:

- **BIO120H1** with a minimum mark of 60%
- **BIO130H1** with a minimum mark of 60%
- **CHM135H1** and **CHM136H1** or **CHM138H1** and **CHM139H1** or **CHM151Y1** with a minimum mark of 60%
- **MAT135H1**, **PHY131H1** or **PHY151H1** with a minimum mark of 60%

*and*, a composite average of at least 70% on the above 2.5 FCE.

Students may apply for this program only during Round 1 of Type 3 Enrolment. Students applying for admissions to the program utilising transfer credits or later than the end of their first year will be considered on a case-by-case basis. For more information about Type 3 enrolment, visit the Faculty of Arts & Science Program Enrolment Instructions website.
New 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 Health & Disease specialist in any given year.

Applying with less than 8 FCEs:

- Completion of BIO130H1 with a minimum grade of 65
- Completion of CHM135H1 and CHM136H1 OR completion of 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. 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 major 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.

Current Completion Requirements:

Required Courses (13.5 FCE)

Prior to entering POST:

1. BIO120H1, BIO130H1
2. (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1 (transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion to a pre-approved chemistry course)
3. MAT135H1/ PHY131H1/ PHY151H1

Year 2: Foundations in health and disease

4. HMB202H1
5. (BIO230H1/ BIO255H1), BIO220H1
6. HMB265H1/BIO260H1
7. BCH210H1
8. statistics: STA220H1/ PSY201H1/ HMB325H1
9. bioethics: PHL281H1/ HMB306H1

Year 3: Selected Topics in health and disease with greater depth and self-directed learning

10. HMB302H1

11. 1.0 FCE from depth courses on the molecular biology of cells and tissues: CSB327H1/ CSB328H1/ CSB331H1/ BCH311H1/ CSB349H1/ PSL350H1
12. PSL300H1, PSL301H1

13. 1.0 FCE from further courses that focus on the structure and function of the human body: ANA300Y1 / IMM340H1 / IMM350H1/ MGY377H1/ MGY378H1/ CSB351Y1

14. 0.5 FCE from courses that will develop the skills necessary for laboratory work: HMB312H1/ CSB330H1
Year 4: Advanced topics in health and disease with emphasis on primary research and critical analysis

15. 0.5 FCE from depth courses in health and disease: HMB321H1 / HMB322H1 / HMB323H1 / HMB342H1 / HMB360H1 / ANA300Y1 / ANA301H1 / BIO270H1 / BIO271H1 / BCH311H1 / BCH340H1 / CJH332H1 / CSB325H1 / CSB327H1 / CSB328H1 / CSB343H1 / CSB345H1 / CSB346H1 / EEB318H1 / EEB319H1 / EEB323H1 / EEB325H1 / EEB362H1 / EEB375H1 / EHJ352H1 / LMP301H1 / LMP363H1 / NFS384H1 / NFS385H1 / PCL201H1 / PCL302H1 / PCL362H1 / PSL304H1 / PSL305H1 / PSY342H1 / PSY371H1 / PSY372H1 / PSY397H1

16. 1.0 FCE from courses that focus on the social, economic and political perspectives of health and disease: HMB303H1 / HMB306H1 / HMB325H1 / ANT208H1 / HST209H1 / HST211H1 / HST408H1 / HST440H1 / JSU237H1 / JNH350H1 / NEW335H1 / NFS284H1 / PHL281H1 / PSY201H1 / SOC243H1 / SOC244H1 / SOC246H1 / SOC309Y1 / SOC363H1 / STA220H1 / UNI103Y1 / WGS367H1


18. HMB499Y1

n.b. At least 1.0 FCE must be at the 400-level

New 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)/(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
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/
Data Analysis and Research-Based Courses

14. 0.5 FCE in statistics: HMB325H1/ 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 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.

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.

Academic Context:

Health and disease encompass the field of studies focused on health systems in the human body and disease systems affecting humans. The Health & Disease program in the Faculty of Arts & Science exists to provide students with a firm foundation in both systems through courses offered through the collaborative program in Human Biology and other courses offered within the Faculty of Arts & Science.

In 2015, the Health & Disease specialist program was revised to emphasize fundamental concepts in health and disease and how these concepts have impacted society. The program takes an interdisciplinary approach to the study of health and disease, ranging from human genetics and the mechanisms of disease to nutrition, exercise, and the social determinants of health. The intent of the program was to provide students with a broad foundation in the study of health of disease through courses in HMB as well as courses that are offered through other departments and programs.

The current proposal is a further revision of the program re-orientation that was initiated in 2015. The proposed program is designed to provide students with a firm foundation health and disease sciences through courses in HMB as well as courses offered throughout the Faculty of Arts & Science.

Students graduating with a specialist in the Health & Disease program will be able to communicate effectively with the public, NGOs, private sector, and government on the basic principles of health and disease and issues surrounding its societal implications. Students will also be able to specialize by pursuing health and disease research through graduate studies, further training as health care professionals, or pursuing advanced degrees in social work, public policy, business, or law.

Learning Outcomes:

Students enter the program at the end of their first year after establishing a foundation in organic biology and chemistry as well as physical chemistry. Students will build on this foundation with foundational courses (HMB202H1, HMB265H1, BIO230H1, BCH210H1, PSL300H1, and PSL301H1) that are designed to provide a broad overview of their respective subject areas, all of which supply the foundation to the study of health and disease systems. Students will also learn quantitative analysis skills in a statistics course, which will become immediately applied to a higher-year lab course or research based course in which students will learn lab skills and/or research skills relevant to further studies in health and disease and cellular molecular biology.

As students progress through their studies, they will take a series of core Health & Disease concentration courses that will cover a wide range of topics relevant to studies in health and disease including: histology (HMB302H1) topics related to health systems (HMB322H1), and higher-year course of the students choosing relating to health systems and/or disease systems (all of which have heavy critical analysis components surrounding current primary research and feature assessments such as grant proposals and literature reviews). These courses focus on particular aspects to health and disease and build on knowledge gains in foundation courses and work to present to students a comprehensive analysis of human health systems and disease systems.

Specific learning outcomes of the program remain as proposed in 2015:

By the end of this program, students will be able to:

1. Demonstrate an understanding of the fundamental concepts in human health and disease and how these concepts are applied.
2. Identify, analyze, and critically evaluate data from health and disease research from the primary literature.
3. Acquire important lab skills in the life sciences.
5. Identify and critically evaluate ethical perspectives on health and disease research
6. Gain research experience in health and disease through the collection, analysis and interpretation of scientific data.
7. Write and speak effectively about health and disease issues to both scientific and broader audiences.

Our objectives and outcomes remain consistent with the 2015 major program modifications, but now that HMB has its own lab space, increased staff support, and wishes to acknowledge the changes in the study of health sciences and disease systems, the required courses have been adjusted to reflect our desired outcomes and objectives, and to offer a more consistent foundation to all students in the program.

