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

**Biochemistry Specialist**

**Start Session:**

Summer 2017

**Current Completion Requirements:**

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

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

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

[PHY131H1, PHY132H1 recommended]

Second Year:

1. BCH242Y1; BIO230H1/BIO255H1; CHM220H1; CHM247H1/CHM249H1

2. One of: BIO260H1/HMB265H1/CHM223H1

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

Fourth Year:

1. BCH478H1

2. Four half courses from the following list, including at least two BCH courses: BCH422H1/BCH425H1/BCH426H1/BCH440H1/BCH441H1/BCH444H1/BCH445H1/ BCH446H1/BCH447H1/BCH448H1/BCH449H1/BCH479H1/BCB420H1/CHM447H1/GY420H1/MGY428H1/MGY451H1/MGY452H1/MGY470H1

3. BCH372Y1/(BCH373H1/BCH375H1)/BCH374Y1/BCH472Y1/BCH473Y1: One full credit from these optional research project courses may be taken for the Specialist program**.

Note: Some of the MGY courses noted above have BIO260H1 as a prerequisite.

Over the course of the Specialist program, additional credits (to bring the program total to 14 full courses or their equivalent) from the following list: BCH350H1/BIO220H1/BIO260H1/CHM217H1 (Analytical Chemistry)/CHM223H1 (Physical Chemistry II)/CHM326H1 (Quantum Mechanics, Spectroscopy)/CHM328H1 (Physical Chemistry)/CHM342H1 (Organic Synthesis)/CHM347H1 (Organic Chemistry of Biological Compounds)/CSC108H1/CSC148H1 (Introductory Computer Science, only one CSC course can be chosen)/HMB265H1/MAT235Y1/MAT237Y1 (Calculus II)/STA220H1/STA221H1/ any suitable 300-level course from CHM/CSB/EEB/HMB/IMM/LMP/PGY/PSL (departmental approval required)

** Additional BCH research project courses can be taken as part of the 20 full credits needed for your degree, but if you take more than one full credit project course, each must be taken with a different research supervisor.

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

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

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

[PHY131H1, PHY132H1 recommended]

Second Year:

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

*Alternatively BIO260 may be taken in third year (due to timetable conflicts BIO260 may not be taken in 2nd year.

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

Fourth Year:

1. BCH478H1

2. Four half courses from the following list, including at least two BCH courses: BCH422H1/BCH425H1/BCH426H1/ BCH428H1/BCH440H1/BCH441H1/BCH444H1/BCH445H1/ BCH446H1/BCH448H1/BCH449H1/BCH479H1/ BCB420H1/CHM447H1/MGY420H1/MGY425H1/MGY428H1/MGY451H1/MGY452H1/MGY470H1

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

Over the course of the Specialist program, additional credits (to bring the program total to 14 full courses or their equivalent) from the following list: BCH350H1/BIO220H1/CHM217H1 (Analytical Chemistry)/ CHM220H1*** (Physical Chemistry for Life Sciences)/CHM223H1 (Physical Chemistry II)/CSC108H1/CSC148H1 (Introductory Computer Science, only one CSC course can be chosen)/MAT235Y1/MAT237Y1 (Calculus II)/ STA221H1/ any suitable 300-level course from CHM/CSB/EEB/HMB/IMM/LMP/MGY/PCL/PSL (departmental approval required)

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

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

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**Brief Description of the Proposal:**

**Consultation:**
3 Retired Courses

BCH373H1: Research Project in Biochemistry
BCH375H1: Research Project in Biochemistry
BCH447H1: Molecular Evolution
### 6 New Focuses

**Focus in Plant Genomics and Biotechnology (Major)**

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<th>Start Session:</th>
<th>Summer 2017</th>
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<tr>
<td><strong>Parent Program:</strong></td>
<td>Cell &amp; Molecular Biology Major</td>
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**Enrolment Requirements:**

Once you have enrolled in the Cell and Molecular Biology Major program, you have the option to apply for entry into a focus. The focuses have a limited enrolment and can only accommodate a restricted number of students with a particular interest in the topic of the focus. **Students can only apply for one focus.** Admission will be determined with a minimum grade of 80% in BIO130H1. If the student does not achieve 80% in BIO130H1, admission can be determined with a minimum grade of 80% in BIO230H1. In addition, students must submit a 300-word statement of interest regarding the topic of the focus. Statement submission instructions are at [http://csb.utoronto.ca/undergraduate-studies/undergraduate-programs/](http://csb.utoronto.ca/undergraduate-studies/undergraduate-programs/). Achieving these requirements does not necessarily guarantee admission to the focus in any given year.

Students in a focus complete the requirements of First Year, the requirements 1.-3. of Higher Years, as well as requirements 4.-7 specific to each focus.

Each year students are enrolled in a focus, they must also be an active participant in the faculty-led learning community for their focus (requirement 7.). The learning community appears as a non-credit course on the [to be determined: either curricular transcript or co-curricular record]. Students who fail to contribute to the faculty-led learning community will be removed from the focus.

**Completion Requirements:**

4. 1.0 FCE from: CSB340H1, CSB350H1/CSB352H1, CSB353H1  
  5. 0.5 FCE from: CSB435H1, CSB450H1, CSB452H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1  
  6. 1.0 FCE from: CSB299Y1, CSB330H1, CSB340H1, CSB350H1, CSB351Y1, CSB352H1, CSB353H1, CSB397Y0, CSB435H1, CSB450H1, CSB452H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1, CSB490H1, CSB491H1, CSB497H1, CSB498Y1, CSB499Y1.  
  7. Plant Biotech Learning Community (each year of focus enrolment)

**Brief Description of the Proposal:**

**Rationale:**

Please see attached Program Proposal Package for Calendar: New Focuses

**Consultation:**
Focus in Stem Cells and Developmental Biology (Major)

Start Session:
Summer 2017

Parent Program:
Cell & Molecular Biology Major

Enrolment Requirements:

Once you have enrolled in the Cell and Molecular Biology Major program, you have the option to apply for entry into a focus. The focuses have a limited enrolment and can only accommodate a restricted number of students with a particular interest in the topic of the focus. **Students can only apply for one focus.** Admission will be determined with a minimum grade of 80% in BIO130H1. If the student does not achieve 80% in BIO130H1, admission can be determined with a minimum grade of 80% in BIO230H1. In addition, students must submit a 300-word statement of interest regarding the topic of the focus. Statement submission instructions are at http://csb.utoronto.ca/undergraduate-studies/undergraduate-programs/. Achieving these requirements does not necessarily guarantee admission to the focus in any given year.

Students in a focus complete the requirements of First Year, the requirements 1.-3. of Higher Years, as well as requirements 4.-7 specific to each focus.

Each year students are enrolled in a focus, they must also be an active participant in the faculty-led learning community for their focus (requirement 7.). The learning community appears as a non-credit course on the [to be determined: either curricular transcript or co-curricular record]. Students who fail to contribute to the faculty-led learning community will be removed from the focus.

Completion Requirements:

4. 1.0 FCE from: CSB328H1, CSB329H1, CSB340H1
5. 0.5 FCE from: CSB427H1, CSB429H1, CSB430H1, CSB431H1, CSB483H1
6. 1.0 FCE from: CSB299Y1, CSB328H1, CSB329H1, CSB340H1, CSB397Y0, CSB427H1, CSB429H1, CSB430H1, CSB431H1, CSB483H1, CSB497H1, CSB498Y1, CSB499Y1.
7. Multicellularity Learning Community (each year of focus enrolment)

Brief Description of the Proposal:

Rationale:
Please see attached Program Proposal Package for Calendar: New Focuses

Consultation:

Focus in Plant Genomics and Biotechnology (Specialist)

Start Session:
Summer 2017
Parent Program:
Cell & Molecular Biology Specialist

Enrolment Requirements:

Once you have been approved for and have enrolled in the Cell and Molecular Biology Specialist program, you have the option to apply for entry into a focus. The focuses have a limited enrolment and can only accommodate a restricted number of students with a particular interest in the topic of the focus. **Students can only apply for one focus.** Admission will be determined with a minimum grade of 80% in BIO130H1. If the student does not achieve 80% in BIO130H1, admission can be determined with a minimum grade of 80% in BIO230H1. In addition, students must submit a 300-word statement of interest regarding the topic of the focus. Statement submission instructions are at http://csb.utoronto.ca/undergraduate-studies/undergraduate-programs/. Achieving these requirements does not necessarily guarantee admission to the focus in any given year.

Students in a focus complete the requirements of First Year, the requirements 1.-3. of Higher Years, as well as requirements 4.-7 specific to each focus.

Each year students are enrolled in a focus, they must also be an active participant in the faculty-led learning community for their focus (requirement 7.). The learning community appears as a non-credit course on the [to be determined] either curricular transcript or co-curricular record. Students who fail to contribute to the faculty-led learning community will be removed from the focus.

Completion Requirements:

4. 1.0 FCE from: CSB340H1, CSB350H1/CSB352H1, CSB353H1
5. 1.0 FCE from: CSB435H1, CSB450H1, CSB452H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1
6. 2.5 FCEs from: BCH422H1, BCH426H1, BCH440H1, BCH441H1, BCH444H1, BCH445H1, CSB328H1, CSB329H1, CSB330H1, CSB331H1, CSB340H1, CSB350H1, CSB351Y1, CSB352H1, CSB353H1, CSB397Y0, CSB428H1, CSB431H1, CSB435H1, CSB450H1, CSB452H1, CSB458H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1, CSB483H1, CSB490H1, CSB491H1, CSB492H1, CSB497H1, CSB498Y1, CSB499Y1. No more than 0.5 FCE in BCH can be used towards this requirement.
7. Plant Biotech Learning Community (each year of focus enrolment)

Brief Description of the Proposal:

Rationale:

Please see attached Program Proposal Package for Calendar: New Focuses

Consultation:

Focus in Molecular Networks of the Cell (Major):

Start Session:
Summer 2017

Parent Program:
Enrolment Requirements:

Once you have enrolled in the Cell and Molecular Biology Major program, you have the option to apply for entry into a focus. The focuses have a limited enrolment and can only accommodate a restricted number of students with a particular interest in the topic of the focus. Students can only apply for one focus. Admission will be determined with a minimum grade of 80% in BIO130H1. If the student does not achieve 80% in BIO130H1, admission can be determined with a minimum grade of 80% in BIO230H1. In addition, students must submit a 300-word statement of interest regarding the topic of the focus. Statement submission instructions are at http://csb.utoronto.ca/undergraduate-studies/undergraduate-programs/. Achieving these requirements does not necessarily guarantee admission to the focus in any given year.

Students in a focus complete the requirements of First Year, the requirements 1.-3. of Higher Years, as well as requirements 4.-7. specific to each focus.

Each year students are enrolled in a focus, they must also be an active participant in the faculty-led learning community for their focus (requirement 7.). The learning community appears as a non-credit course on the [to be determined: either curricular transcript or co-curricular record]. Students who fail to contribute to the faculty-led learning community will be removed from the focus.

Completion Requirements:

4. 1.0 FCE from: CJH332H1, CSB327H1, CSB331H1, CSB353H1
5. 0.5 FCE from: CSB427H1, CSB428H1, CSB429H1, CSB435H1, CSB458H1, CSB459H1, CSB460H1, CSB475H1
6. 1.0 FCE from: BCH422H1, BCH426H1, BCH444H1, BCH445H1, CJH332H1, CSB299Y1, CSB327H1, CSB330H1, CSB331H1, CSB353H1, CSB397Y0, CSB427H1, CSB428H1, CSB429H1, CSB435H1, CSB450H1, CSB452H1, CSB458H1, CSB459H1, CSB460H1, CSB475H1, CSB490H1, CSB491H1, CSB497H1, CSB498Y1, CSB499Y1. No more than 0.5 FCE in BCH can be used towards this requirement.
7. Molecular Network Learning Community (each year of focus enrolment)

Brief Description of the Proposal:

Rationale:

Please see attached Program Proposal Package for Calendar: New Focuses

Consultation:

Focus in Stem Cells and Developmental Biology (Specialist)

Start Session:

Summer 2017

Parent Program:

Cell & Molecular Biology Specialist

Enrolment Requirements:
Once you have been approved for and have enrolled in the Cell and Molecular Biology Specialist program, you have the option to apply for entry into a focus. The focuses have a limited enrolment and can only accommodate a restricted number of students with a particular interest in the topic of the focus. **Students can only apply for one focus.** Admission will be determined with a minimum grade of 80% in BIO130H1. If the student does not achieve 80% in BIO130H1, admission can be determined with a minimum grade of 80% in BIO230H1. In addition, students must submit a 300-word statement of interest regarding the topic of the focus. Statement submission instructions are at http://csb.utoronto.ca/undergraduate-studies/undergraduate-programs/. Achieving these requirements does not necessarily guarantee admission to the focus in any given year.

Students in a focus complete the requirements of First Year, the requirements 1.-3. of Higher Years, as well as requirements 4.-7 specific to each focus.

Each year students are enrolled in a focus, they must also be an active participant in the faculty-led learning community for their focus (requirement 7.). The learning community appears as a non-credit course on the [to be determined: either curricular transcript or co-curricular record]. Students who fail to contribute to the faculty-led learning community will be removed from the focus.

**Completion Requirements:**

4. 1.0 FCE from: CSB328H1, CSB329H1, CSB340H1
5. 1.0 FCE from: CSB427H1, CSB429H1, CSB430H1, CSB431H1, CSB483H1
6. 2.5 FCEs from: BCH422H1, BCH426H1, BCH440H1, BCH441H1, BCH444H1, BCH445H1, CSB299Y1, CSB327H1, CSB328H1, CSB329H1, CSB330H1, CSB331H1, CSB340H1, CSB350H1, CSB352H1, CSB397Y0, CSB427H1, CSB428H1, CSB429H1, CSB430H1, CSB431H1, CSB435H1, CSB450H1, CSB458H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB483H1, CSB490H1, CSB491H1, CSB492H1, CSB497H1, CSB498Y1, CSB499Y1. No more than 0.5 FCE in BCH can be used towards this requirement.
7. Multicellularity Learning Community (each year of focus enrolment)

**Brief Description of the Proposal:**

**Rationale:**

Please see attached Program Proposal Package for Calendar: New Focuses

**Consultation:**

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**Focus in Molecular Networks of the Cell (Specialist)**

**Start Session:**
Summer 2017

**Parent Program:**
Cell & Molecular Biology Specialist

**Enrolment Requirements:**
Once you have been approved for and have enrolled in the Cell and Molecular Biology Specialist program, you have the option to apply for entry into a focus. The focuses have a limited enrolment and can only accommodate a restricted number of students with a particular interest in the topic of the focus. **Students can only apply for one focus.** Admission will be determined with a minimum grade of 80% in BIO130H1. If the student does not achieve 80% in BIO130H1, admission can be determined with a minimum grade of 80% in BIO230H1. In addition, students must submit a 300-word statement of interest regarding the topic of the focus. Statement submission instructions are at http://csb.utoronto.ca/undergraduate-studies/undergraduate-programs/. Achieving these requirements does not necessarily guarantee admission to the focus in any given year.

Students in a focus complete the requirements of First Year, the requirements 1.-3. of Higher Years, as well as requirements 4.-7 specific to each focus.

Each year students are enrolled in a focus, they must also be an active participant in the faculty-led learning community for their focus (requirement 7.). The learning community appears as a non-credit course on the [to be determined: either curricular transcript or co-curricular record]. Students who fail to contribute to the faculty-led learning community will be removed from the focus.

**Completion Requirements:**

4. 1.0 FCE from: CJH332H1, CSB327H1, CSB331H1, CSB353H1
5. 1.0 FCE from: CSB427H1, CSB428H1, CSB429H1, CSB435H1, CSB458H1, CSB459H1, CSB460H1, CSB475H1
6. 2.5 FCEs from: BCH422H1, BHC426H1, BCH440H1, BCH441H1, BCH444H1, BCH445H1, CJH332H1, CSB299Y1, CSB327H1, CSB328H1, CSB329H1, CSB330H1, CSB331H1, CSB340H1, CSB350H1, CSB351Y1, CSB352H1, CSB353H1, CSB397Y0, CSB427H1, CSB428H1, CSB429H1, CSB430H1, CSB431H1, CSB458H1, CSB459H1, CSB460H1, CSB461H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1, CSB483H1, CSB490H1, CSB491H1, CSB492H1, CSB497H1, CSB498Y1, CSB499Y1. No more than 0.5 FCE in BCH can be used towards this requirement.
7. Molecular Network Learning Community (each year of focus enrolment)

**Brief Description of the Proposal:**

**Rationale:**

Please see attached Program Proposal Package for Calendar: New Focuses

**Consultation:**

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**1 Minor Program Modification (Expedited Divisional Review)**

**Cell & Molecular Biology Specialist**

**Start Session:**

Summer 2017

**Current Completion Requirements:**
Students who have taken BIO150Y1, do not take BIO120H1 and BIO220H1 in this program. Students who have taken BIO240H1 and BIO241H1, do not take BIO130H1 and BIO230H1 in this program.

First Year:
BIO120H1, BIO130H1; (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1; JMB170Y1/(MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1.

Higher Years:
1. (PHY131H1, PHY132H1)/(PHY151H1, PHY152H1)
2. (BIO220H1, BIO230H1/BIO255H1), (BIO270H1, BIO271H1), BIO260H1/HMB265H1; BCH210H1
3. CSB330H1/CSB350H1, CSB331H1, CSB349H1, CSB428H1/CSB435H1
4. 0.5 FCE from the following: BCH422H1, BCH426H1, BCH445H1, CSB327H1, CSB447H1
5. 3.0 FCEs from the following (at least 0.5 FCE must be at the 400-level): BCH422H1, BCH426H1, BCH440H1, BCH441H1, BCH444H1, BCH445H1, CJH332H1, CSB299Y1, CSB327H1, CSB329H1, CSB330H1, CSB332H1, CSB340H1, CSB350H1, CSB351Y1, CSB352H1, CSB353H1, CSB397Y0, CSB427H1, CSB428H1, CSB429H1, CSB430H1, CSB431H1, CSB447H1, CSB450H1, CSB452H1, CSB458H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB475H1, CSB490H1, CSB491H1, CSB492H1, CSB497H1, CSB498Y1, CSB499Y1, HMB496Y1/HMB499Y1, MGY480Y1

New Completion Requirements:

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

First Year:
BIO120H1, BIO130H1; (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1; JMB170Y1/(MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1.

Higher Years:
1. (PHY131H1, PHY132H1)/(PHY151H1, PHY152H1)
2. (BIO220H1, BIO230H1/BIO255H1), (BIO270H1, BIO271H1), BIO260H1/HMB265H1; BCH210H1
3. CSB330H1/CSB350H1, CSB331H1, CSB349H1, CSB428H1/CSB435H1
4. 1.0 FCE from: CJH332H1, CSB327H1, CSB329H1, CSB330H1, CSB332H1, CSB340H1, CSB349H1
5. 1.0 FCE from: BCH422H1, BCH426H1, BCH427H1, BCH445H1, CSB427H1, CSB428H1, CSB429H1, CSB430H1, CSB431H1, CSB435H1, CSB447H1, CSB450H1, CSB452H1, CSB458H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB475H1, CSB490H1, CSB491H1, CSB492H1, CSB497H1, CSB498Y1, CSB499Y1, HMB496Y1/HMB499Y1, MGY480Y1

NOTE: No more than 0.5 FCE in BCH can be used towards requirements 5. and 6.

Brief Description of the Proposal:

Rationale:
The accompanying focus proposals required changes to the layout of our current programs. These changes give the general/flexible programs (and the focuses) greater organizational clarity (by providing year-by-year instructions for example). Also, the students have more flexibility in course selection (by making more of our courses acceptable for specific requirements) while maintaining the overall learning objectives of the programs. Also, past arrangements with other departments/units regarding course listings are unaffected by the changes.

Consultation:
**Program Proposal Package for Calendar**

**New Foci**

**Department/Unit:** Cell & Systems Biology (CSB)

**Program:** Cell & Molecular Biology (Specialist and Major)

**Summary:** Three focuses are proposed for the Cell and Molecular Biology Specialist and Major programs. The focuses will organize restricted numbers of high-achieving students with interest in one of three major areas of cell and molecular biology that match major research topics in CSB. Focus students will be required to complete a subset of program courses, and will also be required to participate in a learning community for the focus. The learning community will appear as a Pass/Fail non-credit course on the curricular transcript. The learning community will provide community-building, professional development and enriched academics for focus students. The requirement of learning community participation will also uniquely distinguish focus students, allowing students to be drawn from both the Specialist and Major programs into a single focus (with admission requirements based on grades and a statement of interest). The proposed focuses and learning communities are designed to enhance the educational objectives of our current programs.

### PART I – Calendar Entry

#### 1. Description

**Cell & Molecular Biology Specialist (Science program)**

This is a limited enrolment program that can only accommodate a limited number of students. Admission will be determined with a minimum grade of 70% in BIO130H1. If the student does not achieve 70% in BIO130H1, admission can be determined with a minimum grade of 70% in BIO230H1. Achieving these marks does not necessarily guarantee admission to the program in any given year. Enrolment also requires the completion of four courses, including BIO120H1, BIO130H1; (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1; JMB170Y1/(MAT135H1, MAT136H1)/MAT137Y1/MAT137Y1.

(12.5 full courses or their equivalent)

First Year:
BIO120H1, BIO130H1; (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1; JMB170Y1/(MAT135H1, MAT136H1)/MAT137Y1/MAT137Y1.

Higher Years:
1. (PHY131H1, PHY132H1)/(PHY151H1, PHY152H1)
2. (BIO220H1, BIO230H1/BIO255H1), (BIO270H1, BIO271H1), BIO260H1/HMB265H1; BCH210H1
3. CSB330H1/CSB350H1/CSB352H1,CSB349H1
4. 1.0 FCE from: CJH332H1, CSB327H1, CSB328H1, CSB329H1, CSB331H1, CSB340H1, CSB353H1
5. 1.0 FCE from: BCH422H1, BCH426H1, BCH444H1, BCH445H1, CSB427H1, CSB428H1,CSB429H1, CSB430H1, CSB431H1, CSB435H1, CSB450H1, CSB452H1, CSB458H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1, CSB483H1
6. 2.5 FCE from: BCH422H1, BCH426H1, BCH440H1, BCH444H1, BCH445H1, CJH332H1, CSB299Y1, CSB327H1, CSB328H1, CSB329H1, CSB330H1, CSB331H1, CSB340H1, CSB350H1, CSB351Y1, CSB352H1, CSB353H1, CSB397Y0, CSB427H1, CSB428H1, CSB429H1, CSB430H1, CSB431H1, CSB435H1, CSB447H1, CSB450H1, CSB452H1, CSB458H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1, CSB483H1, CSB490H1, CSB491H1, CSB492H1, CSB497H1, CSB498Y1, CSB499Y1, HMB496Y1/HMB499Y1, MGY480Y1

**NOTE:** No more than 0.5 FCE in BCH can be used towards requirements 5. And 6.

**Disciplinary Foci (optional)**
Once you have been approved for and have enrolled in the Cell and Molecular Biology Specialist program, you have the option to apply for entry into a focus. The focuses have a limited enrolment and
can only accommodate a restricted number of students with a particular interest in the topic of the focus. **Students can only apply for one focus.** Admission will be determined with a minimum grade of 80% in BIO130H1. If the student does not achieve 80% in BIO130H1, admission can be determined with a minimum grade of 80% in BIO230H1. In addition, students must submit a 300-word statement of interest regarding the topic of the focus. Statements submission instructions are at [http://csb.utoronto.ca/undergraduate-studies/undergraduate-programs/](http://csb.utoronto.ca/undergraduate-studies/undergraduate-programs/). Achieving these requirements does not necessarily guarantee admission to the focus in any given year.

Students in a focus complete the requirements of First Year, the requirements 1.–3. of Higher Years, as well as requirements 4.–7. specific to each focus.

Each year students are enrolled in a focus, they must also be an active participant in the faculty-led learning community for their focus (requirement 7.). The learning community appears as a non-credit course on the [to be determined: either curricular transcript or co-curricular record]. Students who fail to contribute to the faculty-led learning community will be removed from the focus.

**Molecular Networks of the Cell**
4. 1.0 FCE from: CJH332H1, CSB327H1, CSB331H1, CSB353H1
5. 1.0 FCE from: CSB427H1, CSB428H1, CSB429H1, CSB435H1, CSB458H1, CSB459H1, CSB460H1, CSB475H1
6. 2.5 FCE from: BCH422H1, BCH426H1, BCH440H1, BCH441H1, BCH444H1, BCH445H1, CJH332H1, CSB299Y1, CSB327H1, CSB328H1, CSB329H1, CSB330H1, CSB331H1, CSB340H1, CSB350H1, CSB351Y1, CSB352H1, CSB353H1, CSB397Y0, CSB427H1, CSB428H1, CSB429H1, CSB430H1, CSB431H1, CSB435H1, CSB447H1, CSB450H1, CSB452H1, CSB458H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1, CSB483H1, CSB490H1, CSB491H1, CSB492H1, CSB497H1, CSB498Y1, CSB499Y1. No more than 0.5 FCE in BCH can be used towards this requirement.
7. Molecular Network Learning Community (each year of focus enrolment)

**Stem Cells and Developmental Biology**
4. 1.0 FCE from: CSB328H1, CSB329H1, CSB340H1
5. 1.0 FCE from: CSB427H1, CSB429H1, CSB430H1, CSB431H1, CSB483H1
6. 2.5 FCEs from: BCH422H1, BCH426H1, BCH440H1, BCH441H1, BCH444H1, BCH445H1, CSB299Y1, CSB327H1, CSB328H1, CSB329H1, CSB330H1, CSB331H1, CSB340H1, CSB350H1, CSB352H1, CSB397Y0, CSB427H1, CSB428H1, CSB429H1, CSB430H1, CSB431H1, CSB435H1, CSB450H1, CSB458H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1, CSB483H1, CSB490H1, CSB491H1, CSB492H1, CSB497H1, CSB498Y1, CSB499Y1. No more than 0.5 FCE in BCH can be used towards this requirement.
7. Multicellularity Learning Community (each year of focus enrolment)

**Plant Genomics and Biotechnology**
4. 1.0 FCE from: CSB340H1, CSB350H1, CSB352H1, CSB353H1
5. 1.0 FCE from: CSB435H1, CSB450H1, CSB452H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1
6. 2.5 FCE from: BCH422H1, BCH426H1, BCH440H1, BCH441H1, BCH444H1, BCH445H1, CSB299Y1, CSB328H1, CSB329H1, CSB330H1, CSB331H1, CSB340H1, CSB350H1, CSB351Y1, CSB352H1, CSB353H1, CSB397Y0, CSB427H1, CSB428H1, CSB429H1, CSB430H1, CSB431H1, CSB435H1, CSB450H1, CSB458H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1, CSB483H1, CSB490H1, CSB491H1, CSB492H1, CSB497H1, CSB498Y1, CSB499YY. No more than 0.5 FCE in BCH can be used towards this requirement.
7. Plant Biotech Learning Community (each year of focus enrolment)

**Cell & Molecular Biology Major (Science program)**
This is a Type 1 program. Enrolment requires the completion of four courses.

(8 full courses or their equivalent)
First Year: BIO120H1, BIO130H1; (CHM135H1, CHM136H1)/(CHM138H1, CHM139H1)/CHM151Y1; JMB170Y1/(MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1/(PHY131H1, PHY132H1)/(PHY151H1,
PHY152H1
Higher Years:
1. (BIO220H1, BIO230H1/BIO255H1)
2. BIO260H1/HMB265H1; BCH210H1
3. CSB349H1
4. 1.0 FCE from: CSB327H1, CSB328H1, CSB329H1, CSB331H1, CSB340H1, CSB353H1
5. 1.5 FCE (at least 0.5 FCE at the 400-level) from: BCH422H1, BCH426H1, BCH440H1, BCH441H1, BCH444H1, BCH445H1, CJH332H1, CSB299Y1, CSB327H1, CSB328H1, CSB329H1, CSB330H1, CSB331H1, CSB340H1, CSB350H1, CSB351Y1, CSB352H1, CSB353H1, CSB397Y0, CSB427H1, CSB428H1, CSB429H1, CSB430H1, CSB431H1, CSB435H1, CSB447H1, CSB450H1, CSB452H1, CSB458H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1, CSB483H1, CSB490H1, CSB491H1, CSB492H1, CSB497H1, CSB498H1, CSB499Y1, HMB496Y1/HMB499Y1, MGY480Y1. No more than 0.5 FCE in BCH can be used towards this requirement.

Disciplinary Focuses (optional)
Once you have enrolled in the Cell and Molecular Biology Major program, you have the option to apply for entry into a focus. The focuses have a limited enrolment and can only accommodate a restricted number of students with a particular interest in the topic of the focus. **Students can only apply for one focus.** Admission will be determined with a minimum grade of 80% in BIO130H1. If the student does not achieve 80% in BIO130H1, admission can be determined with a minimum grade of 80% in BIO230H1. In addition, students must submit a 300-word statement of interest regarding the topic of the focus. Statements submission instructions are at [http://csb.utoronto.ca/undergraduate-studies/undergraduate-programs/](http://csb.utoronto.ca/undergraduate-studies/undergraduate-programs/). Achieving these requirements does not necessarily guarantee admission to the focus in any given year.

Students in a focus complete the requirements of First Year, the requirements 1.-3. of Higher Years, as well as requirements 4.-7. specific to each focus.

Each year students are enrolled in a focus, they must also be an active participant in the faculty-led learning community for their focus (requirement 7.). The learning community appears as a non-credit course on the [to be determined: either curricular transcript or co-curricular record]. Students who fail to contribute to the faculty-led learning community will be removed from the focus.