Depth of Knowledge:

Introductory courses are designed to expose students to fundamental concepts in genetics (HMB265H1/BIO260H1), health and disease (HMB202H1), as well as biochemistry (BCH210H1) and molecular biology (BIO230H1/BIO255H1). These courses provide a core knowledge base in these areas from which students will build. Students are then introduced to more advanced health and disease courses that highlight anatomy and physiology (ANA300Y1, PSL300H1, PSL301H1), histology (HMB302H1), and the immune system (IMM350H1). Further depth in these subjects is available in courses that focus on epidemiology (HMB342H1), or principles of pathobiology (LMP363H1). Students can further engage in specialized courses in the genetics of human disease (HMB441H1), and advanced nutrition (NFS484H1).

Critical and Creative Thinking:

Students engage in critical thinking early on in the program. For example, in HMB265H1 and HMB202H1 there are assignments and tests that focus on the application of course concepts and information through problem-based learning, whereas written assignments and oral presentations are based on the synthesis and critical analysis of information and techniques from both primary and review articles. As with all life science programs, the integration of primary research findings into all of our courses, but especially in 300- and 400-level courses, is a critical component of the student learning experience. Students are taught how to interpret and critically analyze research as well as develop the skills in synthesizing information from multiple sources. The program also uses creative ways to facilitate reflective thinking. For example, HMB443H1 integrates community engaged learning as a primary method for teaching students about micronutrient deficiencies and food security.

Information Literacy:

Students learn effective written and oral strategies for communicating their analyses and critiques. For example, seminar courses often require students to be creative and persuasive in developing research grant proposals in translational medicine (HMB402H1). Team-based learning and peer evaluations, either in class or online, are also integrated in several different courses, such as HMB302H1 where students work in pairs or small groups where students engage in peer learning and evaluation. Seminar presentations or poster presentations are common among most advanced courses and this enables students to develop key skills in explaining, discussing, critically analyzing and synthesizing research findings in an oral presentation format. Students also have opportunities to cultivate an ability to interact and debate issues in a group setting with guest speakers that are experts in their fields, preparing them with communication skills that will be useful in a professional workplace.

In order to complete written and oral assignments, students are required to learn to use Internet based search engines (e.g. PubMed, Google Scholar, Ensembl, Allen Brain Atlas, etc.) to acquire relevant information from the primary literature, and genome and gene expression databases. In HMB302H1, students engage in peer teaching and evaluation facilitated by social media and access to an online image database. Students are typically evaluated on their effective gathering and use of this information through enhanced citations, and the ability to use PowerPoint, Keynote, blogs and other presentation formats.

Quantitative Reasoning:

While many courses will integrate quantitative analysis and reasoning, such as genetic mapping (HMB265H1), or statistically analyzing altered physical parameters due to exercise (HMB471H1), the program also requires that students take basic statistics courses (HMB325H1/STA220H1/STA288H1/PSY201H1) that will serve as a foundation for understanding concepts and analyzing research in other courses.

Social and Ethical Responsibility:

Several courses will introduce students to some of the bioethical, social and health policy issues and controversies...
surrounding specific topics in health and disease, such as AIDS (HAJ453H1), and dementia (HMB440H1). The overall objective is to challenge students to think about the benefits of health and disease research, and the limits of these benefits, on society, including medicine, law and biotechnology.

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<tr>
<th>An Integrative, Inquiry Based Activity:</th>
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<tr>
<td>Seminar courses at the 400-level provide a major opportunity for students to integrate knowledge from across a spectrum of health and disease related courses. Students in the specialist program are required to complete a full-year research project course or a summer research project course (HMB496Y1/HMB499Y1). Students will typically identify suitable supervisors in hospital research institutes or campus-based laboratories and research groups. Research project course oversight includes a HMB faculty advisor facilitates the placements, guide workshops on research presentation skills or apply statistical analyses (in collaboration with Department of Statistical Sciences), as well as organize research presentation days (with research faculty to serving as assessors). Students gain invaluable first-hand experience integrating their knowledge of health and disease and other related subjects, learn to apply their quantitative reasoning and analytical skills, practice effective communication and team-based learning, and learn about ethical standards in research.</td>
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<tbody>
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<td>The total number of FCE required has been reduced to 13.0 FCE from 13.5 FCE as part of the re-alignment of the programs requirements. HMB322H1 (Topics in Health &amp; Disease) is now a required course and will further enhance the histology learned in HMB302H1 (Histology) and will help provide a full foundation of students interested in health and disease sciences. A research based course in addition to a required lab course is now required to again ensure that a full foundation is provided to the specialist students in the Health &amp; Disease program as research based skills are acquired in both a lab and in the classroom vis a vis literature reviews, grant proposals, application of knowledge transfer, etc. The requisite line of 1.0 FCE from further courses that focus on the structure and function of the human body: ANA300Y1 / IMM340H1 / IMM350H1 / MGY377H1/ MGY378H1 / CSB351Y1 has been moved and incorporated into the required 2.0 FCE of higher-year Health &amp; Disease concentration courses. PSL300H1 and PSL301H1 are still required. This is to allow students to have more flexibility in self-guiding their academic interests. The update of the specialist enrolment criteria is designed to better demonstrate and offer more transparency on criteria already being used for enrolment into this program as students not entering from first year have their second year courses assessed.</td>
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| 45 |
This realignment of four of our five programs has benefited the program as a whole and our students greatly, and have allowed us to see more clearly where there are gaps in the program structure and program objectives, as well as allowing us to see how to better align the programs with their objectives, as outlined in 2015.

Since then, we have consulted with the Dalla Lana School of Public Health on pedagogy revisions for our Global Health major and Specialist (ASMAJ25757 and ASSPE2575), and have consulted with our faculty and staff to better assess pedagogy gaps and inconsistencies in program structure and pressure points within our programs in terms of enrollment and student outcomes. Many of the gaps/alignment were due to lack of lab space, staff, support, or lack of faculty to teach core courses.

Even in the 2015 major modification proposal, it was outlined that HMB has been working closely with [the Cell Systems and Biology Department], [the Department of Ecology and Evolutionary Biology] and the [Faculty of Arts & Science] to expand and modernize lab course offerings in the planned renovations of the [Ramsay Wright] teaching labs. However, at the time of the proposal, the labs were not yet constructed. Construction began in spring 2015 and they are currently nearing completion. HMB teaching labs will be ready for full-time use by September 2017. As such, we wish to utilize these labs in our HMB courses to better meet listed course objectives for the benefit of our students.

Sine many of the recommendations from the external review have been met, and now that HMB has more staff support including 2 lab technicians, a more clear vision, our own teaching labs (which will allow us to use the space more frequently), and have been approved to hire an appointed faculty member starting in July 2017 (the search is currently ongoing) who will allow us to offer more course sections of some of our courses without overburdening teaching assignments, we would like to make further revisions to better meet objectives outlined in 2014. The proposed restructuring of all of our programs is the next step in further defining improvements and innovations first initiated in 2015-2016.

Impact that the proposal may have on students or other academic units/divisions:
Impact on other units should be minimal as enrolment is not planned to increase. The majority of the courses required in the program are the same course requirement/requirement options as the current neuroscience major. Impact on our unit should also not increase as we have increased staff support. The Health & Disease specialist program is a Type 3 limited enrolment program and is capped at 44 students per cohort year (to guarantee they have a space in one of the lab courses we require them to take). The total program enrolment this year is 67, and the two year average is 60. We do not anticipate this specialist program decreasing or increasing in size.