**Molecular Networks of the Cell**
4. 1.0 FCE from: CJH332H1, CSB327H1, CSB331H1, CSB353H1
5. 0.5 FCE from: CSB427H1, CSB428H1, CSB435H1, CSB458H1, CSB459H1, CSB460H1, CSB475H1
6. 1.0 FCE from: BCH422H1, BCH426H1, BCH440H1, BCH441H1, BCH444H1, CJH332H1, CSB299Y1, CSB327H1, CSB330H1, CSB331H1, CSB353H1, CSB397Y0, CSB427H1, CSB428H1, CSB429H1, CSB435H1, CSB447H1, CSB450H1, CSB452H1, CSB458H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1, CSB483H1, CSB490H1, CSB491H1, CSB497H1, CSB498Y1, CSB499Y1. No more than 0.5 FCE in BCH can be used towards this requirement.
7. Molecular Network Learning Community (each year of focus enrolment)

**Stem Cells and Developmental Biology**
4. 1.0 FCE from: CSB328H1, CSB329H1, CSB340H1
5. 0.5 FCE from: CSB427H1, CSB429H1, CSB430H1, CSB431H1, CSB483H1
6. 1.0 FCE from: CSB299Y1, CSB328H1, CSB329H1, CSB340H1, CSB397Y0, CSB427H1, CSB429H1, CSB430H1, CSB431H1, CSB435H1, CSB447H1, CSB497H1, CSB498Y1, CSB499Y1
7. Multicellularity Learning Community (each year of focus enrolment)

**Plant Genomics and Biotechnology**
4. 1.0 FCE from: CSB340H1, CSB350H1/CSB352H1, CSB353H1
5. 0.5 FCE from: CSB435H1, CSB450H1, CSB452H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1
6. 1.0 FCE from: CSB299Y1, CSB330H1, CSB340H1, CSB350H1, CSB351Y1, CSB352H1, CSB353H1, CSB397Y0, CSB435H1, CSB450H1, CSB452H1, CSB459H1, CSB460H1, CSB472H1, CSB473H1, CSB474H1, CSB475H1, CSB490H1, CSB497H1, CSB498Y1, CSB499Y1
7. Plant Biotech Learning Community (each year of focus enrolment)
2. Academic Context

The academic rationale for focuses and associated learning communities
CSB contains over thirty faculty members with research strengths in molecular biology, cell biology, developmental biology and genomics in both plants and animals, as well as in animal neurobiology/physiology related to our Animal Physiology Major. Our research is coupled with education at both the undergraduate and graduate levels. Our educational goals focus on training professional research scientists, professionals in health and other sectors, members of the biotechnology and information-based economy, and scientifically literate citizens. The Cell & Molecular Biology Specialist and Major programs are designed to achieve these goals. **The proposed focuses will enhance our educational objectives by addressing several challenges facing students in our current programs.**

First, the conceptual breadth of Cell & Molecular Biology can be challenging for students. In our consultations with students, we heard that “Cell & Molecular Biology” can sound ambiguous to a first year student. The focuses will provide conceptual guidance for students interested in one of three major areas spanning the field (and our expertise in CSB), while maintaining a general, flexible option. Our program offers over forty 3rd and 4th year courses, and the focuses separate them into conceptually related groups, allowing students to achieve greater synthesis and consolidation in a particular area of Cell & Molecular Biology.

Second, the enrolment of >600 students in our Cell & Molecular Biology programs can hinder students from connecting with professors and other students in the program. The focuses will provide communities for high-achieving students with specific interest in these areas. 30 students are envisioned in each focus (Specialist and Major combined; years 2-4 combined; representing ~15% of all students in the programs). These numbers are not expected to create enrolment pressures on any particular course, at least not beyond those already present. These numbers will allow us to enhance the student experience in two ways. They will allow us to build a Departmental culture of preparing focus students for independent research courses in CSB faculty laboratories. They will also allow “learning communities” to be run by faculty members in each area (Prof Tony Harris for “Molecular networks of the cell”; Prof Ashley Bruce for “Stem cells and developmental biology”; Prof Keiko Yoshioka for “Plant genomics and biotechnology”). These learning communities will be an integral part of the focuses and are described in detail at the end of this section.

Third, the changes will increase student awareness of two important areas of Cell & Molecular Biology. Ten years ago, the Zoology and Botany Departments were reorganized to become CSB and EEB. Since then, the field of plant molecular biology (with its impact on general knowledge, human resources, Canadian agri-business, biotechnology, and responses to global warming) has not been highlighted for our undergraduates. The focus “Plant genomics and biotechnology” will restore the visibility of this field. Second, as enrolment of our Cell & Molecular Biology programs has grown over the last nine years, enrolment in our current Developmental Biology Specialist program has dropped from ~100 students to ~11 students. We anticipate a tripling of enrolment in this area (to ~30 students) by re-casting it as the focus “Stem cells and developmental biology” (a closure to the current Developmental Biology Specialist program is proposed separately). This change will increase our students’ understanding of developmental and stem cell biology in general, and its implications for regenerative medicine.

Finally, the changes are accompanied by adjustments to the layout of the current programs. These changes give the general/flexible programs (and the focuses) greater organizational clarity (by providing year-by-year instructions for example). Also, the students have more flexibility in course selection (by making more of our courses acceptable for specific requirements) while maintaining the overall learning objectives of the programs. Also, past arrangements with other departments/units regarding course listings are unaffected by the changes.

The need to restrict enrolment in the focuses: avoidance of course enrolment pressures
Since most students pursue Major programs, having the focuses available to both Cell & Molecular Biology Majors and Specialists would maximize student opportunities. However, fully open focuses could overload our 4th year courses. The situation seems most problematic for the “Stem Cells and
Developmental Biology Focus”. We anticipate that it would become the most popular of the focuses. The focus’ five core 4th year courses have a total enrolment of 120 (24 each). Last year, 4th year student numbers were ~160 and ~15 in the Cell & Molecular Biology major and specialist, respectively. Major students would take one of these 4th year courses to fulfill line 5 of the focus, and they would draw from them again in line 6. Specialist students would take two of these 4th year courses to fulfill line 5 of the focus, and they draw from them again in line 6. If 50% of all Cell & Molecular Biology students enrolled in the “Stem Cells and Developmental Biology Focus”, then ~110 spaces in these 4th year courses would be required to fulfill line 5 alone, and line 6 would then push us over the limit of 120. Such enrolment is possible given interest in stem cells (e.g. an email survey of our 45 Cell & Molecular Biology specialists revealed that 7/10 respondents would be interested in pursuing this focus), and we anticipate our total Cell & Molecular Biology population may grow after the introduction of focuses. Moreover, non-focus Cell & Molecular Biology students require 4th year courses and students from other programs (e.g. Human Biology) often enrol in our courses.

Thus, we propose the following text in the calendar:

“The focuses have a limited enrolment and can only accommodate a restricted number of students with a particular interest in the topic of the focus. Students can only apply for one focus. Admission will be determined with a minimum grade of 80% in BIO130H1. If the student does not achieve 80% in BIO130H1, admission can be determined with a minimum grade of 80% in BIO230H1. In addition, students must submit a 300-word statement of interest in the topic of the focus. Statements are submitted on-line at [to be created]. Achieving these requirements does not necessarily guarantee admission to the focus in any given year.”

An analysis of 2016 BIO130H1 data indicated that 659 of 1825 students received a minimum grade of 80%, and of these 659 students, 54 are now enrolled in the Cell & Molecular Biology Major or Specialist. This restriction alone would eliminate the course pressure above. Additionally, for effective learning communities (see next section) we propose an additional restriction based on the 300-word statement of interest. With this added restriction we would have accepted ~30 of the 54 students into the focuses for 2016.

For the statement of interest, we would guide students by asking them to address specific questions, e.g:

- What sparked your interest in the focus topic?
- What was the most surprising thing you learned in BIO130H1?
- What do you hope to achieve within the focus and learning community?
- If you are applying after 1st year, please explain?

The plan for learning communities linked to each focus

The learning communities will provide community-building, professional development and enriched academics for focus students. They will connect relatively small groups of year 2-4 students with a common interest in the focus topic over 2-3 year periods for each student (30 students are planned for each focus and associated learning community [Specialist and Major combined; years 2-4 combined]). These connections will foster networking and mentoring among current students as well as contacts with focus alumni. We anticipate that focus students will self-organize on-line discussion groups.

The learning communities will have the following names:

- “Molecular Networks Learning Community”
- “Multicellularity Learning Community”
- “Plant Biotech Learning Community”

Each learning community will have a dedicated faculty member.

The students and faculty member will meet twice each term to discuss specific topics. For the launch we plan the following topics (a combination of advice sessions and scientific discussion sessions), and will modify them in the future with student input:

October: Study skills/time management and information sources (courses, talks, journals, websites) (advice from the faculty member, and 1-2 faculty/grad student guests, with a general discussion for students to share advice)
November: **Research discussion** (of a recent research paper; of a news story; or of how a concept could be explained to a lay audience—selected by the faculty member in the launch year and students later). One example is the application of basic knowledge in each area, e.g.:

- “Molecular Networks Learning Community” → synthetic cells as devices
- “Multicellularity Learning Community” → stem cells for tissue regeneration
- “Plant Biotech Learning Community” → GMOs for feeding the world population

January: **Advice on obtaining a research position** (a discussion of CSB labs and general advice by the faculty member, and 1-2 faculty/grad student guests, with a general discussion for students to share advice)

February: **Research discussion** (of a recent research paper; of a news story; or of how a concept could be explained to a lay audience—selected by the faculty member in the launch year and students later)

To tailor learning community objectives to student interests and to assess outcomes, we plan to conduct surveys at the end of each year.

The learning communities are listed in the calendar as requirements for the focuses, and they will appear on the transcript as a Pass/Fail non-credit course. The model for this (name, status on transcript, etc.) is the First-Year Learning Community (FLC). A mark of Pass is given based on attendance and participation, which will be assessed by the faculty member at each meeting. To complete a focus, a Pass must be earned for the learning community for each year enrolled in the focus, and other course requirements must be met.

**To promote student engagement,** we will:

- inform all focus students at the beginning of each year that learning community attendance is required (except for cases of illness or course conflicts)
- inform all focus students at the beginning of each year that meaningful participation in the learning community is monitored
- warn students midway each year if their lack of attendance or participation may result in a Fail

**To meet the challenge of timetable conflicts,** we will:

- hold two 8am ‘breakfast’ meetings
- find two additional times when the fewest students of a learning community have a course conflict
- inform all students of these four times once the learning community students have been finalized in early October
- inform students of the discussion topics and materials on-line before each meeting (key topics may also be discussed by students on-line)

**To maintain the interest of individual students over three years periods,** we will:

- change the guest faculty and graduate students each year for new perspectives during the advice sessions
- change the topics of scientific sessions each year
- make it clear that students are expected to take on mentorship/leadership roles in their final two years in the learning community

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### 3. Learning Outcomes

**Cell & Molecular Biology is a broad and interdisciplinary field of study and requires basic training in a variety of core sciences to provide strong foundational knowledge for subsequent advancement in the discipline.** The curriculum in the first two years begins with introductory biology courses including an introductory course in Cell & Molecular Biology. The curriculum also includes training in physical and organic chemistry, and mathematics or physics. All of these foundational courses provide students with the framework to connect related concepts and begin to expose them to the interdisciplinary nature of the field (e.g., how concepts learned about electricity in physics and electrochemistry in chemistry apply to Cell & Molecular Biology concepts such as membrane potentials and cell signalling). The second year focuses on further development of general concepts in biology,
including how the genome and molecular pathways give rise to functioning cells and organisms (BIO230H1), as well as training in genetics (BIO260H1/HMB265H1), and the basic biochemistry of lipids, proteins, and metabolism (BCH210H1).

The upper year curriculum includes more than forty 3rd and 4th year courses that focus on moving from textbooks to the cutting edge of research (primary literature) in a variety of areas. The focuses organize these courses as follows (only CSB courses shown; see Section 1 for full description):

“Molecular networks of the cell”
CSB327H1, Extracellular Matrix Dynamics and Associated Pathologies
CSB331H1, Advanced Cell Biology I: Cellular Dynamics During Development
CSB353H1, Introduction to Plant-Microbe Interactions
CSB427H1, Drosophila as a Model in Cancer Research
CSB428H1, Advanced Cell Biology II: Cell Polarity and Cytoskeletal Dynamics
CSB429H1, Germ Cell Biology
CSB435H1, Regulatory Networks and Systems in Molecular Biology
CSB458H1, Epigenetics
CSB459H1, Plant Molecular Biology and Biotechnology
CSB460H1, Plant Signal Transduction
CSB475H1, Plant Metabolomics

“Stem cells and developmental biology”
CSB328H1, Developmental Biology
CSB329H1, Stem Cell Biology: Developmental Models and Cell-based Therapeutics
CSB340H1, Plant Development
CSB427H1, Drosophila as a Model in Cancer Research
CSB429H1, Germ Cell Biology
CSB430H1, Neurogenesis
CSB431H1, Evolution and Development: Gastrulation
CSB483H1, Seminar in Development

“Plant genomics and biotechnology”
CSB340H1, Plant Development
CSB350H1, Laboratory in Molecular Plant Biology
CSB352H1, Bioinformatic Methods
CSB353H1, Introduction to Plant-Microbe Interactions
CSB435H1, Regulatory Networks and Systems in Molecular Biology
CSB450H1, Proteomics in Systems Biology
CSB452H1, Molecular Plant-Microorganism Interactions
CSB459H1, Plant Molecular Biology and Biotechnology
CSB460H1, Plant Signal Transduction
CSB472H1, Computational Genomics and Bioinformatics
CSB473H1, Chemical Genomics
CSB474H1, Methods in Genomics and Proteomics
CSB475H1, Plant Metabolomics

The introduction of focuses will enhance our main program outcomes. Cell & Molecular Biology graduates have a strong and broad foundational knowledge within the discipline. The focuses will enhance their specialized knowledge within one of three areas of the discipline that will allow them to critically evaluate the literature, as well as to generate and test hypotheses. Students will develop problem-solving skills and will be provided with extensive opportunities to develop their oral and written communication skills (the required course CSB349H1 is designed to provide students with problem solving challenges and oral and written presentation experience, as well as group work; and these experiences are also an integral part of our 400-level courses). Students also gain abilities to find and evaluate sources of information, abilities to manipulate and draw statistical inferences from data sets, and be able to evaluate the general and ethical implications of their work and the work of others.
The introduction of learning communities will have added benefits: both academic and for professional development. Students will:

- dissect and debate central problems/advances/opportunities in the focus area
- make a strong connection with a faculty member, and meet guest faculty
- receive advice on job applications and networking
- mentor one another
- form networks with current students and learning community alumni

The creation of our focuses, and associated learning communities, is anticipated to enhance career opportunities for our Cell & Molecular Biology graduates through more focused training, networking with past and present students, and learning community discussion topics. Employment may be found in the public and private sectors in areas such as: basic, applied and clinical research; biotechnology; education; sales; consulting; publishing; and information technology. In addition, students who go on to complete graduate degrees may find employment as professors and/or lead researchers in universities, government, research institutes and industry. Occupations also include those associated with: bioinformatics; high-throughput technologies; agriculture; and pharmaceutical discovery, testing, and regulation. Many individuals also choose to pursue a professional degree in areas such as: medicine; dentistry; nursing and other health sciences; veterinary medicine; forensic sciences; business administration; and law. More generally, Cell & Molecular Biology graduates are well informed citizens able to critically evaluate information in the public domain that is used to guide public and private policy decisions.

**PART II – Internal Information for Governance**

**4. Rationale and Background Information**

The focuses will create small groups of high-achieving students interested in the same topic. They will take similar courses, form faculty-led learning communities, and be better prepared for independent research courses in the laboratories of CSB faculty members. The students will be drawn from our Specialist and Major programs and then combined to form one focus group for each of the three topics of interest (“Molecular networks of the cell”; “Stem cells and developmental biology”; and “Plant genomics and biotechnology”). Each focus group will also contain students across years of study (similar numbers in 2nd, 3rd and 4th years). We plan to accept ~10 students per year (3-4 from the Specialist program and 6-7 from the Major program) into each Focus for a steady-state size of ~30 students per focus (across all years). These students will be selected once they have enrolled in the Specialist or Major program. The focuses will have limited enrolment and ROSI will not allow students to enrol in them. Students will apply to our department directly, and we will be responsible for selecting the students and for notifying the Faculty Registrar so they can enrol the selected students. We plan to add students to the focuses one week after program enrolment closes. Any costs related to the selection process, will be covered by our department. Students will only be allowed to apply for one focus (this will maximize the total number of students in the focuses, and individual students should only select the one focus that they are specifically interested in). Admission will be determined with a minimum grade of 80% in BIO130H1. If the student does not achieve 80% in BIO130H1, admission can be determined with a minimum grade of 80% in BIO230H1. In addition, students will submit a 300-word statement of interest in the topic of the focus. Statements will be submitted on-line through an interface to be created. Achieving these requirements will not necessarily guarantee admission to the focus in any given year.

In the launch year, similar numbers of students will be accepted in years 2-4 (the numbers may be lower for 4th year because these students would need to have completed the 3rd year requirements of the focus). In following years, students at year 2 will be prioritized, but if space is available applicants at years 3 and 4 will be considered. This strategy emphasizes individual student participation over 2-3 year periods, and thus enhances community cohesion within each focus.

Each year, students will be surveyed to identify strengths and weaknesses of the focuses and the associated learning communities. The learning community faculty leaders, and other interested CSB
faculty members, will discuss the student responses and compare approaches to improve the focuses and learning communities. Enrolment numbers will also be compared among the focuses, and the possibility of increasing focus enrolment and creating additional learning communities for such focuses would be discussed (e.g. if focus demand was high, course enrolment pressure was reasonable, administration was feasible, and additional faculty were available, then it might be possible to increase enrolment in the “Stem Cells and Developmental Biology” focus and maintain small learning community groups by creating two sections of the “Multicellularity Learning Community”).

Section 2 (Academic context) described how the proposed focuses will improve the student experience. The focuses will also help us achieve departmental goals for the training and experience of our undergraduates.

First, the focuses will make a substantial contribution to our ongoing efforts to improve student engagement and student communities. For example, Prof Les Buck runs a discussion group for students in our 4th year independent research courses. The learning communities for each of the three Cell & Molecular Biology Focuses will further promote this small-community culture among our undergraduates. Another group, run by Prof Ashley Bruce, produces on-line videos profiling the career paths of current students and graduates (Profiling Opportunity: Pathways to the Future (POP)). Additionally, Prof Chris Garside organizes our Re-Orientation sessions for program advice after program enrollment. Prof Garside also produces videos and other materials for our Undergraduate Facebook and YouTube pages. Finally, we support the CSB Undergraduate Student Union’s mentoring program, and social and academic events. Together, these initiatives are designed to improve student experience while enrolled in our programs, and to maintain our connections with students post-graduation for both program outcome assessment and student-student networking (pre/post-graduation). As part of these initiatives for student engagement, the focuses will provide opportunities for our most high-achieving students to best prepare themselves for further research and employment opportunities in CSB-related fields.

Second, the focuses will connect faculty and students with common interests. As discussed above, two of the long-standing research strengths of CSB are currently not connecting optimally with our undergraduates. Faculty members in these areas (“Stem cells and developmental biology” and “Plant genomics and biotechnology”) have been discussing how to improve this connection over the past two years. Through these discussions, it was also recognized that a distinct research area has also gained strength in the department (“Molecular networks of the cell”). With all three focuses, the broad field of Cell & Molecular Biology will be covered in a balanced way, while also reflecting the research strengths of CSB. The focuses will enroll high-achieving students with specific interest in one of these areas, making them top candidates for recruitment as independent research students at the undergraduate or graduate level.

Third, the introduction of focuses aligns with our 2015 departmental self-study and external review. For example, in a CSB student focus group “students were enthusiastic about the increasing number of opportunities for student-faculty interaction outside of the classroom”. Students “did not experience significant challenges enrolling in required courses” (pressure is not expected to increase with the introduction of focuses) but “would appreciate more guidance on how to obtain research project positions in research labs” (obtaining such positions will be a major topic of our focus learning communities, and we will build a Departmental culture of preparing focus students for independent research courses in CSB faculty laboratories). Separately, a meeting of faculty members connected to the current Developmental Biology Specialist program “discussed the possibility of closing the program…due primarily to the overlap with the Cell & Molecular Biology Specialist program” but “if in the future the Cell & Molecular Biology Major and/or Specialist programs were modified to include streams or concentrations, developmental biology should be included in such a configuration, as developmental biology remains a core discipline in the molecular life sciences”. Also, it was suggested to “modify the program to reflect the current direction of developmental biology research, in particular with an emphasis on stem cells” and we created a new course (CSB329H1, Stem Cell Biology: Developmental Models and Cell-based Therapeutics) to address the concern that we did not “have enough teaching resources in this more specialized discipline”. The “Stem cells and developmental biology” focus aligns with these plans.

The external reviewers’ comments echoed those above and, based on student discussions, they made the following specific recommendations for improved student-faculty communication:

“(1) It would be very valuable to have access to a Departmental Student Advisor for matters related to the
(2) The availability of research topics and research positions is not well advertised. A formula that encourages meetings with professors beyond those already available should be developed. (3) Meetings that introduce undergraduate programs, research topics, and available research positions within various degree programs take place at different times and in different locations. A centralized strategy that leverages various “majors fairs” in one meeting area and at one meeting time should be considered.”

The proposed focuses, and in particular their faculty-led learning communities, will add to the department’s strategies to improve student-faculty communication in such ways.

5. Departmental/College Resource Implications

<table>
<thead>
<tr>
<th>Estimated enrolment per academic year in this program (please explain)</th>
<th>Each focus will contain ~30 students (~10 in 2nd year, ~10 in 3rd year, ~10 in 4th year). With three focuses, there will be a total of 90 students enrolled (combined across years and Major/Specialist).</th>
</tr>
</thead>
<tbody>
<tr>
<td>New courses necessary to mount for this program</td>
<td>None</td>
</tr>
<tr>
<td>Additional instructor requirements</td>
<td>None</td>
</tr>
<tr>
<td>Teaching assistant requirements</td>
<td>No new requirements</td>
</tr>
<tr>
<td>Laboratory equipment requirements</td>
<td>No new requirements</td>
</tr>
<tr>
<td>Computing resource requirements</td>
<td>No new requirements</td>
</tr>
<tr>
<td>Libraries resource requirements</td>
<td>No new requirements</td>
</tr>
<tr>
<td>Other</td>
<td>A CSB undergraduate website interface and CSB undergraduate staff time will be required for receiving and processing focus applications.</td>
</tr>
</tbody>
</table>

I will provide these resources required for this program from my existing budget.

DATE | Name of Chair/Program Director: Vince Tropepe
**2 Minor Program Modifications (Full Divisional Review)**

**Focus In Computer Systems**

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

**Current Completion Requirements:**

Required Courses:

1. CSC324H1, CSC343H1, CSC443H1, CSC469H1, CSC488H1

2. 1.0 FCE from the following: CSC372H1/ECE385H1, CSC358H1, CSC458H1

Suggested Related Courses:

1. CSC301H1, CSC309H1, CSC410H1, ECE489H1

2. Relevant courses offered at UTM: CSC347H5, CSC423H5, CSC427H5

3. Relevant courses offered by Engineering: ECE454H1, ECE568H1

**New Completion Requirements:**

Required Courses:

1. CSC324H1, CSC343H1, CSC443H1, CSC469H1, CSC488H1

2. 1.0 FCE from the following: CSC372H1/ECE385H1, CSC358H1, CSC458H1

Suggested Related Courses:

1. CSC301H1, CSC309H1, CSC367H1, CSC410H1, ECE489H1,

2. Relevant courses offered at UTM: CSC347H5, CSC423H5, CSC427H5
3. Relevant courses offered by Engineering: ECE454H1, ECE568H1

Program Delivery:

Method: In Class

Brief Description of the Proposal:

Consultation:

Computer Science Minor

Start Session:

Summer 2017

Current Enrolment Requirements:

This is a limited enrolment program (Type 2L) that can only accommodate a certain number of students. Eligibility is based on the following criteria:

A. Completion of at least 4.0 FCEs including CSC148H1/CSC207H1 (with a minimum grade of 60%) and CSC165H1/CSC236H1/CSC240H1 (with a minimum grade of 60%), AND

B. An average of the grades in CSC148H1/CSC207H1 and CSC165H1/CSC236H1/CSC240H1 that meets the department's annual cutoff. When more than one course has been completed from a list of alternatives, the higher grades will be used. Also, CSC240H1 grades will be adjusted to account for the course's greater difficulty. Finally, note that the cutoff changes from year to year, depending on the current capacity of the program and the pool of applicants. For more information, including historical data, please visit http://web.cs.toronto.edu/program/ugrad/admission.htm.

New Enrolment Requirements:

This is a limited enrolment program (Type 2L) that can only accommodate a certain number of students. Eligibility is based on the following criteria:

A. Completion of at least 4.0 FCEs including CSC148H1 (with a minimum grade of 70%) and CSC165H1/CSC240H1 (with a minimum grade of 70%), AND

B. An average of the grades in CSC148H1/CSC207H1 and CSC165H1/CSC236H1/CSC240H1 that meets the department's annual cutoff. When more than one course has been completed from a list of alternatives, the higher grades will be used. Also, CSC240H1 grades will be adjusted to account for the course's greater difficulty. Finally, note that the cutoff changes from year to year, depending on the current capacity of the program and the pool of applicants. For more information, including historical data, please visit http://web.cs.toronto.edu/program/ugrad/admission.htm.
3 Minor Program Modifications (Expeditied Divisional Review)

Focus In Human-computer Interaction

Start Session:
Summer 2017

Current Calendar Description:

Current Enrolment Requirements:

New Enrolment Requirements:

Enrolment in the Computer Science Specialist Program (ASSPE1689).

Current Completion Requirements:

Required Courses:

1. CSC300H1, CSC301H1, CSC318H1, CSC428H1

2. SOC101Y1, SOC200H1, SOC202H1, SOC302H1 [To enrol in restricted SOC courses, please contact the CS Undergraduate Office in the July preceding the academic year in which you plan to take the course]

3. 1.0 FCE from the following: CSC309H1, CSC320H1, CSC321H1, CSC343H1, CSC384H1, CSC401H1, CSC404H1, CSC418H1, CSC485H1, CSC490H1/491H1

4. PSY100H1, PSY270H1/PSY280H1

Suggested Related Courses:

1. CSC454H1, CSC290H1

2. At least one half-course in Human Factors or Ergonomics offered by the Department of Mechanical and Industrial Engineering, such as MIE240H1, MIE343H1, MIE344H1, MIE448H1, or MIE449H1. Human factors is a sister discipline to human-computer interaction that approaches problems in slightly different ways.
3. IRE260H1

**New Completion Requirements:**

**Required Courses:**

1. CSC300H1, CSC301H1, CSC318H1, CSC428H1
2. (SOC100H1, SOC150H1)/SOC101Y1, SOC202H1, SOC204H1/SOC200H1, SOC252H1/SOC254H1/SOC302H1 [To enrol in restricted SOC courses, please contact the CS Undergraduate Office in the July preceding the academic year in which you plan to take the course]
3. 1.0 FCE from the following: CSC309H1, CSC320H1, CSC321H1, CSC343H1, CSC384H1, CSC401H1, CSC404H1, CSC418H1, CSC485H1, CSC490H1/491H1
4. PSY100H1, PSY270H1/PSY280H1

**Suggested Related Courses:**

1. CSC454H1, CSC290H1
2. At least one half-course in Human Factors or Ergonomics offered by the Department of Mechanical and Industrial Engineering, such as MIE240H1, MIE343H1, MIE344H1, MIE448H1, or MIE449H1. Human factors is a sister discipline to human-computer interaction that approaches problems in slightly different ways.
3. IRE260H1

**Program Delivery:**

**Method:** In Class

**Brief Description of the Proposal:**

Updated SOC courses to align with changes in that department.

**Consultation:**

Discussion with Christian Caron, Associate Chair for Undergraduate Studies in Sociology.

**Computer Science Specialist**

**Start Session:**

Summer 2017

**Current Enrolment Requirements:**

This is a limited enrolment program (Type 2L) that can only accommodate a certain number of students. Eligibility is based on the following criteria:

A. Completion of at least 4.0 FCEs including CSC148H1/CSC207H1 (with a minimum grade of 60%) and CSC165H1/CSC236H1/CSC240H1 (with a minimum grade of 60%), AND

B. An average of the grades in CSC148H1/CSC207H1 and CSC165H1/CSC236H1/CSC240H1 that meets the department's annual cutoff. When more than one course has been completed from a list of alternatives, the higher grades will be used. Also, CSC240H1 grades will be adjusted to account for the course's greater difficulty. Finally, note that the cutoff changes from year to year, depending on the current capacity of the program and the pool of
applicants. For more information, including historical data, please visit [http://web.cs.toronto.edu/program/ugrad/admission.htm](http://web.cs.toronto.edu/program/ugrad/admission.htm).

Note that students admitted to the program after second or third year will be required to pay retroactive program fees.

**New Enrolment Requirements:**

This is a limited enrolment program (Type 2L) that can only accommodate a certain number of students. Eligibility is based on the following criteria:

A. Completion of at least 4.0 FCEs including CSC148H1 (with a minimum grade of 70%) and CSC165H1/CSC240H1 (with a minimum grade of 70%), AND

B. An average of the grades in CSC148H1/CSC207H1 and CSC165H1/CSC236H1/CSC240H1 that meets the department’s annual cutoff. When more than one course has been completed from a list of alternatives, the higher grades will be used. Also, CSC240H1 grades will be adjusted to account for the course’s greater difficulty. Finally, note that the cutoff changes from year to year, depending on the current capacity of the program and the pool of applicants. For more information, including historical data, please visit [http://web.cs.toronto.edu/program/ugrad/admission.htm](http://web.cs.toronto.edu/program/ugrad/admission.htm).