Consultation:
Director Dr. Melanie Woodin has consulted extensively with Vice-Deans Pamela Klassen and Poppy Lockwood as well as with faculty within the Human Biology program.
After consultations with Biochemistry in January 2017, we have eliminated the option to use CHM247H1 in lieu of BCH210H1.
The following consultations were due to feedback from the Life Science Planning Meeting in January 2017:
After consultations with EEB in January 2017, EHJ352H1 has been added as a course option for higher year Health & Disease concentration courses. BIO220H1 is now included in the admissions criteria for students applying with 8.0 or more FCE complete.
After consultations with Pathobiology in January 2017, LMP365H1 has been removed as a course option for higher year Health & Disease concentration courses, and replaced with LMP363H1.

Diversity:
The re-design of the Health & Disease program ensures all students receive a solid foundation in both health systems and disease systems in the human body. HMB works closely with Accessibility Services, and accommodations requested are met. This will not change. Further, many of our faculty work to offer a variety of assignments that better provide to a variety of learners in their courses.

Resource Implications:
Current support is adequate.

Faculty and TA Support:
Current support is adequate.
# Global Health Specialist

<table>
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<th>Start Session:</th>
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<td>Summer 2017</td>
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## Current Calendar Description:

### HMB: Global Health

The objective of the HMB: Global Health program is to provide students with instruction in fundamental biological sciences and to integrate a broad understanding of the socio-economic and cultural determinants of health to populations around the world.

## New Calendar Description:

## Current Admission Requirements:

## New Admission Requirements:

No changes

## Current Enrolment Requirements:

This is a Type 3 limited enrolment program. Meeting the following minimum criteria does not guarantee admissions to the program.

- BIO120H1 with a minimum mark of 60%
- BIO130H1 with a minimum mark of 60%
- CHM136H1 and CHM135H1 or CHM138H1 and CHM139H1 or CHM151Y1 with a minimum mark of 60%
- MAT135H1 or PHY131H1 or PHY151H1 with a minimum mark of 60%

and, a composite average of at least 70% on the above 2.5 FCE.

Students may apply for this specialist program only during Round 1 of Type 3 Enrolment. Students applying for admissions to the program utilising transfer credits or later than the end of their first year will be considered on a case-by-case basis. For more information about Type 3 enrolment, visit the [Faculty of Arts & Science Subject Program Enrolment Instructions website](#).

## New 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.

**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 major 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.

Current Completion Requirements:

Required courses (15.5 FCE)

Prior to entering POST:
1. BIO120H1, BIO130H1
2. (CHM136H1, CHM135H1)/(CHM138H1, CHM139H1)/CHM151Y1 (transfer credits will be accepted in lieu of the chemistry requirements only if they carry a direct exclusion to a pre-approved chemistry course)
3. (MAT135, MAT136) / (PHY131H1, PHY132H1)/(PHY151H1, PHY152H1)

Year 2: Foundations in global health
4. HMB203H1
5. BIO220H1, BIO230H1/BIO255H1
6. Statistics: STA220H1/PSY201H1/HMB325H1
7. 0.5 from Bio-Social Courses: ANT100Y1/ GGR100H1/ GGR107H1/ GGR124H1/ PHL100Y1/ PSY100H1/ SOC101Y1/ SOC102H1/ SOC103H1/ TRN150Y1/ TRN151Y1/ VIC170Y1/ VIC171Y1/ NEW150Y1/ POL101Y1/ WGS160Y1
8. 1.0 FCE from Environment or Resource Management courses: JGE236H1/ FOR201H1/ GGR201H1/ GGR203H1/ GGR206H1/ ENV221H1/ ENV222H1
9. 1.0 FCE from Social, Cultural or Political Science courses: ANT204H1/ANT208H1/GGR216H1/ GGR220H1/HST209H1/GJG216H1/JSU237H1/NEW250Y1/PHL273H1/PHL275H1/PHL281H1/ POL201Y1/ POL208Y1/ PSY220H1/SOC205H1/ SOC210H1/ SOC214H1/ SOC243H1/ SOC244H1/ SOC246H1/ SOC256H1/ SOC281H1/ WGS271Y1

Year 3: Selected Topics in global health
10. HMB303H1
11. 1.0 FCE from Biological Sciences: HMB265H1/ HMB342H1/ HMB390H1/ANT203Y1/ BCH210H1/ BIO251H1/(BIO270H1+BIO271H1)/ EEB225H1/ EEB263Y1/ ENV234H1/ JGE236H1/(PSL300H1+PSL301H1)/ STA221H1
12. 0.5 FCE from a higher year lab course: HMB312H1/ BCH370H1/ CSB330H1/ CSB350H1/ MGY379Y1/ PSL372H1
13. 1.5 FCE from Basic Medical Sciences:CSB351Y1/ LMP363H1/ MGY377H1/ MGY378H1/ NFS284H1
14. 0.5 FCE from Ecology/Evolution: EHJ352H1/ EEB319H1/ EEB322H1/EEB323H1/ EEB324H1/ EEB328H1/ EEB362H1/ EEB365H1/ BCH311H1/ CSB349H1/ PSL350H1
15. 1.0 FCE from Environmental Issues: GGR305H1/ GGR307H1/ GGR314H1/ JGE321H1/ ENV322H1/ FOR302H1/ FOR303H1

Year 4: Advanced topics in global health with emphasis on primary research and critical analysis
16. 1.0 FCE from 400-level Soc/Hum/Proj series: HMB420H1/ HMB433H1/ HMB462H1/ HMB498Y1/HMB499Y1/ANT427H1/ANT440H1/ ANT450H1/ ANT452H1/ ANT460H1/ GGR418H1/GGR419H1/GGR438H1/GGR439H1/HST411H1/HST440H1/HST446H1/ JFG475H1/ NEW452H1/POL412Y1/ POL413H1/POL417Y1/ PHL415H1/ PHL440H1/ PHL470H1/ PHL482H1/TRN419Y1/TRN421Y1/WGS426H1
New Completion Requirements:

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

**Chemical and Physical Foundations of Biological Systems**

(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.

MAT135H1 / PHY131H1 / PHY151H1

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 / HMB322H1 / ANA300Y1 / ANA301H1 / CSB351Y1 / IMM340H1 / IMM350H1 / MGY377H1 / MGY378H1

**Global Health Concentration Courses**

10. HMB203H1
11. HMB323H1
12. 0.5 FCE from: PHS100H1 / GGR112H1 / PSY100H1 / ABS201Y1 / ANT100Y1 / SOC101Y1 / ECO100Y1 / SOC102H1
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 / HMB443H1 / HMB440H1 / HMB447H1 / HMB462H1 / HMB473H1 / HMB474H1 / HMB496Y*/ HMB499Y1*/ JEH455H1 / CSB351Y1 / EBB428H1 / EHJ352H1 / MGY350H1 / MGY377H1 / MGY378H1
15. 1.0 FCE from courses on the social and ecological dimensions of Global Health: HMB303H1 / HMB306H1 / ABS240Y1 / ABS245Y1 / ABS350H1 / ABS355H1 / ANT345H1 / ANT348H1 / ANT358H1 / ANT458H1 / ANT460H1 / ECO314H1 / ECO324H1 / ECO334H1 / ECO342H1 / ECO358H1 / ECO402H1 / EEB428H1 / ENV341H1 / ENV430H1 / ENV432H1 / GGR433H1 / GGR436H1 / HST410H1 / HST440H1 / HST464H1 / JNH350H1 / NEW352H1 / NEW353H1 / NEW453H1 / NFS490H1 / PHS300H1 / PSY320H1 / PSY321H1

**Data Analysis and Research-Based Courses**

16. 0.5 FCE in statistics: HMB325H1 / STA220H1 / STA288H1 / PSY201H1 / HMB325H1
17. 0.5 FCE in bioethics: HMB306H1 / HMB406H1 / PHL281H1
18. 1.0 FCE from: 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.