Note that students admitted to the program after second or third year will be required to pay retroactive program fees.

**Current Completion Requirements:**

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

First year (2.5 FCEs):
1. (CSC108H1, CSC148H1)/CSC150H1, CSC165H1/CSC240H1; (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1

Second year (3.5 FCEs):
2. CSC207H1, CSC209H1, CSC236H1/CSC240H1, CSC258H1, CSC263H1/CSC265H1; MAT221H1/MAT223H1/MAT240H1; STA247H1/STA255H1/STA257H1

Notes:

1. Students with a strong background in an object-oriented language such as Python, Java or C++ may omit CSC108H1 and proceed directly with CSC148H1. [There is no need to replace the missing half-credit for program completion; however, please base your course choice on what you are ready to take, not on saving a half-credit].
2. CSC240H1 is an accelerated and enriched version of CSC165H1 plus CSC236H1, intended for students with a strong mathematical background, or who develop an interest after taking CSC165H1. If you take CSC240H1 without CSC165H1, there is no need to replace the missing half-credit for program completion; but please see Note
1. Consult the Undergraduate Office for advice about choosing among CSC108H1 and CSC148H1, and between CSC165H1 and CSC240H1.

Later years (6.0 FCEs):
3. CSC369H1, CSC373H1/CSC375H1

4. 5.0 FCEs from the following:
   • Any 300-/400-level CSC course;
   • BCB410H1, BCB420H1, BCB430Y1;
   • ECE385H1, ECE489H1;
   • MAT224H1, MAT235Y1/MAT237Y1/MAT257Y1, any 300-/400-level MAT course except MAT329Y1, MAT390H1, MAT391H1;
   • STA248H1/STA261H1, any 300-/400-level STA course

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

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

The choices in 4 must satisfy the requirement for an integrative, inquiry-based activity by including one of the following half-courses: CSC301H1, CSC318H1, CSC404H1, CSC411H1, CSC418H1, CSC420H1, CSC428H1, CSC454H1, CSC485H1, CSC490H1, CSC491H1, CSC494H1, CSC495H1. This requirement may also be met by participating in the PEY (Professional Experience Year) program.

Preparing for graduate study in Computer Science

Strong students should consider the option of further study in graduate school (where the degrees offered are typically M.Sc. and Ph.D.). If you find yourself frequently receiving marks in the B+ range or better, you should consult with faculty members to learn more about graduate school and whether it would be a good option for you. You will want to ask for advice on your particular interests and you will find faculty members are happy to talk to you but there are also some course choices that should be considered by all students thinking of graduate study in Computer Science.

The focuses can help you further refine your areas of interest, but you should not take courses exclusively in one area. You will benefit by having taken an advanced course requiring considerable software development and a theory course.

It will be especially beneficial to have done a project course (CSC494H1/CSC495H1), a capstone course (CSC490H1/CSC491H1), and/or a summer research project. It is good if this individual work is in the area where you eventually decide you'd like to do your own research, but that is not essential; what you need most is some experience doing work on your own, under the mentorship of an experienced researcher.

Choosing courses

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

**New Completion Requirements:**

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

First year (2.5 FCEs):
1. (CSC108H1, CSC148H1)/CSC150H1, CSC165H1/CSC240H1; (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1

Second year (3.5 FCEs):
2. CSC207H1, CSC209H1, CSC236H1/CSC240H1, CSC258H1, CSC263H1/CSC265H1; MAT221H1/MAT223H1/MAT240H1; STA247H1/STA255H1/STA257H1

Notes:

1. Students with a strong background in an object-oriented language such as Python, Java or C++ may omit CSC108H1 and proceed directly with CSC148H1. [There is no need to replace the missing half-credit for program completion; however, please base your course choice on what you are ready to take, not on saving a half-credit].
2. CSC240H1 is an accelerated and enriched version of CSC165H1 plus CSC236H1, intended for students with a strong mathematical background, or who develop an interest after taking CSC165H1. If you take CSC240H1 without CSC165H1, there is no need to replace the missing half-credit for program completion; but please see Note 1.
3. Consult the Undergraduate Office for advice about choosing among CSC108H1 and CSC148H1, and between CSC165H1 and CSC240H1.

Later years (6.0 FCEs):
3. CSC369H1, CSC373H1/CSC375H1

4. 5.0 FCEs from the following:
   - Any 300-/400-level CSC course;
   - BCB410H1, BCB420H1, BCB430Y1;
   - ECE385H1, ECE489H1;
   - MAT224H1, MAT235Y1/MAT237Y1/MAT257Y1, any 300-/400-level MAT course except MAT329Y1, MAT390H1, MAT391H1;
   - STA248H1/STA261H1, any 300-/400-level STA course

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

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

The choices in 4 must satisfy the requirement for an integrative, inquiry-based activity by including one of the following half-courses: CSC301H1, CSC318H1, CSC404H1, CSC411H1, CSC418H1, CSC420H1, CSC428H1,
Preparing for graduate study in Computer Science

Strong students should consider the option of further study in graduate school (where the degrees offered are typically M.Sc. and Ph.D.). If you find yourself frequently receiving marks in the B+ range or better, you should consult with faculty members to learn more about graduate school and whether it would be a good option for you. You will want to ask for advice on your particular interests and you will find faculty members are happy to talk to you but there are also some course choices that should be considered by all students thinking of graduate study in Computer Science.

The focuses can help you further refine your areas of interest, but you should not take courses exclusively in one area. You will benefit by having taken an advanced course requiring considerable software development and a theory course.

It will be especially beneficial to have done a project course (CSC494H1/CSC495H1), a capstone course (CSC490H1/CSC491H1), and/or a summer research project. It is good if this individual work is in the area where you eventually decide you’d like to do your own research, but that is not essential; what you need most is some experience doing work on your own, under the mentorship of an experienced researcher.

Choosing courses

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

Brief Description of the Proposal:

Consultation:

Focus In Scientific Computing

Start Session:

Summer 2017

Current Calendar Description:

Current Completion Requirements:

Required Courses:

1. MAT235Y1/MAT237Y1/MAT257Y1,
2. 1.5 FCEs from the following: CSC336H1, CSC436H1, CSC446H1, CSC456H1, CSC466H1

3. 1.0 FCE from the following: CSC320H1/CSC418H1, CSC321H1/CSC411H1, CSC343H1, CSC384H1, CSC358H1/CSC458H1

Suggested Related Courses:

MAT224H1/MAT240H1, MAT244H1, MAT334H1/MAT354H1, MAT337H1/MAT357H1

It is also recommended that students in this focus consider taking a half-course or two from the basic sciences (such as physics, chemistry, biology), as these sciences are the source of many problems solved by numerical techniques.

**New Completion Requirements:**

Required Courses:

1. MAT235Y1/MAT237Y1/MAT257Y1,
2. 1.5 FCEs from the following: CSC336H1, CSC436H1, CSC446H1, CSC456H1, CSC466H1
3. 1.0 FCE from the following: CSC320H1/CSC418H1, CSC321H1/CSC411H1, CSC343H1, CSC384H1, CSC358H1/CSC458H1

Suggested Related Courses:

- CSC367H1
- MAT224H1/MAT240H1, MAT244H1, MAT334H1/MAT354H1, MAT337H1/MAT357H1

It is also recommended that students in this focus consider taking a half-course or two from the basic sciences (such as physics, chemistry, biology), as these sciences are the source of many problems solved by numerical techniques.

**Program Delivery:**

**Method:** In Class

**Brief Description of the Proposal:**

**Consultation:**

**1 New Course (Proposal Details Below)**

CSC367H1: Parallel Programming

**Proposal Details for 1 New Course**
## CSC367H1: Parallel Programming

<table>
<thead>
<tr>
<th>Calendar Title</th>
<th>Parallel Programming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviated Title</td>
<td>Parallel Programming</td>
</tr>
<tr>
<td>Division</td>
<td>Arts and Science, Faculty of</td>
</tr>
<tr>
<td>Unit</td>
<td>Computer Science, Department of</td>
</tr>
<tr>
<td>College</td>
<td></td>
</tr>
<tr>
<td>Associated with (Division)</td>
<td></td>
</tr>
<tr>
<td>Associated with (Unit)</td>
<td></td>
</tr>
<tr>
<td>Contact Hours</td>
<td><strong>Lecture:</strong> 24</td>
</tr>
<tr>
<td>Description</td>
<td>Introduction to aspects of parallel programming. Topics include computer instruction execution, instruction-level parallelism, memory system performance, task and data parallelism, parallel models (shared memory, message passing), synchronization, scalability and Amdahl's law, Flynn taxonomy, vector processing and parallel computing architectures.</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>CSC258H1, CSC209H1</td>
</tr>
<tr>
<td>Corequisites</td>
<td></td>
</tr>
<tr>
<td>Exclusions</td>
<td></td>
</tr>
<tr>
<td>Recommended Preparation</td>
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</tr>
<tr>
<td>Competency Levels</td>
<td><strong>Critical and Creative Thinking:</strong> notably</td>
</tr>
<tr>
<td></td>
<td><strong>Communication:</strong> notably</td>
</tr>
<tr>
<td></td>
<td><strong>Information Literacy:</strong> none</td>
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<tr>
<td>Experiential Learning</td>
<td><strong>Research:</strong> none</td>
</tr>
<tr>
<td></td>
<td><strong>Nature of &quot;Other&quot; Experiential Learning:</strong> None selected</td>
</tr>
<tr>
<td>Distribution Requirements</td>
<td>Science</td>
</tr>
<tr>
<td>Breadth Requirements</td>
<td>The Physical and Mathematical Universes (5)</td>
</tr>
<tr>
<td>Credit Value</td>
<td>Fixed: 0.5</td>
</tr>
<tr>
<td>Student May Select Credit/ No Credit</td>
<td>Yes</td>
</tr>
<tr>
<td>Rationale</td>
<td>This course covers a range of aspects of parallel computing, with the emphasis on exposing Computer Science students to the fundamentals of parallel computing, and enabling them to develop the necessary skills to design efficient software for parallel systems.</td>
</tr>
<tr>
<td></td>
<td>In the current computational landscape, there is a growing need for expertise with parallel programming in a wide spectrum of Computer Science areas. Our students should develop the ability to program applications that leverage parallel processing effectively. In increasingly higher application domains, designing parallel solutions for solving large problems requires a solid understanding of parallel architectures and parallel models (e.g., shared memory, message passing), efficient synchronization, and scalability considerations.</td>
</tr>
<tr>
<td></td>
<td>This course is aimed at the third-year level, and may be counted towards the program requirements.</td>
</tr>
<tr>
<td>Consultation</td>
<td></td>
</tr>
<tr>
<td>Resource Implications</td>
<td>Department lab computers</td>
</tr>
<tr>
<td>-----------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Resource Budget</td>
<td>Academic Unit will provide the resources required for this course from their existing budget.</td>
</tr>
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Economics, Department of

1 New Course (Proposal Details Below)

ECO423H1: Economics and Biosocial Data

Proposal Details for 1 New Course

ECO423H1: Economics and Biosocial Data

<table>
<thead>
<tr>
<th>Calendar Title</th>
<th>Economics and Biosocial Data</th>
</tr>
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<tbody>
<tr>
<td>Abbreviated Title</td>
<td>Economics and Biosocial Data</td>
</tr>
<tr>
<td>Division</td>
<td>Arts and Science, Faculty of</td>
</tr>
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<td>Unit</td>
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<td>College</td>
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<tr>
<td>Associated with (Division)</td>
<td></td>
</tr>
<tr>
<td>Associated with (Unit)</td>
<td></td>
</tr>
<tr>
<td>Contact Hours</td>
<td>Lecture: 24, Seminar: 0, Practical: 0, Tutorial: 12</td>
</tr>
<tr>
<td>Description</td>
<td>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.</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>ECO200Y1/ECO204Y1/ECO206Y1; ECO220Y1/ECO227Y1/(STA220H1,STA255H1)/(STA257H1,STA261H1) ; at least 1.0 ECO FCE at the 300+ level; or permission of the instructor.</td>
</tr>
<tr>
<td>Corequisites</td>
<td></td>
</tr>
<tr>
<td>Exclusions</td>
<td>ECO422H1S (winter 2017)</td>
</tr>
<tr>
<td>Recommended Preparation</td>
<td>ECO374H1/ECO375H1</td>
</tr>
<tr>
<td>Competency Levels</td>
<td>Critical and Creative Thinking: extensively, Quantitative Reasoning: extensively, Communication: notably, Social and Ethical Responsibility: slightly, Information Literacy: notably</td>
</tr>
<tr>
<td>Experiential Learning</td>
<td>Research: none, Other: none</td>
</tr>
<tr>
<td>Distribution Requirements</td>
<td>Social Science</td>
</tr>
<tr>
<td>Breadth Requirements</td>
<td>Society and its Institutions (3)</td>
</tr>
<tr>
<td>Credit Value</td>
<td>Fixed: 0.5</td>
</tr>
<tr>
<td>Student May Select Credit/ No Credit</td>
<td>Yes</td>
</tr>
<tr>
<td>Rationale</td>
<td>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</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Consultation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Implications</td>
<td></td>
</tr>
<tr>
<td>Resource Budget</td>
<td>Academic Unit will provide the resources required for this course from their existing budget.</td>
</tr>
</tbody>
</table>
# Environment, School of

## 2 New Courses (Proposal Details Below)

ENV262H1: The Science of Energy in the Environment  
ENV461H1: The U of T Campus as a Living Lab of Sustainability

### Proposal Details for 2 New Courses

#### ENV262H1: The Science of Energy in the Environment

<table>
<thead>
<tr>
<th>Calendar Title</th>
<th>The Science of Energy in the Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviated Title</td>
<td>Science of Energy in Environment</td>
</tr>
<tr>
<td>Division</td>
<td>Arts and Science, Faculty of</td>
</tr>
<tr>
<td>Unit</td>
<td>Environment, School of</td>
</tr>
<tr>
<td>College</td>
<td></td>
</tr>
<tr>
<td>Associated with (Division)</td>
<td></td>
</tr>
<tr>
<td>Associated with (Unit)</td>
<td></td>
</tr>
<tr>
<td>Contact Hours</td>
<td>Lecture: 24  Seminar:  Practical:  Tutorial: 12</td>
</tr>
<tr>
<td>Description</td>
<td>Energy is a fundamental organizing principle of Nature. It has a central role in the origin and evolution of the universe, and is the basis of the ecosystem of the Earth and of technology and the world economy. This course will explore the science of energy in all its forms. (ENV262H1 is primarily intended as a Breadth Requirement course for students in the Humanities and Social Sciences.)</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>None</td>
</tr>
<tr>
<td>Corequisites</td>
<td></td>
</tr>
<tr>
<td>Exclusions</td>
<td>ENV346H1; GGR347H1, GGR348H1</td>
</tr>
<tr>
<td>Recommended Preparation</td>
<td></td>
</tr>
<tr>
<td>Competency Levels</td>
<td><strong>Critical and Creative Thinking:</strong> extensively  <strong>Quantitative Reasoning:</strong> none  <strong>Communication:</strong> none  <strong>Social and Ethical Responsibility:</strong> slightly  <strong>Information Literacy:</strong> none</td>
</tr>
<tr>
<td>Experiential Learning</td>
<td><strong>Research:</strong> none  <strong>Other:</strong> none</td>
</tr>
<tr>
<td>Nature of &quot;Other&quot; Experiential Learning</td>
<td>None selected</td>
</tr>
<tr>
<td>Distribution Requirements</td>
<td>Science</td>
</tr>
<tr>
<td>Breadth Requirements</td>
<td>The Physical and Mathematical Universes (5)</td>
</tr>
<tr>
<td>Credit Value</td>
<td>Fixed: 0.5</td>
</tr>
<tr>
<td>Student May Select Credit/No Credit</td>
<td>Yes</td>
</tr>
<tr>
<td>Rationale</td>
<td>Breadth course aimed at non-Science students in any program in FAS, to be listed on the breadth course offerings pages of the calendar (<a href="http://stepforward.artsci.utoronto.ca/breadth-courses-categories-4-lte-category-5-pmu/">http://stepforward.artsci.utoronto.ca/breadth-courses-categories-4-lte-category-5-pmu/</a>). Optional for Environmental Studies Major and Minor programs.</td>
</tr>
</tbody>
</table>
This course is one of three proposed Energy and Environment courses. Two related courses were offered as Special Topics courses in 2015-16 and 2016-17, as a FAS-supported pilot project in the School of the Environment. We are now proposing to make both courses permanent offerings. The Schools Curriculum Committee has reviewed both courses, has agreed that they are meeting the teaching needs and objectives of the School, and has approved this course proposal.