Global Health Specialists Notes:

Courses can only count toward one requirement, even if listed as options to multiple requisites of the program.

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.

Academic Context:

Global Health encompasses the field of studies focus on health systems in the human body, and social and cultural constructs affecting human and human health. The Global health program in the Faculty of Arts & Science exists to provide students with a firm foundation in human biology and introduce them to the field of public health though courses offered through the collaborative program in Human Biology and other courses offered within the Faculty of Arts & Science.

The Global Health specialist program has been revised to emphasize fundamental concepts in human biology. The program takes an interdisciplinary approach that integrates genetics, physiology, and psychology through courses in HMB as well as courses that are offered through other departments and programs.

Students graduating from the Global Health specialist program will be able to communicate effectively with the public, NGOs, private sector, and government on the basic principles of health and disease and issues surrounding its societal implications. Students will also be able to specialize by pursuing research through graduate studies, further training as health care professionals, or pursuing advanced degrees in social work, public policy, business, or law.

Learning Outcomes:

Students enter the program at the end of their first year after establishing a foundation in organic biology and chemistry as well as physical chemistry. Students will build on this foundation with foundational courses (HMB203H1, HMB265H1, BIO230H1, BCH210H1, PSL300H1, and PSL301H1 and a social introductory course of their choosing: PHS100H1/ GGR112H1/ PSY100H1/ABS201Y1/ ANT100Y1/ SOC101Y1/ ECO100Y1/ SOC102H1) that are designed to provide a broad overview of their respective subject areas, all of which supply the foundation to the study of human biology and global health. Students will also learn quantitative analysis skills in a statistics course, which will become immediately applied to a higher-year lab course or research based course in which students will learn lab skills and/or research skills relevant to further studies in health and disease and cellular molecular biology.

Depth of Knowledge:

Introductory courses are designed to expose students to fundamental concepts in genetics (HMB265H1/BIO260H1), global health (HMB202H1), as well as molecular biology (BIO230H1/BIO255H1). These courses provide a core knowledge base in these areas from which students will build. Students are then introduced to more advanced health and disease courses that highlight anatomy and physiology (ANA300Y1, PSL300H1, PSL301H1), histology (HMB302H1), and social constructs affecting human health and development (PHS100H1/ PSY100H1/ABS201Y1/ ANT100Y1/ SOC101Y1/ ECO100Y1). Further depth in these subjects is available in courses that focus on environmental impacts of health (JEH455H1), global health policy (HMB303H1), or principles of heavy metals in the body (HMB437H1).

Critical and Creative Thinking:

Students engage in critical thinking early on in the program. For example, in HMB265H1 there are assignments and tests that focus on the application of course concepts and information through problem-based learning, whereas written assignments and oral presentations are based on the synthesis and critical analysis of information and techniques from both primary and review articles. As with all life science programs, the integration of primary research findings into all of our courses, but especially in 300- and 400-level courses, is a critical component of the student learning experience. Students are taught how to interpret and critically analyze research as well as develop the skills in synthesizing information from multiple sources. The program also uses creative ways to facilitate reflective thinking. For example, HMB443H1 integrates community engaged learning as a primary method for teaching students about micronutrient deficiencies and food security.

Information Literacy:
seminar courses often require students to be creative and persuasive in developing research grant proposals in translational medicine (HMB402H1). Team-based learning and peer evaluations, either in class or online, are also integrated in several different courses, such as HMB302H1 where students work in pairs or small groups where students engage in peer learning and evaluation. Seminar presentations or poster presentations are common among most advanced courses and this enables students to develop key skills in explaining, discussing, critically analyzing and synthesizing research findings in an oral presentation format. Students also have opportunities to cultivate an ability to interact and debate issues in a group setting with guest speakers that are experts in their fields, preparing them with communication skills that will be useful in a professional workplace.

Quantitative Reasoning:
While many courses will integrate quantitative analysis and reasoning, such as genetic mapping (HMB265H1), or statistically analyzing health data (HMB342H1), the program also requires that students take basic statistics courses (HMB325H1/ STA220H1/ STA288H1/ PSY201H1) that will serve as a foundation for understanding concepts and analyzing research in other courses.

Social and Ethical Responsibility:
Several courses will introduce students to some of the bioethical, social and health policy issues and controversies surrounding specific topics in health and disease, such as AIDS (JNH350H1, HAJ453H1), and dementia (HMB440H1). The overall objective is to challenge students to think about the benefits of health and disease research, and the limits of these benefits, on society, including medicine, law and biotechnology.

An Integrative, Inquiry Based Activity:
Seminar courses at the 400-level provide a major opportunity for students to integrate knowledge from across a spectrum of health and disease related courses. Students in the specialist program are required to complete a full-year research project course or a summer research project course (HMB496Y1/HMB499Y1), although this is not a requirement. Students will typically identify suitable supervisors in hospital research institutes or campus-based laboratories and research groups. Research project course oversight includes a HMB faculty advisor facilitates the placements, guide workshops on research presentation skills or apply statistical analyses (in collaboration with Department of Statistical Sciences), as well as organize research presentation days (with research faculty to serving as assessors). Students gain invaluable first-hand experience integrating their knowledge of health and disease and other related subjects, learn to apply their quantitative reasoning and analytical skills, practice effective communication and team-based learning, and learn about ethical standards in research.

Program Delivery:
Method: In Class; Online
Mode: Full Time; Part Time

Brief Description of the Proposal:
Modification of how Calendar listing is organized for better clarity of program requirements, Total FCE count reduced from 15.5 FCE to 13.5 FCE, complete assessment of value and necessity of each course listed, resulting in several requisite lines being merged together, and several requisite lines being separated out to ensure that all necessary foundation life science courses (such as PSL300H1 and PSL301H1 and BCH210H1) are required.

Details of Proposed Change:
Total FCE required has been reduced from 15.5 FCE to 13.5 FCE to make the program more manageable in four years to students enrolled in the program.

Update of specialist enrolment criteria to better demonstrate and offer more transparency on criteria already being used for specialist enrolment.

HMB265H1/ BIO260H1 and BCH210H1 are are now required, as are PSL300H1 and PSL301H1 are now required. The old requisite line was: HMB265H1/ HMB342H1/ HMB390H1/ANT203Y1/ BCH210H1 / BIO251H1/(BIO270H1+BIO271H1)/ EEB225H1/ EEB263Y1/ ENV234H1/ JGE236H1/ (PSL300H1+PSL301H1)/ STA221H1
directly related to the study of global health and public policy related to health.

The number of Social/Environmental/Political perspective courses required has been reduced. The OLD Social/Environmental/Political perspective lines are:

1. 0.5 from Bio-Social Courses: ANT100Y1/ GGR100H1/ GGR107H1/ GGR124H1/ PHL100Y1/ PSY100H1/ SOC101Y1/ SOC102H1/ SOC103H1/ TRN150Y1/ TRN151Y1/ VIC170Y1/ VIC171Y1/ NEW150Y1/ POL101Y1/ WGS160Y1

2. 1.0 FCE from Environment or Resource Management courses: JGE236H1/ FOR201H1/ GGR203H1/ GGR206H1/ ENV221H1/ ENV222H1

3. 1.0 FCE from Social, Cultural or Political Science courses: ANT204H1/ANT208H1/GGR216H1/ GGR220H1/ HST209H1/JGI216H1/JSU237H1/NEW250Y1/PHL273H1/PHL275H1/PHL281H1/ POL201Y1/ POL208Y1/ PSY220H1/SOC205H1/ SOC210H1/ SOC214H1/ SOC243H1/ SOC244H1/ SOC246H1/ SOC256H1/ SOC281H1/ WGS271Y1

4. 0.5 FCE from Ecology/Evolution: EHJ352H1/ EEB319H1/ EEB322H1/EEB323H1/ EEB324H1/ EEB328H1/ EEB362H1/ EEB365H1/ BCH311H1/ CSB349H1/ PSL350H1

5. 1.0 FCE from Environmental Issues: GGR305H1/ GGR307H1/ GGR314H1/ JGE321H1/ ENV322H1/ FOR302H1/ FOR303H1

6. 1.0 FCE from 400-level Soc/Hum/Proj series: HMB420H1/ HMB433H1/ HMB462H1/ HMB498Y1/HMB499Y1/ANT427H1/ANT440H1/ANT450H1/ANT452H1/ANT460H1/ GGR418H1/GGR419H1/GGR433H1/GGR434H1/HST410H1/HST440H1/HST464H1/ JNH350H1/ NEW452H1/TRN411Y1/TRN419Y1/TRN421Y1/WSG426H1

The NEW Social/Environmental/Political perspective lines proposed are:

1. 0.5 FCE from: PHS100H1/ GGR112H1/ PSY100H1/ABS201Y1/ ANT100Y1/ SOC101Y1/ ECO100Y1/ SOC102H1 Transfer credits from AP and IB psychology are not accepted.

2. 1.0 FCE from courses on the social dimensions of Global Health: HMB303H1/ HMB306H1/ ABS240Y1/ ABS250Y1/ ABS350H1/ ABS355H1/ ANT345H1/ANT348H1/ANT358H1/ANT458H1/ANT460H1/ ECO314H1/ ECO324H1/ECO333H1/ECO342H1/ECO343H1/ECO344H1/ECO402H1/ EEB428H1/ EEB430H1/ ENV341H1/ HST310H1/ JNH350H1/ PHL373H1/PHL380H1/ PHL381H1/ PHL382H1/ PHL383H1/ PHL384H1/ POL301Y1/POL343Y1/ POL380H1/ POL380Y1/ PSY333H1/SOC312H1/ SOC364H1/ SOC381Y1/ WGS365H1/WGS367H1/WGS368H1

Rationale:

The Human Biology Program completed a self-study in March 2014 that the program and the Faculty of Arts & Science has been steadily working on the recommendations to enhance the overall quality of the program. Many of the recommendations have already been put into effect: our smallest program (Health Care Ethics major) has been closed for further admissions and a proposal to formally close the program will be put forward in October 2017, we have signed a MOA giving the School of the Environment full ownership of the Environment and Health major and specialist (ASMAJ0365 and ASSEPE0365) and have agreed to continue teaching and supporting the capstone requirement course for the specialist program: JEH455H1 (Topics in Environment & Health) and giving Environment and Health students enrolment priority in a number of our courses.

Impact that the proposal may have on students or other academic units/divisions:

Impact on other units should be minimal as enrolment is not planned to increase. The majority of the courses required in the program are the same course requirement/ requirement options as the current neuroscience major. Impact on our unit should also not increase as we have increased staff support. The Global Health specialist program is a Type 3 limited enrolment program and is capped at 44 students per cohort year (to guarantee they have a space in one of the lab courses we require them to take). The total program enrolment this year is 7, and the two year average is 5. We do anticipate this specialist program increasing in size as it is now more clear and manageable, but the cap of 44 per cohort year will remain in effect.

Consultation:

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Director Dr. Melanie Woodin has consulted extensively with Vice-Deans Pamela Klassen and Poppy Lockwood as well as with faculty within the Human Biology program. The development of the new program structure was also done in collaboration with Dr. Andrea Cortinois from the Dalla Lana School of Public Health. We had a series of meetings from March to August 2016 to discuss and review development of both the major and specialist in the HMB: Global Health Program.

The program proposals were also sent on December 7, 2016 to the Health Studies program, The Centre for Indigenous Studies, The Department of Economics, and the Department of Anthropology to notify them that a significant number of their courses are being listed as program options, but that we are not asking for priority enrolment into these courses nor are we asking for pre-requisite waivers. All four programs have responded positively, and have consented to having their courses listed in this program.

After consultations with Biochemistry in January 2017, we have eliminated the option to use CHM247H1 in lieu of BCH210H1.

After consultation with EEB in January 2017, have added BIO220H1 as a required course and have included it in admissions criteria for students applying with 8.0 or more FCE complete. (increasing the FCE count from 13.0 FCE to 13.5 FCE). This was the only feedback received from the Life Science Planning Meeting in January 2017.

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<th>Diversity:</th>
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<td>The re-design of the global health major program ensures all students receive a well-rounded education in the field of global health. HMB works closely with Accessibility Services, and accommodations requested are met. This will not change. Further, many of our faculty work to offer a variety of assignments that better provide to a variety of learners in their courses.</td>
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<th>Resource Implications:</th>
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<td>Current support is adequate.</td>
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<th>Faculty and TA Support:</th>
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<td>Current support is adequate.</td>
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**6 Minor Program Modifications (Full Divisional Review)**

**Statistics Specialist**

**Start Session:**
Summer 2017

**Current Completion Requirements:**

(11.0 full courses or their equivalent)

First Year:

CSC108H1/CSC120H1/CSC121H1/CSC148H1, MAT137Y1/MAT157Y1.

Second Year:

MAT223H1/MAT240H1, MAT224H1/MAT247H1, MAT237Y1/MAT257Y1; STA257H1, STA261H1
(MAT223H1/MAT240H1 recommended in 1st year) while CSC148H1 might well be taken in 2nd year)

Higher Years:

1. STA302H1, STA303H1, STA347H1, STA355H1, STA410H1, STA442H1
2. 2 full year courses from the given list: (STA414H1/CSC411H1), STA422H1, STA437H1, STA447H1, STA452H1,
   STA453H1, STA457H1, STA465H1, STA480H1
3. 1.5 full year courses from: ACT451H1, ACT452H1, ACT460H1; APM412H1;
   MAT327H1, MAT334H1/MAT354H1, MAT337H1/MAT357H1, MAT301H1/MAT347Y1
   CSC207H1, CSC310H1, CSC336H1/CSC436H1,
   STA300 + level courses

**New Completion Requirements:**

(11.0 full courses or their equivalent)

First Year:

CSC108H1/CSC120H1/CSC121H1/CSC148H1, MAT137Y1/MAT157Y1. STA130H1 is strongly recommended.