-- This is 200-level breadth course aimed at Arts students in either ENV programs or the FAS generally. The breadth category is PMU.
-- It should have no pre-requisites and not be a pre-requisite for any other course (although it may be recommended). It should be optional in Arts ENV programs, but excluded from Science ENV programs (to prevent collision with ENV346).
-- This course will be listed and promoted on the Faculty of Arts and Science breadth course pages and advertised to all comers. We aim to have a large enrolment (around ~100 at least) similar to existing 200 level PHY breadth courses.

**Consultation**

Physics

**Resource Implications**

Instructor, Steven Morris, Physics, with input from Ben Akrigg, Classics, and Adonis Yatchew, Economics

data missing

**Resource Budget**

AcademicUnit has received Decanal approval for additional resources required for this course, and will provide documentation at the curriculum committee meeting.

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**ENV461H1: The U of T Campus as a Living Lab of Sustainability**

**Calendar Title**

The U of T Campus as a Living Lab of Sustainability

**Abbreviated Title**

U of T Campus as Living Lab

**Division**

Arts and Science, Faculty of

**Unit**

Environment, School of

**College**

Associated with (Division)

Associated with (Unit)

**Contact Hours**

<table>
<thead>
<tr>
<th>Lecture: 24</th>
<th>Seminar:</th>
<th>Practical:</th>
<th>Tutorial:</th>
</tr>
</thead>
</table>

**Description**

Sustainability is a growing priority for universities all over the world. Many are developing strong operational sustainability goals and targets, and are giving increasing emphasis to teaching and research on sustainability issues. Yet few have committed at the executive level to integrating academic and operational sustainability in the context of treating their campus as a living laboratory of sustainable practice, research and teaching. Arguably, it is such living lab approaches that offer the largest potential for universities to play a significant role in the sustainability transition. This course will explore and apply the living lab concept, in the context of operational sustainability at the University of Toronto. We will begin by looking at the literature on university sustainability and the living lab concept. The bulk of the course will involve undertaking an applied research project on some aspect of campus sustainability, working in close partnership with operational staff at the University of Toronto. Students will develop the skills needed to work across disciplines and fields of study, and with non-academic partners. This course will put students to work on operational sustainability projects identified by the staff working in or with the Sustainability Office at the University of Toronto. Students will be organized into groups, each of which will be assigned one project, to be overseen by one or more U of T staff members. The bulk of the course will consist of regular meetings with the staff clients, with instructors, and in small groups to undertake a group project. Each group will produce a mid-term and final report, and give a mid-term and final presentation. Each student will also submit two 360 reviews of the group process. A crucial aspect
of this course is the ability of students to work collaboratively together in a group environment, and to work effectively with a university staff person acting as a client for their work. Students will be provided with a Handbook outlining information on working in groups and the focus of the class in the second week will be on this issue. The first 360 peer review will serve to provide information on how well each group is working. Students are encouraged to discuss and resolve group process issues in the weekly group meetings, and in their regular meetings with the instructor and TA. The second 360 review will occur at the end of the term. The results of the two 360 reviews will be used, where appropriate, to adjust individual marks from the group averages.

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>Students must have completed a minimum of 10.0 FCE to register for the course.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corequisites</td>
<td></td>
</tr>
<tr>
<td>Exclusions</td>
<td></td>
</tr>
<tr>
<td>Recommended Preparation</td>
<td>1.0 FCE of environment-related coursework</td>
</tr>
</tbody>
</table>
| Competency Levels | **Critical and Creative Thinking:** extensively  
|                 | **Quantitative Reasoning:** slightly  
|                 | **Communication:** extensively  
|                 | **Social and Ethical Responsibility:** extensively  
|                 | **Information Literacy:** extensively                                        |
| Experiential Learning | **Research:** extensively  
|                 | **Other:** extensively                                                        |
| **Nature of "Other" Experiential Learning:** | Experiential Study, Service Learning, Fieldwork |
| Distribution Requirements | Social Science, Science, Humanities                                            |
| Breadth Requirements | Society and its Institutions (3)                                              |
| Credit Value | Fixed: 0.5                                                                   |
| Student May Select Credit/ No Credit | Yes                                                                                |
| Rationale | In 2016, Prof John Robinson joined the UofT in a joint appointment with the School of the Environment and the Munk School of Global Affairs. Prof Robinson has an international reputation as a leader in the areas of urban sustainability and processes of community engagement to promote sustainability. Further, having served as Associate Provost, Sustainability, at UBC, Prof Robinson is an expert in University sustainability programming. To capitalize on Prof Robinsons expertise and to provide our students with a unique experiential learning experience with one of the worlds foremost experts in the sustainability transition, we are proposing this new course. This course is a unique offering for the School, and for the UofT, since it pairs student groups with members of the Universitys operational staff to address key challenges in the sustainability transition. It will provide our students with a capstone 4th year learning experience, and will address enrollment pressure in some of our other 4th year ENV courses (ENV440, ENV451). Students work in close partnership with operational staff at the University of Toronto, such as the UofT Sustainability Office, to identify operational sustainability projects on the UofT campus. Students conduct research on these topics, and hold regular meetings with staff clients. Further, students engage in regular peer-review of each others research methods and findings. |
| Consultation | We sent notices to the following departments advising them that this Special Topics course would be offered in 2016-2017 and inviting students from other programs to take the course. We were not made aware of any concerns regarding overlap. Geography, Ecology & Evolutionary Biology, Earth Sciences, Chemistry, Physics, Forestry, Daniels Faculty of Architecture, Religious Studies, Psychology, Indigenous Studies, Environmental Engineering, Anthropology, Economics, Philosophy, Political Science, Women & Gender Studies, Urban Studies; Peace, Conflict & Justice program |
| Resource Implications | Instructor will be Prof. John Robinson who is cross-appointed to the School  
|                 | TA at standard allocation of 1.2 hours per student for courses with tutorials  
|                 | No lab involved  
|                 | No computer equipment required (students will use their own computers)  
|                 | Academic Unit will provide the resources required for this course from their existing budget. |
| Resource Budget |  |
Impact Centre

**2 New Courses (Proposal Details Below)**

IMC391H1: Exploring New Ventures
IMC392Y1: Exploring New Ventures

**1 Retired Course**

IMC390Y1: Exploring New Ventures

**Proposal Details for 2 New Courses**

**IMC391H1: Exploring New Ventures**

<table>
<thead>
<tr>
<th>Calendar Title</th>
<th>Exploring New Ventures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviated Title</td>
<td>Exploring New Ventures</td>
</tr>
<tr>
<td>Division</td>
<td>Arts and Science, Faculty of</td>
</tr>
<tr>
<td>Unit</td>
<td>Impact Centre</td>
</tr>
<tr>
<td>College</td>
<td></td>
</tr>
<tr>
<td>Associated with (Division)</td>
<td></td>
</tr>
<tr>
<td>Associated with (Unit)</td>
<td></td>
</tr>
<tr>
<td>Contact Hours</td>
<td></td>
</tr>
<tr>
<td>Lecture: 12</td>
<td>Seminar:</td>
</tr>
<tr>
<td>Description</td>
<td>This experiential learning course allows students to explore the inner working of new venture companies. The majority of the course consists of a placement with Toronto-based start-ups, with oversight from the Impact Centre. In-class activities facilitate the application of entrepreneurial tools to develop the students entrepreneurial skills.</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>IMC200H1/ RSM100H1/ MGT100H1. 8.0 FCEs in any subject.</td>
</tr>
<tr>
<td>Corequisites</td>
<td></td>
</tr>
<tr>
<td>Exclusions</td>
<td>IMC390Y1, IMC392Y1</td>
</tr>
<tr>
<td>Recommended Preparation</td>
<td>Although the internships often relate to science innovations, they are targeted at students from all disciplines. This includes science and engineering, social sciences and humanities students, mirroring the roles of these individuals in enterprises.</td>
</tr>
<tr>
<td>Competency Levels</td>
<td>Critical and Creative Thinking: extensively</td>
</tr>
<tr>
<td></td>
<td>Communication: notably</td>
</tr>
<tr>
<td></td>
<td>Information Literacy: extensively</td>
</tr>
<tr>
<td>Experiential Learning</td>
<td>Research: none</td>
</tr>
<tr>
<td>Nature of “Other” Experiential Learning</td>
<td>Experiential Study</td>
</tr>
<tr>
<td>Distribution Requirements</td>
<td>Social Science</td>
</tr>
<tr>
<td>Breadth Requirements</td>
<td>Society and its Institutions (3)</td>
</tr>
<tr>
<td>Credit Value</td>
<td>Fixed: 0.5</td>
</tr>
<tr>
<td>Student May Select Credit/</td>
<td>Yes</td>
</tr>
<tr>
<td>No Credit</td>
<td>Rationale</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>This will be a half-credit version of IMC392Y1. The timing of the placements and the arrival time of the students often make it difficult to run a 7-month placement. The half-credit course will allow shorter placements, as well as placements that start in January.</td>
</tr>
</tbody>
</table>

**IMC392Y1: Exploring New Ventures**

<table>
<thead>
<tr>
<th>Calendar Title</th>
<th>Exploring New Ventures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviated Title</td>
<td>Exploring New Ventures</td>
</tr>
<tr>
<td>Division</td>
<td>Arts and Science, Faculty of</td>
</tr>
<tr>
<td>Unit</td>
<td>Impact Centre</td>
</tr>
<tr>
<td>College</td>
<td></td>
</tr>
<tr>
<td>Associated with (Division)</td>
<td></td>
</tr>
<tr>
<td>Associated with (Unit)</td>
<td></td>
</tr>
<tr>
<td>Contact Hours</td>
<td><strong>Lecture:</strong> 12</td>
</tr>
<tr>
<td>Description</td>
<td>This experiential learning course allows students to explore the inner working of new venture companies. The majority of the course consists of a placement with Toronto-based start-ups, with oversight from the Impact Centre. In-class activities facilitate the application of entrepreneurial tools to develop the students’ entrepreneurial skills.</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>IMC200H1/RSM100H1/MGT100H1. 8.0 FCEs in any subject.</td>
</tr>
<tr>
<td>Corequisites</td>
<td></td>
</tr>
<tr>
<td>Exclusions</td>
<td>IMC390Y1, IMC391H1</td>
</tr>
<tr>
<td>Recommended Preparation</td>
<td>Although the internships often relate to science innovations, they are targeted at students from all disciplines. This includes science and engineering, social sciences and humanities students, mirroring the roles of these individuals in enterprises.</td>
</tr>
<tr>
<td>Competency Levels</td>
<td><strong>Critical and Creative Thinking:</strong> notably</td>
</tr>
<tr>
<td></td>
<td><strong>Communication:</strong> notably</td>
</tr>
<tr>
<td></td>
<td><strong>Information Literacy:</strong> extensively</td>
</tr>
<tr>
<td>Experiential Learning</td>
<td><strong>Research:</strong></td>
</tr>
<tr>
<td>Distribution Requirements</td>
<td>Science, Social Science</td>
</tr>
<tr>
<td>Breadth Requirements</td>
<td>Society and its Institutions (3)</td>
</tr>
<tr>
<td>Credit Value</td>
<td>Fixed: 1</td>
</tr>
<tr>
<td>Student May Select Credit/No Credit</td>
<td>Yes</td>
</tr>
<tr>
<td>Rationale</td>
<td>This course is a renumbered version of IMC390Y1, which has been offered for several years. The</td>
</tr>
</tbody>
</table>
change is intended to make room for IMC391H1, a half-credit version of the placements. The other minor changes are based on the experience gained while offering this course in past years. The changes are:
- Change from Pass/Fail to normal grading. Even though students work on very diverse projects, we have learned that we can assign unbiased grades based on the common course-work.
- Adjust the title of the course: The Ministry of Education now has a formal definition of what an internship is, and we do not fall with this new meaning of the term "internship."
- Change the course code, in order to also allow a half-course.
- Adjust the list of pre-requisites due to changes in course codes in the Rotman Commerce program.
- Adjust the language of the course description to bring it in line with the current vocabulary of experiential learning.

The course content and learning style are not affected by these changes.