Second Year:

MAT223H1/MAT240H1, MAT224H1/MAT247H1, MAT237Y1/MAT257Y1; STA257H1, STA261H1
(MAT223H1/MAT240H1 recommended in 1st year) while CSC148H1 might well be taken in 2nd year)

Higher Years:

1. STA302H1, STA303H1, STA347H1, STA355H1, STA410H1, STA442H1
2. 2 full year courses from the given list: (STA414H1/CSC411H1), STA422H1, STA437H1, STA447H1, STA452H1,
   STA453H1, STA457H1, STA465H1, STA480H1
3. 1.5 full year courses from: ACT451H1, ACT452H1, ACT460H1; APM412H1;
   MAT327H1, MAT334H1/MAT354H1, MAT337H1/MAT357H1, MAT301H1/MAT347Y1
   CSC207H1, CSC310H1, CSC336H1/CSC436H1,
   STA300 + level courses

**Brief Description of the Proposal:**

Consultation:
**Applied Statistics Specialist**

**Start Session:**
Summer 2017

**Current Completion Requirements:**

(10.0 FCEs plus a disciplinary focus requiring 2.0-3.5 FCEs)

First year:
1. **CSC108H1/CSC120H1/CSC121H1/CSC148H1, (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1**

2. Recommended: introductory course in disciplinary focus.

Second year
3. **MAT223H1/MAT240H1, MAT235Y1/MAT237Y1/MAT257Y1, (STA220H1/STA221H1/ECO220Y1,STA255H1)/(STA247H1,STA248H1)/(STA257H1,STA261H1)**
   **MAT223H1/MAT240H1** can be taken in first year.

Upper years:
4. **STA302H1,STA303H1,STA304H1/STA305H1,STA355H1,STA410H1,STA437H1,STA442H1,STA490Y1**
5. 0.5 FCEs from STA 300+-level offerings
6. 1.0 FCEs from the following list:
   **MAT224H1/MAT247H1, MAT244H1/MAT267H1 APM236H1/APM346H1/APM462H1 CSC148H1/CSC207H1**

**Disciplinary Focuses**

Students in the Applied Statistics Specialist program must complete at least one disciplinary focus. Students whose interests do not match any of the focuses listed below should consult the Department of Statistical Sciences regarding the possibility of creating a new disciplinary focus, by the start of the third year of their program.

To enrol in one or more focuses, students must first be enrolled in the Applied Statistics Specialist program. Enrolment instructions can be found on the [Arts & Science Current Students program enrolment web site](#). Focuses can be chosen on ACORN after admission to the program, which begins in July.

**Health Studies:** (2.5 FCE)
**UNI209H1, UNI211H1, UNI373H1, UNI330H1/UNI411H1/UNI464H1**

**Global Health:** (2.5 FCE)
**BIO120H1, BIO130H1, HMB203H1, HMB323H1, HMB342H1/HMB433H1**
(Recommended: **HMB433H1**)

**Health and Disease:** (3.0 FCE)
**BIO120H1, BIO130H1, HMB202H1, HMB265H1, HMB302H1, HMB321H1/HMB322H1/HMB422H1**
**Note:** Students in this focus who do not have all the prerequisites for any of the HMB courses should email the HMB program office at hmb.undergrad@utoronto.ca prior to enrolling in the course to request a prerequisite waiver.

**Fundamental Genetics and its Applications:** (3.0 FCE)
**BIO120H1, BIO130H1, HMB201H1, HMB265H1, HMB301H1, HMB321H1/HMB421H1/HMB441H1**
(Recommended: **HMB421H1**)
**Note:** Students in this focus who do not have all the prerequisites for any of the HMB courses should email the HMB program office at hmb.undergrad@utoronto.ca prior to enrolling in the course to request a prerequisite waiver.

**Neuroscience:** (3.5 FCE)
**BIO120H1, BIO130H1, PSY100H1, HMB200H1/HMB220H1, HMB265H1, HMB300H1, HMB420H1/HMB440H1**
Note: Students in this focus who do not have all the prerequisites for any of the HMB courses should email the HMB program office at hmb.undergrad@utoronto.ca prior to enrolling in the course to request a prerequisite waiver.

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

Cognitive Psychology: (2.0 FCE)  
PSY100H1, PSY270H1, PSY493H1, PSY342H1/PSY405H1/PSY406H1

Sociolinguistics: (3 FCE)  
LIN100Y1; 2 of LIN228H1, LIN229H1, LIN232H1 or LIN241H1; LIN351H1 and LIN456H1

Psycholinguistics: (3 FCE)  
LIN100Y1; 2 of LIN228H1, LIN229H1, LIN232H1 or LIN241H1; 2 of JLP374, JLP315 or JLP471

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

Sociology: (2.5 FCE)  
SOC101Y1 (minimum grade of 65%) or SOC102H1+SOC103H1 (minimum combined average grade of 65%); SOC200H1; one of SOC303H1/SOC312H1/SOC355H1; 0.5 credit SOC course at 400-level. Students interested in advanced study in Sociology should consider additional courses, in particular SOC201H1 and SOC203H1.

New Completion Requirements:

(10.0 FCEs plus a disciplinary focus requiring 2.0-3.5 FCEs)

First year:  
1. CSC108H1/CSC120H1/CSC121H1/CSC148H1, (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1.

2. Recommended: introductory course in disciplinary focus MAT223H1/MAT240H1. STA130H1 is also strongly recommended.

Second year  
3. MAT223H1/MAT240H1, MAT235Y1/MAT237Y1/MAT257Y1, (STA220H1/STA221H1/ECO220Y1,STA255H1)/(STA247H1,STA248H1)/(STA257H1,STA261H1)

Upper years:  
4. STA302H1, STA303H1, STA304H1/STA305H1, STA355H1, STA410H1, STA437H1, STA442H1, STA490Y1

5. 0.5 FCEs from STA 300+-level offerings

6. 1.0 FCEs from the following list:  
   MAT224H1/MAT247H1, MAT244H1/MAT267H1
   APM236H1/APM346H1/APM462H1
   CSC148H1/CSC207H1

Disciplinary Focuses

Students in the Applied Statistics Specialist program must complete at least one disciplinary focus.

To enrol in one or more focuses, students must first be enrolled in the Applied Statistics Specialist program. Enrolment instructions can be found on the Arts & Science Current Students program enrolment web site. Focuses can be chosen on ACORN after admission to the program, which begins in July.