<table>
<thead>
<tr>
<th>Consultation</th>
<th>Significant consultations were done when IMC390 was introduced in 2013. The changes here do not affect the content or learning outcomes of the course.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Implications</td>
<td></td>
</tr>
<tr>
<td>Resource Budget</td>
<td>Academic Unit will provide the resources required for this course from their existing budget.</td>
</tr>
</tbody>
</table>
1 New Course (Proposal Details Below)

MAT245H1: Mathematical Methods in Data Science

Proposal Details for 1 New Course

MAT245H1: Mathematical Methods in Data Science

Calendar Title | Mathematical Methods in Data Science
Abbreviated Title | Math. Methods in Data Science
Division | Arts and Science, Faculty of
Unit | Mathematics, Department of
College |
Associated with (Division) |
Associated with (Unit) |
Contact Hours | Lecture: 36 | Seminar: | Practical: 24 | Tutorial: |
Description | 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.
Prerequisites | MAT137Y1/MAT157Y1, MAT223H1/MAT240H1, MAT224H1/MAT247H1
Corequisites | MAT237Y1/MAT257Y1
Exclusions |
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
<table>
<thead>
<tr>
<th><strong>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.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consultation</strong> 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>
</tr>
<tr>
<td><strong>Resource Implications</strong> 1 instructor, 1 or 2 TAs (depending on enrolment), computer lab with python installed.</td>
</tr>
<tr>
<td><strong>Resource Budget</strong> Academic Unit will provide the resources required for this course from their existing budget.</td>
</tr>
</tbody>
</table>
# Proposal Details for 1 New Course

**ANA411H1: Anatomy in Application: Exercise & Biomechanics**

<table>
<thead>
<tr>
<th>Calendar Title</th>
<th>Anatomy in Application: Exercise &amp; Biomechanics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviated Title</td>
<td>ANATOMY APPLICATION</td>
</tr>
<tr>
<td>Division</td>
<td>Arts and Science, Faculty of</td>
</tr>
<tr>
<td>Unit</td>
<td></td>
</tr>
<tr>
<td>College</td>
<td></td>
</tr>
<tr>
<td>Associated with (Division)</td>
<td>Medicine, Faculty of</td>
</tr>
<tr>
<td>Associated with (Unit)</td>
<td></td>
</tr>
<tr>
<td>Contact Hours</td>
<td>Lecture: 24</td>
</tr>
<tr>
<td>Description</td>
<td>This course will cover musculoskeletal anatomy (both upper and lower limb) topics with an emphasis on applying detailed anatomical review, biomechanical principles and research evidence to explain or clarify exercise principles and myths.</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>ANA126Y1 or ANA300Y1 (78%) or equivalent</td>
</tr>
<tr>
<td>Corequisites</td>
<td></td>
</tr>
<tr>
<td>Exclusions</td>
<td>none</td>
</tr>
<tr>
<td>Recommended Preparation</td>
<td></td>
</tr>
<tr>
<td>Competency Levels</td>
<td>Critical and Creative Thinking: notably</td>
</tr>
<tr>
<td></td>
<td>Communication:</td>
</tr>
<tr>
<td>Experiential Learning</td>
<td>Research: notably</td>
</tr>
<tr>
<td>Nature of “Other” Experiential Learning</td>
<td>Distinctive Practicals or Laboratories</td>
</tr>
<tr>
<td>Distribution Requirements</td>
<td>Science</td>
</tr>
<tr>
<td>Breadth Requirements</td>
<td>Living Things and Their Environment (4)</td>
</tr>
<tr>
<td>Credit Value</td>
<td>Fixed: 0.5</td>
</tr>
<tr>
<td>Student May Select Credit/No Credit</td>
<td>Yes</td>
</tr>
<tr>
<td>Rationale</td>
<td>In any health field which provides exercise-based intervention or assesses functional movement and status, the need for exceptional anatomy and biomechanical knowledge is paramount. Traditionally, anatomy is the learned in undergraduate programs along with physiology to create the foundation for the understanding of major body systems. In some fields, additional training in the understanding of mechanical laws related to movement or structure of the human body (biomechanics) is also included in undergraduate training.</td>
</tr>
</tbody>
</table>
Effective education requires not only attaining a continuum of basic sciences but an integration of fundamental concepts amongst the topics to better understand the functional applications of the basic sciences. The aim of this course is to provide an opportunity for students to gain a better appreciation of the anatomical and functional relationship of the musculoskeletal systems and appreciate the link between anatomy and biomechanics to apply this knowledge and evaluate exercise practice and functional movement.

Currently, students at the University of Toronto, Faculty of Arts & Science have only one gross anatomy course: ANA300 which covers a major body systems. This course includes the musculoskeletal system as a topic but does not focus on functional anatomy or exercise practices. Biomechanics courses are typically limited to an introductory content for Kinesiology program students only.

The introduction of this course, ANA411, this will provide a advancement to taking ANA300 or ANA126 (KPE) for those students who are interested in learning musculoskeletal anatomy in more depth and understand how to use this information alongside biomechanical principles of musculoskeletal regions of the body to better assess functional tasks or design or evaluate effective exercise programs.

The course will provide learning opportunities through detailed lab review of prosection specimens and models following an introduction of either a review of a biomechanical principle or a research-informed exercise topic which may be controversial in a seminar format. Students will build upon these two learning components and be expected to provide one presentation using current literature combined with known anatomical and biomechanical principles to resolve either a controversial topic or substantiate a current exercise practice. Within this presentation, students will be expected to include relevant review of a musculoskeletal region to underscore/substantiate their conclusions.

<table>
<thead>
<tr>
<th>Consultation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Implications</td>
</tr>
<tr>
<td>Teaching Assistants - 2</td>
</tr>
<tr>
<td>Laboratory Equipment - Anatomy Labs - twice per week</td>
</tr>
<tr>
<td>Computing Resources: None</td>
</tr>
<tr>
<td>Seminar Room - once per week</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resource Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Unit will provide the resources required for this course from their existing budget.</td>
</tr>
</tbody>
</table>
1 New Course (Proposal Details Below)

MGY460H1: Genetic Analysis of Development

1 Course Modification for Committee Review

MGY450H1: Genetic Analysis of Development

| Code | Current: MGY451H1  
New: MGY450H1 |
|------|------------------|
| Calendar Title | Current: Genetic Analysis of Development I  
New: Genetic Analysis of Development |
| Abbreviated Title | Current: Gen Analy Devel 1  
New: Gen Analy Devel |
| Description | Current:  
Basic and advanced principles of genetic analysis applied to the study of two of the best-understood eukaryotic model organisms: the yeast Saccharomyces cerevisiae and the nematode worm Caenorhabditis elegans. We emphasize the use of genetic approaches to address problems in cell biology and development, such as the regulation of cell fate. Much of the knowledge gained from these simple organisms has proven broadly applicable, and the same principles of developmental genetic analysis underlie efforts to understand the development of more complex organisms.  
New:  
Basic and advanced principles of genetic analysis applied to the study of the best-understood eukaryotic model organisms. We emphasize the use of genetic approaches to address problems in cell biology and development, such as the regulation of cell fate. Much of the knowledge gained from simple model organisms has proven broadly applicable, and the same principles of developmental genetic analysis underlie efforts to understand the development of more complex organisms. |
| Rationale | We are combining content from MGY451 and MGY452 into a single one semester course and renumbering it MGY450. |

1 Course Modification that Doesn't Need Committee Review

MGY452H1: Genetic Analysis of Development II

| Rationale | We are removing MGY452 from the calendar. We want to recombine it with MGY451 to make it a single course (MGY450) |

Proposal Details for 1 New Course

MGY460H1: Genetic Analysis of Development

<table>
<thead>
<tr>
<th>Impact on Programs</th>
<th>This proposal triggers modifications in the unit's program(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calendar Title</td>
<td>Genetic Analysis of Development</td>
</tr>
<tr>
<td>Abbreviated Title</td>
<td>Genetic Analysis Development</td>
</tr>
<tr>
<td>Division</td>
<td>Arts and Science, Faculty of</td>
</tr>
<tr>
<td>Unit</td>
<td></td>
</tr>
<tr>
<td>Contact Hours</td>
<td>Lecture: 24</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Description</td>
<td>Basic and advanced principles of genetic analysis applied to the study of the best-understood eukaryotic model organisms including the nematode worm Caenorhabditis elegans, the zebrafish, and the laboratory mouse. We emphasize the use of genetic approaches to address problems in cell biology and development, such as the regulation of cell fate and tissue development. Much of the knowledge gained from these experimentally tractable organisms has proven broadly applicable, and the same principles of developmental genetic analysis underlie efforts to understand the development of humans.</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>BIO260H1/HMB265H1, MGY311Y1/CSB349H1/BCH311H1</td>
</tr>
<tr>
<td>Corequisites</td>
<td></td>
</tr>
<tr>
<td>Exclusions</td>
<td></td>
</tr>
<tr>
<td>Recommended Preparation</td>
<td>MGY340H1, MGY350H1</td>
</tr>
<tr>
<td>Competency Levels</td>
<td><strong>Critical and Creative Thinking:</strong> extensively</td>
</tr>
<tr>
<td></td>
<td><strong>Communication:</strong> notably</td>
</tr>
<tr>
<td></td>
<td><strong>Information Literacy:</strong> notably</td>
</tr>
<tr>
<td>Experiential Learning</td>
<td><strong>Research:</strong> none</td>
</tr>
<tr>
<td>Nature of “Other” Experiential Learning</td>
<td>None selected</td>
</tr>
<tr>
<td>Distribution Requirements</td>
<td></td>
</tr>
<tr>
<td>Breadth Requirements</td>
<td></td>
</tr>
<tr>
<td>Credit Value</td>
<td>Fixed: 0.5</td>
</tr>
<tr>
<td>Student May Select Credit/ No Credit</td>
<td>Yes</td>
</tr>
<tr>
<td>Rationale</td>
<td>This course is an amalgamation of content from MGY451 and MGY452H1, both of which we intend to retire. We found MGY451/452 were poorly subscribed and had content that overlapped with the many similar and more extensive courses on development offered by CSB. As designed this course will fit into a new &quot;genetics track&quot; of courses that starts with MGY340 (Molecular Genetics), then MGY350 (Model Organisms in Disease), then MGY460 (this course) and finally MGY470 (Human Genetics). These four courses will be the backbone of our genetics Specialists and Major streams.</td>
</tr>
<tr>
<td>Consultation</td>
<td>Because MGY451 and MGY452 are so poorly subscribed (10 to 15 students per semester) and because no other units require these courses we have undertaken limited consultation at this point about our intent to collapse them into one course. The CSB Developmental Biology Specialist does cross-list MGY451/MGY452 as a possible course (among many) that can be used to fulfill its program requirements. This will have to be changed and we will inform them of our changes.</td>
</tr>
<tr>
<td>Resource Implications</td>
<td>This course will be taught by 3 professors in the Department of Molecular Genetics with no TA support.</td>
</tr>
<tr>
<td>Resource Budget</td>
<td>Academic Unit will provide the resources required for this course from their existing budget.</td>
</tr>
</tbody>
</table>
**1 Minor Program Modification (Expedited Divisional Review)**

### Physiology Minor

**Start Session:** Summer 2017

**Current Completion Requirements:**

(4 full courses or their equivalent; one 300+ level FCE must be included in the program)

1. 2 full course equivalents from: (BIO120H1, BIO130H1)/BIO150Y1; PSL201Y1/(PSL300H1, PSL301H1)
2. 2 full course equivalents from: BIO251H1, BIO270H1, BIO271H1; CSB325H1, CSB332H1/CJH332H1, CSB343H1, CSB344H1, CSB345H1/CSB445H1, CSB346H1, CSB347H1; EEB328H1; HMB200H1/HMB220H1, HMB430H1, HMB470H1, HMB472H1; PSL280H1, PSL299Y1, PSL 300-series, PSL400-series; PSY290H1, PSY396H1, PSY397H1, PSY399H1, PSY490H1, PSY492H1, PSY494H1, PSY497H1

**New Completion Requirements:**

(4 full courses or their equivalent; one 300+ level FCE must be included in the program)

1. 2 full course equivalents from: (BIO120H1, BIO130H1)/BIO150Y1; PSL201Y1/(PSL300H1, PSL301H1)
2. 2 full course equivalents from: BIO251H1, BIO270H1, BIO271H1; CSB325H1, CSB332H1/CJH332H1, CSB343H1, CSB344H1, CSB345H1/CSB445H1, CSB346H1, CSB347H1; EEB328H1; HMB200H1/HMB220H1, HMB430H1, HMB470H1, HMB472H1; PSL280H1, PSL299Y1, PSL 300-series, PSL400-series; PSY290H1, PSY396H1, PSY397H1, PSY399H1, PSY490H1, PSY492H1, PSY494H1, PSY497H1

**Brief Description of the Proposal:**

**Consultation:**
# Psychology, Department of

## 1 New Course (Proposal Details Below)

**PSY369H1: Psychobiology Laboratory**

## 1 Retired Course

**PSY399H1: Psychobiology Laboratory**

### Proposal Details for 1 New Course

**PSY369H1: Psychobiology Laboratory**

<table>
<thead>
<tr>
<th>Calendar Title</th>
<th>Psychobiology Laboratory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviated Title</td>
<td>Psychobiology Lab</td>
</tr>
<tr>
<td>Division</td>
<td>Arts and Science, Faculty of</td>
</tr>
<tr>
<td>Unit</td>
<td>Psychology, Department of</td>
</tr>
<tr>
<td>College</td>
<td></td>
</tr>
<tr>
<td>Associated with (Division)</td>
<td></td>
</tr>
<tr>
<td>Associated with (Unit)</td>
<td></td>
</tr>
<tr>
<td>Contact Hours</td>
<td>Lecture:</td>
</tr>
<tr>
<td>Description</td>
<td>Formerly numbered PSY399H1, this lab is an introduction to experimental methods in behavioural neuroscience, including neuroanatomical and psychopharmacological methods in rodents. Course projects will cover experimental design, laboratory techniques, data analysis, and scientific writing. Course capacity is limited to 12-15 students and priority is given to PSY Specialists and Research Specialists during the first enrolment period.</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>PSY202H1 (or exclusion), PSY290H1/HMB200H1</td>
</tr>
<tr>
<td>Corequisites</td>
<td></td>
</tr>
<tr>
<td>Exclusions</td>
<td>HMB310H1/PSY399H1/PSY399H5/PSYC06H3</td>
</tr>
<tr>
<td>Recommended Preparation</td>
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</tr>
<tr>
<td>Competency Levels</td>
<td>Critical and Creative Thinking: slightly</td>
</tr>
<tr>
<td></td>
<td>Communication: slightly</td>
</tr>
<tr>
<td></td>
<td>Information Literacy: slightly</td>
</tr>
<tr>
<td>Experiential Learning</td>
<td>Research: extensively</td>
</tr>
<tr>
<td></td>
<td>Nature of &quot;Other&quot; Experiential Learning: None selected</td>
</tr>
<tr>
<td>Distribution Requirements</td>
<td>Science</td>
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<tr>
<td>Breadth Requirements</td>
<td>Living Things and Their Environment (4)</td>
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<tr>
<td>Credit Value</td>
<td>Fixed: 0.5</td>
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<td>Student May Select Credit/ No Credit</td>
<td>No</td>
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<tr>
<td>Rationale</td>
<td></td>
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<tr>
<td>Consultation</td>
<td></td>
</tr>
<tr>
<td>Resource Implications</td>
<td></td>
</tr>
<tr>
<td><strong>Resource Budget</strong></td>
<td>Academic Unit will provide the resources required for this course from their existing budget.</td>
</tr>
</tbody>
</table>
# 2 Minor Program Modifications (Expedited Divisional Review)

## Actuarial Science Specialist

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

### Current Completion Requirements:

1. (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. ECO100Y1 (70%)
2. MAT137Y1 (65%)/MAT157Y1
3. MAT223H1/MAT240H1 (should be taken in first year, enforced as a prereq for MAT237Y)

**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.**

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 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:

1. (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. CSC108/120/121/148

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.**

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 corequisites are met): RSM430H1, 433H1, 437H1. CSC108H1/CSC120H/ CSC121H and MAT246H1 are recommended (not required) for students in the Actuarial Science Specialist Program.