Health Studies: (2.0 FCE)  
HST209H1, HST211H1, HST373H1, HST330H1/HST411H1/HST464H1
Health and Disease: (3.0 FCE)
**BIO120H1, BIO130H1, HMB202H1, HMB265H1, HMB302H1, HMB321H1/HMB322H1/HMB422H1**

Fundamental Genetics and its Applications: (3.0 FCE)
**BIO120H1, BIO130H1, HMB265H1, HMB301H1, HMB321H1/HMB421H1/HMB441H1**
(Recommended: **HMB421H1**)

Neuroscience: (3.5 FCE)
**BIO120H1, BIO130H1, PSY100H1, HMB200H1/HMB220H1, HMB265H1, HMB300H1, HMB420H1/HMB440H1**
(Recommended: **HMB420H1**)

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

Cognitive Psychology: (2.0 FCE)
**PSY100H1, PSY270H1, PSY493H1, PSY342H1/PSY405H1/PSY406H1**

Sociolinguistics: (3 FCE)
**LIN100Y1; 2 of LIN228H1, LIN229H1, LIN232H1 or LIN241H1; LIN351H1 and LIN456H1**

Psycholinguistics: (3 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** or **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) **EEB319H1/321H1/328H1/365H1/428H1/433H1/440H1 or ENV234H1/334H1/432H1**

Evolutionary Biology: (3.5 FCE)
**BIO120H1, BIO130H1, BIO220H1**: 1.5 FCE from **HMB265H1/BIO260H1, EEB318H1, EEB323H1, EEB324H1, EEB325H1, EEB362H1, EUB352H1**; 0.5 FCE from **EEB440H1, EEB455H1, EEB459H1, EEB460H1**

Notes:
* **BIO260H1** requires **BIO230H1** as a prerequisite.
* Students in the Applied Statistics specialist 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**
**Statistics Minor**

**Start Session:**
Summer 2017

**Current Completion Requirements:**

(4 full courses or their equivalent)

First Year:

\[ \text{MAT133Y1 (70%)/(MAT135H1, MAT136H1)/MAT135Y1/MAT137Y1/MAT157Y1} \ (\text{MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1 is strongly recommended}) \]

Second Year:

\[ \text{MAT221H1 (70%)/MAT223H1/MAT240H1, (STA220H1/STA221H1/ECO220Y1, STA255H1)/(STA247H1, STA248H1)/(STA257H1, STA261H1)/ECO227Y1} \]

\[ \text{MAT221H1 (70%)/MAT223H1/MAT240H1} \text{ recommended in 1st year} \]

Higher Years:

\[ \text{STA302H1} \]

2. 2 half (H) course equivalents from all available STA300+ level courses

**New Completion Requirements:**

(4 full courses or their equivalent)

First Year:

\[ \text{MAT133Y1 (70%)/(MAT135H1, MAT136H1)/MAT135Y1/MAT137Y1/MAT157Y1} \ (\text{MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1 is strongly recommended), STA130H1} \text{ is also strongly recommended.} \]

Second Year:

\[ \text{MAT221H1 (70%)/MAT223H1/MAT240H1, (STA220H1/STA221H1/ECO220Y1, STA255H1)/STA247H1, STA248H1)/STA257H1, STA261H1)/ECO227Y1} \]

\[ \text{MAT221H1 (70%)/MAT223H1/MAT240H1} \text{ recommended in 1st year} \]

Higher Years:

\[ \text{STA302H1} \]

2. 2 half (H) course equivalents from all available STA300+ level courses
### Statistics Major

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<th>Start Session:</th>
<th>Summer 2017</th>
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### Current Completion Requirements:

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

**First Year:**
CSC108H1/CSC120H1/CSC121H1/CSC148H1 (may be taken in 2nd year);  
(MAT135H1,MAT136H1)/MAT137Y1/MAT157Y1.

**Second Year:**
MAT223H1/MAT240H1, MAT235Y1/MAT237Y1/MAT257Y1; (STA220H1/STA221H1/ECO220Y1, STA255H1)/  
(STA247H1, STA248H1)/(STA257H1, STA261H1)/ECO227Y1  
(MAT223H1/MAT240H1 recommended in 1st year, MAT221H1 is not allowed)

**Higher Years:**
1. STA302H1
2. 3 half (H) course equivalents from all available STA300+ level courses (For example, a student interested in economics/commerce/finance might think to include STA304H1, STA347H1, STA457H1 in their programme, while someone engaged in a life science might entertain STA303H1, STA305H1, STA437H1. On the other hand, a student with an interest in pure math might choose to focus on applications of that subject matter to theoretical probability and statistics, selecting STA347H1, STA355H1 towards a major in statistics.)
3. 1 half (H) course equivalent from the available STA400+ level courses (For those anticipating a future professional need to analyze large arrays of data STA410H1, STA414H1 are certainly very worthy of consideration.)

### New Completion Requirements:

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

**First Year:**
CSC108H1/CSC120H1/CSC121H1/CSC148H1 (may be taken in 2nd year);  
(MAT135H1,MAT136H1)/MAT137Y1/MAT157Y1. STA130H1 is strongly recommended.

**Second Year:**
MAT223H1/MAT240H1, MAT235Y1/MAT237Y1/MAT257Y1; (STA220H1/STA221H1/ECO220Y1, STA255H1)/  
(STA247H1, STA248H1)/(STA257H1, STA261H1)/ECO227Y1  
(MAT223H1/MAT240H1 recommended in 1st year, MAT221H1 is not allowed)

**Higher Years:**
1. STA302H1
2. 3 half (H) course equivalents from all available STA300+ level courses (For example, a student interested in economics/commerce/finance might think to include STA304H1, STA347H1, STA457H1 in their programme, while someone engaged in a life science might entertain STA303H1, STA305H1, STA437H1. On the other hand, a student with an interest in pure math might choose to focus on applications of that subject matter to theoretical probability and statistics, selecting STA347H1, STA355H1 towards a major in statistics.)
3. 1 half (H) course equivalent from the available STA400+ level courses (For those anticipating a future professional need to analyze large arrays of data STA410H1, STA414H1 are certainly very worthy of consideration.)

### Brief Description of the Proposal:

Consultation:
### Actuarial Science Specialist

**Start Session:**
Summer 2017

### Current Enrolment Requirements:

This is a limited enrolment program. All students who request the program and obtain at least the specified mark(s) in the required course(s) will be eligible to enrol. **Courses required in either the major or specialist programs in actuarial science may not be taken as CR/NCR.**

Required courses: MAT137Y1 with a final mark of at least 65% and ECO100Y1 with a final mark of at least 70% and ACT240H1 and ACT245H1 and ACT247H1 with a final mark of at least 70% in each course. Once these requirements are met by a student, the student will be eligible to enroll in the Actuarial Science Specialist Program. **Note that the Mathematics Department enforces MAT223H/MAT240H as a prerequisite for MAT237Y.**

### New Enrolment Requirements:

This is a limited enrolment program. All students who request the program and obtain at least the specified mark(s) in the required course(s) will be eligible to enrol. **Courses required in either the major or specialist programs in actuarial science may not be taken as CR/NCR.**

In order to enrol into the Actuarial Science Specialist program, the following courses must be completed: MAT137Y1 with a final mark of at least 65%, and ECO101H1 + ECO102H1 both with a final mark of at least 70%, and ACT240H1 and ACT245H1 and ACT247H1 with a final mark of at least 70% in each course. Students will usually enrol into the Actuarial Science Major program after completion of MAT137Y1 and ECO101H1 + ECO102H1, and then they will enrol into the Specialist program after the completion of ACT240H1, ACT245H2 and ACT247H1. Once these requirements are met by a student, the student will be eligible to enroll in the Actuarial Science Specialist Program. **Note that the Mathematics Department enforces MAT223H/MAT240H as a prerequisite for MAT237Y.**

### Current Completion Requirements:

(12 courses)

This program is designed to prepare a student for professional work as an actuary, and more generally in the financial risk management industry.