### 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

Fundamental Genetics and its Applications: (3.0 FCE)
BIO120H1, BIO130H1, HMB201H1, 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 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.

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

Fundamental Genetics and its Applications: (3.0 FCE)
BIO120H1, BIO130H1, HMB201H1, 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 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)
SOC100H1+SOC150H1 (minimum combined average grade of 65%); SOC204H1; 1.0 FCE from SOC303H1, SOC312H1, SOC336H1, SOC355H1, SOC363H1, SOC364H1. Students interested in advanced study in Sociology should consider additional courses, in particular SOC201H1, SOC251H1, and SOC254H1

Brief Description of the Proposal:

Consultation:
1 Minor Program Modification (Full Divisional Review)

**Cognitive Science Major**

**Start Session:**
Summer 2017

**Current Enrolment Requirements:**

This is a Type 2 program. Enrolment is limited and admission requires the completion of either COG250Y1, or a combination of 1.5 FCE in CSC, LIN, PHL, PSY (no more than 1 FCE from a single department). Please note that meeting the minimum admission requirements does not guarantee one a spot in any of our programs, depending on the number of program spaces available.

**New Enrolment Requirements:**

This is a Type 2 program. Enrolment is limited and admission requires the completion of either COG250Y1, or a combination of 1.5 FCE in CSC, LIN, PHL, PSY (no more than 1 FCE from a single department). Please note that meeting the minimum admission requirements does not guarantee one a spot in any of our programs, depending on the number of program spaces available.

Students are responsible for checking co- and prerequisites for all courses. Please note that not all courses are offered on a regular basis. A list of approved Cognitive Science courses can be found on the website: www.uc.utoronto.ca/requirements. For any questions, consult the Cognitive Science Program Office, UC173, University College, 416-946-4025. Email: cecille.sioulis@utoronto.ca or the Program Director at: cogsci.director@utoronto.ca

**Current Completion Requirements:**

(8 FCEs)

Where noted below, please consult the Faculty of Arts & Science Course Calendar on prerequisites. Note that those interested in taking upper-level computer science courses should begin with CSC108H1, not CSC104H1.

**First Year:**

CSC104H1/CSC108H1/CSC120H1; LIN100Y1; COG250Y1 (can be taken as a corerequisite in Year 2)

**Second Year:**
STA220H1/PSY201H1; PSY270H1

Second Year and Higher:

PHL342H1; PSY473H1/PSY493H1; and 3 FCEs from one of Stream 1, 2, or 3:

Stream 1: Perception and Attention

PHL232H1; PSY280H1; and 2.0 FCEs of any of the following: COG341H1; COG342H1; PSY312H1; PSY380H1; PSY475H1; PHL340H1; PHL405H1; JLP374H1; NEW333H1; NEW438H1

COG499H1

For those with the appropriate prerequisites: CSC207H1; CSC320H1; CSC420H1

Stream 2: Language and Cognition

1.5 FCEs of any of the following: LIN232H1; LIN241H1; JLP315H1; LIN331H1; LIN341H1; JLP374H1

1.5 FCEs of any of the following: COG341H1; COG342H1; JLP471H1; JLS472H1; JLS473H1; PSY312H1; PHL245H1; PHL340H1; PHL345H1; PHL351H1; PHL451H1; NEW333H1; NEW438H1

COG499H1

For those with the appropriate prerequisites: CSC401H1; CSC485H1

Stream 3: Thinking and Reasoning

PHL245H1; PSY260H1; and 2.0 FCEs of any of the following: COG341H1; COG342H1; PSY312H1, PSY370H1; PSY371H1; PSY372H1; PHL246H1; PHL340H1; PHL347H1; JLP374H1; JLP471H1; JLS472H1; JLS473H1; NEW333H1; NEW438H1

COG499H1

For those with the appropriate prerequisites: CSC207H1; CSC304H1; CSC321H1; CSC384H1; CSC486H1

Fourth Year: COG401H1
New Completion Requirements:

(8 FCEs)

Where noted below, please consult the Faculty of Arts & Science Course Calendar on prerequisites. Note that those interested in taking upper-level computer science courses should begin with CSC108H1, not CSC104H1.

First Year:

CSC104H1/CSC108H1/CSC120H1; LIN102H1 (note: LIN200H1 does not serve as prerequisite for upper year LIN courses); COG250Y1

Second Year:

STA220H1/PSY201H1; PSY270H1

Second Year and Higher:

PHL342H1; PSY473H1/PSY493H1; and 3 FCEs from one of Stream 1, 2, or 3:

Stream 1: Perception and Attention

PHL232H1; PSY280H1; and 2.0 FCEs of any of the following: COG341H1; COG342H1; PSY312H1; PSY380H1; PSY475H1; PHL340H1; PHL405H1; JLP374H1; NEW333H1; NEW438H1

COG499H1

For those with the appropriate prerequisites: CSC207H1; CSC320H1; CSC420H1

Stream 2: Language and Cognition

1.5 FCEs of any of the following: LIN232H1; LIN241H1; JLP315H1; LIN331H1; LIN341H1; JLP374H1

1.5 FCEs of any of the following: COG341H1; COG342H1; JLP471H1; JLS472H1; JLS473H1; PSY312H1; PHL245H1; PHL340H1; PHL345H1; PHL351H1; PHL451H1; NEW333H1; NEW438H1
COG499H1

For those with the appropriate prerequisites: CSC401H1; CSC485H1

Stream 3: Thinking and Reasoning

PHL245H1; PSY260H1; and 2.0 FCEs of any of the following: COG341H1; COG342H1; PSY312H1, PSY370H1; PSY371H1; PSY372H1; PHL246H1; PHL340H1; PHL347H1; JLP374H1; JLP471H1; JLS472H1; JLS473H1; NEW333H1; NEW438H1

COG499H1

For those with the appropriate prerequisites: CSC207H1; CSC304H1; CSC321H1; CSC384H1; CSC486H1

Fourth Year: COG401H1

Brief Description of the Proposal:

Consultation:

1 New Course (Proposal Details Below)

COG415H1: Cognitive Science in Practice

Proposal Details for 1 New Course

<table>
<thead>
<tr>
<th>COG415H1: Cognitive Science in Practice</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Calendar Title</td>
<td>Cognitive Science in Practice</td>
</tr>
<tr>
<td>Abbreviated Title</td>
<td>Cognitive Science in Practice</td>
</tr>
<tr>
<td>Division</td>
<td>Arts and Science, Faculty of</td>
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<tr>
<td>Unit</td>
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<tr>
<td>College</td>
<td>University College</td>
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<tr>
<td>Associated with (Division)</td>
<td></td>
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<tr>
<td>Associated with (Unit)</td>
<td></td>
</tr>
<tr>
<td>Contact Hours</td>
<td>Lecture: 18</td>
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<tr>
<td>Description</td>
<td>This course provides COG students with the opportunities to practice quantitative and qualitative</td>
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</tbody>
</table>
evaluation and assessment methods in real world situations and juxtapose theory with practice. Placement activities will ground topics such as problem solving, logistics, decision making, etc., through practical application, individual and group / in-class critical reflection.

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>COG250Y1, COG341H1/COG342H1, PSY370H1</th>
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</thead>
<tbody>
<tr>
<td>Corequisites</td>
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<tr>
<td>Exclusions</td>
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<tr>
<td>Recommended Preparation</td>
<td></td>
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<tr>
<td>Competency Levels</td>
<td>Critical and Creative Thinking: extensively</td>
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<tr>
<td></td>
<td>Quantitative Reasoning: none</td>
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<td></td>
<td>Communication: notably</td>
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<td></td>
<td>Social and Ethical Responsibility: none</td>
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<td></td>
<td>Information Literacy: extensively</td>
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<tr>
<td>Experiential Learning</td>
<td>Research:</td>
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<tr>
<td></td>
<td>Other: extensively</td>
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<tr>
<td></td>
<td>Nature of &quot;Other&quot; Experiential Learning: None selected</td>
</tr>
<tr>
<td>Distribution Requirements</td>
<td>Science</td>
</tr>
<tr>
<td>Breadth Requirements</td>
<td>Society and its Institutions (3)</td>
</tr>
<tr>
<td>Credit Value</td>
<td>Fixed: 0.5</td>
</tr>
<tr>
<td>Student May Select Credit/ No Credit</td>
<td>Yes</td>
</tr>
<tr>
<td>Rationale</td>
<td>This course provides group experiences (groups of four students offering 60 person hours to partners) of assessing real world situations from a Cognitive Science perspective. It supports students in transferring knowledge from the classroom to new environments and thus consolidates that knowledge and pushes students to increased cognitive flexibility in generalizing and reapplying the fruits of their classroom work. Reciprocally, it enables students and (instructors) to understand and evaluate the extent to which the Cognitive Science program provides transfer appropriate training. This course also provides a structural intersection with the Psychology department's critical thinking workshop series.</td>
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<tr>
<td>Consultation</td>
<td></td>
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<tr>
<td>Resource Implications</td>
<td>Sessional Lecturer</td>
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<tr>
<td>Resource Budget</td>
<td>Academic Unit will provide the resources required for this course from their existing budget.</td>
</tr>
</tbody>
</table>
NEW First-Year Seminars (199H1 and 199Y1)
SCIENCES - 2017-2018

LTE: Living Things and Their Environment
PMU: The Physical and Mathematical Universes

Half courses – LTE
Critical periods, brain plasticity, and development
When you reach a certain age, it’s thought that you are no longer able to learn certain things. This can be referred to as a critical, sensitive or optimal period. We will explore these periods in animals and humans. In humans, we will evaluate sensitive periods across different psychological functions (including language and cognitive ability) and across different social contexts. We will explore the role of early life experiences for development, and discuss the benefits and pitfalls of brain plasticity for learning. Students will learn about mechanisms of brain plasticity and explore current research on critical periods and age-related limits on learning.
Amy Finn, Psychology

Half courses – PMU
Distributed Computing: from Cloud Systems to Bitcoin Currency and Self-Driving Cars
Distributed Computing studies how devices communicate and coordinate their actions in order to achieve a common goal -- even when failures occur. Examples of such networks include cloud-based services like Gmail and Dropbox, safety-critical systems like autonomous cars and autopilot systems, and financial systems like Bitcoin. In this course, we will discuss some of the key problems and challenges of this area, and review some of the basic ideas and techniques used to tackle them. The course will consist of lectures and student group discussions and presentations.
Sam Toueg, Computer Science

Resources and Sustainability
The rise of humanity is intricately linked to the exploitation of natural resources. From its earliest attempts to use fire and extract metals from rocks, to coal-fired steam that brought the industrial revolution, hydrocarbons that fuel international travel and trade, nuclear energy to produce electricity, and the reliance on smartphones in our daily lives, the planet’s resources have brought innovation and problems and require us to ask questions regarding sustainability. This course will explore the gamut from resource extraction and trading, to its societal consequences including global politics, environmental pollution, and remediation. The course will involve reading of scientific literature, student-led discussions, oral presentations and research projects, and potentially field trips to sites in Southern Ontario.
Earth Sciences

Earth, Portrait of Planet
Modern Earth Sciences, touches on virtually all aspects of modern life, from the atmosphere to large scale natural disasters. This course will explore how earth sciences have shaped our society and our understanding of the earth as a system. Potential course topics include (but are not limited to), the great climate change crisis and what do we know about climate change in the past, to the literally earth moving ideas of plate tectonics (and the associated natural disasters). The course will involve reading of scientific literature, student-led discussions, oral presentations and research projects.

Earth Sciences

Life and Death in the Solar System
Earth is the only planet in the solar system known to support life. Through directed readings, seminars, videos and lab visits, participants in this course will work with instructors whose own research tackles important questions concerning the origin of life on earth; the limits to life on this planet; implications for life under extreme conditions elsewhere in the solar system; and the life cycles of the planets themselves. The course will involve reading of scientific literature, student-led discussions, oral presentations and research projects, as well as potential field trips to sites in Southern Ontario.

Earth Sciences

Earth and Life through Time
This seminar will look through the lens of earth history to explore drivers of change in the biosphere and the impacts of these changes. We will focus on episodes of mass extinction, and the spectacular landscape changes and speciation events which often followed. Abrupt or gradual climatic changes, massive volcanism, asteroid impacts, catastrophic carbon releases, and human activity will be evaluated as the causes of major extinction events in Earth history. The course will involve reading of scientific literature, student-led discussions, oral presentations and research projects, as well as potential field trips to sites in Southern Ontario.

Earth Sciences

Exploring Math Around Us!
This course aims to develop an appreciation for mathematics that occurs in everyday life. The course will feature a variety of mathematical topics accessible to those who are interested but not pursuing it further at the University level. The topics may include symmetry and shapes, Mobius strips, combinatorics and counting, puzzle solving, fractals, game theory, cake cutting problems, etc. Apart from problem solving and experimenting with mathematical ideas, students will be expected to make group presentations on a topic that they would like to explore further.

Yulan Qing, Math

Understanding Statistics Using Real Data
The author introduces and explains important statistical concepts using many datasets analyzed over his career working with colleagues in medicine, public health, and the exercise and nutritional sciences. Topics include games of chance, randomized block and completely randomized statistical designs, random sampling and randomization, summary statistics such as
the proportion, mean, median, standard deviation, standard error and the correlation coefficient, the p value and confidence interval, bias and confounding variables, collinearity, measurement error, the correct choice of a sampling unit, parametric and non-parametric analyses, simulation and the Central Limit Theorem. These issues are studied without calculus and very little algebra. Instead, students learn how to interpret results obtained from real studies using the well-known statistical package SAS. Students are not expected to create SAS computer programs but receive and use programs created by the author to analyze these datasets.

Paul Corey, Statistical Sciences

**Year courses – PMU**

**Statistical Evidence: Truth or Myth?**
Statistical notions permeate daily life in various ways. The class will familiarize the students with basic statistical concepts using introductory textbooks that use a minimum of mathematical derivations. Examples from real life that span romance, health, science, and probabilistic games will be used to illustrate the concepts. Students will also learn how to identify sound analyses in news and scientific articles and how to avoid statistical pitfalls.

Radu Craiu, Statistical Sciences

**The New Black: Dark Matter and Dark Energy**
It is now 80 years since astronomers found the first evidence for a form of matter that wasn't part of the stars in our galaxies, but rather is "dark" and has a gravitational attraction to ordinary matter. Other lines of evidence lead us to believe that there is six times more dark matter than the ordinary matter we are familiar with. Despite this, we have no credible, direct evidence for what this dark matter might be. It is one of the biggest puzzles in particle physics and cosmology. In the last decade, we have also discovered that something else is going on – the universe appears to be filled with "dark energy" that causes the expansion of our universe to speed up instead of slowdown. We will discuss what we know about the hypotheses of dark matter and dark energy, and the debates about what might really be going on. Are we seeing science in crisis, with a revolution just around the corner, or is this just the "normal science" talked about by Kuhn and other philosophers of science? Participants will be expected to participate in seminar-style discussions, as well as take the lead on at least one topic of discussion.

Pekka Sinervo, Physics & Trinity College