**First Year:**
1. ECO101H1 (70%), ECO102H1 (70%)
2. MAT137Y1 (65%)/MAT157Y1
3. MAT223H1/MAT240H1 (should be taken in first year, enforced as a prereq for MAT237Y)
4. CSC108H1/CSC120H1/CSC121H1/CSC148H1

**Second Year:**
1. ACT240H1 (70%), ACT245H1 (70%), ACT247H1 (70%)
2. MAT237Y1/MAT257Y1
3. STA257H1, STA261H1
4. MGT201H1

**Higher Years:**
ACT348H1, ACT349H1, ACT370H1, ACT451H1, ACT452H1, ACT455H1, ACT460H1, ACT466H1, STA302H1, STA347H1, STA457H1

**NOTES:**

In order to enroll in ANY 300- or 400-level ACT course, the minimum grade of C must be obtained in each of ACT240H1, ACT245H1 and ACT247H1. The enrolment requirements and the prerequisites for all ACT courses will be strictly enforced.
**MAT336H1/MAT337H1** and **APM346H1**. Students in the Actuarial Science Specialist Program who have successfully completed **ACT348H1** and **ACT349H1** may request to enroll in the following RSM courses (provided the appropriate prerequisites and corequisites are met): **RSM430H1**, **433H1**, **437H1**. **CSC108H1/CSC120H/CSC121H** and **MAT246H1** are recommended (not required) for students in the Actuarial Science Specialist Program.

**New Completion Requirements:**

(12.5 courses)

This program is designed to prepare a student for professional work as an actuary, and more generally in the financial risk management industry.

**First Year:**

1. **ECO101H1** (70%), **ECO102H1** (70%)
2. **MAT137Y1** (65%)/**MAT157Y1**
3. **MAT223H1/MAT240H1** (should be taken in first year, enforced as a prereq for **MAT237Y**)
4. **CSC108H1/CSC120H1/CSC121H1/CSC148H1**

**STA130H1** is strongly recommended.

**Second Year:**

1. **ACT240H1** (70%), **ACT245H1** (70%), **ACT247H1** (70%)
2. **MAT237Y1/MAT257Y1**
3. **STA257H1, STA261H1**
4. **MGT201H1**

**Higher Years:**

**ACT348H1, ACT349H1, ACT370H1, ACT451H1, ACT452H1, ACT455H1, ACT460H1, ACT466H1, STA302H, STA347H1, STA457H1**

**NOTES:**

In order to enroll in ANY 300- or 400-level ACT course, the minimum grade of C must be obtained in each of **ACT240H1**, **ACT245H1** and **ACT247H1**. The enrolment requirements and the prerequisites for all ACT courses will be strictly enforced.

Students who have an interest in pursuing studies in mathematical finance should consider taking **MAT244H1**, **MAT336H1/MAT337H1** and **APM346H1**. Students in the Actuarial Science Specialist Program who have successfully completed **ACT348H1** and **ACT349H1** may request to enroll in the following RSM courses (provided the appropriate prerequisites and co-requisites are met): **RSM430H1**, **433H1**, **437H1**. **MAT246H1** is recommended (not required) for students in the Actuarial Science Specialist Program.

**Brief Description of the Proposal:**

**Consultation:**
**Actuarial Science Major**

### Start Session:

Summer 2017

### Current Enrolment Requirements:

This is a limited enrolment program. All students who request the program and obtain at least the specified mark(s) in the required course(s) will be eligible to enrol. **Courses required in either the major or specialist programs in actuarial science may not be taken as CR/NCR.**

Required courses: **MAT137Y1** with a final mark of at least 65% and **ECO100Y1** with a final mark of at least 70%. **Note that the Mathematics Department enforces STA223H/240H as a prerequisite for MAT237Y.**

### New Enrolment Requirements:

This is a limited enrolment program. All students who request the program and obtain at least the specified mark(s) in the required course(s) will be eligible to enrol. **Courses required in either the major or specialist programs in actuarial science may not be taken as CR/NCR.**

Required courses: **MAT137Y1** with a final mark of at least 65% and **ECO101H1 + ECO102H1** both with a final mark of at least 70%. **Note that the Mathematics Department enforces STA223H/240H as a prerequisite for MAT237Y.**

### Current Completion Requirements:

(8.5 courses or their equivalent, including at least two full-course equivalents at the 300+-level, of which at least one is a the 400 level)

**First Year:**
1. MAT137Y1 (65%)/MAT157Y1
2. ECO101H1 (70%), ECO102H1 (70%)
3. MAT223H1/MAT240H1 (should be taken in first year, enforced prerequisite for MAT237Y)

**Higher Years:**
1. MGT201H1
2. ACT240H1, ACT245H1, ACT247H1, ACT348H1, ACT370H1
3. MAT237Y1/MAT257Y1
4. STA257H1, STA261H1
5. Two of: ACT349H1, ACT371H1, ACT372H1, ACT451H1, ACT452H1, ACT455H1, ACT460H1, ACT466H1, ACT470H1, ACT473H1, ACT475H1, STA302H1, STA347H1, STA457H1

**NOTES:**

In order to enroll in ANY 300- or 400-level ACT course, the minimum grade of C must be obtained in each of ACT240H1, ACT245H1 and ACT247H1. The enrolment requirements and the prerequisites for all ACT courses will be strictly enforced.

Students who have an interest in pursuing studies in mathematical finance should consider taking MAT244H1, MAT336H1/MAT337H1 and APM346H1.

### New Completion Requirements:

(8.5 courses or their equivalent, including at least two full-course equivalents at the 300+-level, of which at least one is a the 400 level)

**First Year:**
1. MAT137Y1 (65%)/MAT157Y1
2. ECO101H1 (70%), ECO102H1 (70%)
3. MAT223H1/MAT240H1 (should be taken in first year, enforced prerequisite for MAT237Y)

Higher Years:
1. MGT201H1
2. ACT240H1, ACT245H1, ACT247H1, ACT348H1, ACT370H1
3. MAT237Y1/MAT257Y1
4. STA257H1, STA261H1
5. Two of: ACT349H1, ACT371H1, ACT372H1, ACT451H1, ACT452H1, ACT455H1, ACT460H1, ACT466H1, ACT470H1, ACT473H1, ACT475H1, STA302H1, STA347H1, STA457H1

NOTES:

In order to enroll in ANY 300- or 400-level ACT course, the minimum grade of C must be obtained in each of ACT240H1, ACT245H1 and ACT247H1. The enrolment requirements and the prerequisites for all ACT courses will be strictly enforced.

Students who have an interest in pursuing studies in mathematical finance should consider taking MAT244H1, MAT336H1/MAT337H1 and APM346H1.

Brief Description of the Proposal:

Consultation: