Approved Curriculum Modifications Sciences Curriculum Committee,
November 17, 2017
Science Curriculum Committee
Full Review Proposals By Unit
1 New Course:

CSB457H1: Post-transcriptional Gene Regulation

<table>
<thead>
<tr>
<th>Contact Hours:</th>
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<tbody>
<tr>
<td>Lecture: 12</td>
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<tr>
<td>Seminar: 24</td>
</tr>
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</table>

Description:

This course focuses on advances in post-transcriptional gene regulation. Topics include regulatory RNAs, RNA processing, localization, translation, and degradation. In addition to lectures covering background material, emphasis is placed on current research and involves discussion of primary literature in a round-table format.

Prerequisites:

Minimum grade of 70% in BCH311H1/CSB349H1/MGY311Y1

Exclusions:

Recommended Preparation:

Breadth Requirements:

Living Things and Their Environment (4)

Distribution Requirements:

Science

Competencies:

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

Experiential Learning:

Research: none; Other: none

Rationale:

This course is designed to supplement knowledge in the area of gene regulation, expanding upon material covered in CSB349H1. Emphasis will be placed on biological processes that occur after transcription has occurred, and will provide insight into recent exciting developments in RNA metabolism. Additionally, students will learn to dissect and critically evaluate primary research literature in round-table discussions, an important skill that will complement more traditional lecture-based learning.

Consultation:

We have been in contact and will continue to discuss course content with Biochemistry and Molecular Genetics and Microbiology to minimize the overlap. The other departments do not seem to have concerns about excessive overlap among these courses.

Resources:

Instructor only.

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

Overlap with Existing Courses:
This course is designed to build upon material covered in courses like BCH311H1, CSB349H1 and MGY311Y1, but emphasizing dissection and critical evaluation of primary literature through small class size based discussions. There is a potential for some overlap with MGY420H1, Regulation of Gene Expression.

**Programs of Study for Which This Course Might be Suitable:**  
Cell and Molecular Biology, Genome Biology, Molecular Genetics, Biochemistry

**Estimated Enrolment:**  
24

**Instructor:**  
Prof. John Calarco
4 Course Modifications:

CHM210H1: Chemistry of Environmental Change

Prerequisites:
CHM135H1/CHM139H1/CHM151Y1,(MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1

Rationale:
Adding MAT157Y to the list of first year Math course prerequisite choices would allow student enrolment in this chemistry course without having to go through obtaining permission from the Department.

Consultation:
This addition is made in consultation with and with the approval of the Math Department.

CHM217H1: Introduction to Analytical Chemistry

Prerequisites:
(CHM135H1/CHM139H1, CHM136H1/CHM138H1)/CHM151Y1 with a minimum grade of 63%:(MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1

Rationale:
Adding MAT157Y to the list of first year Math course prerequisite choices would allow student enrolment in this chemistry course without having to go through obtaining permission from the Department.

Consultation:
This addition is made in consultation with and with the approval of the Math Department.

CHM310H1: Environmental Chemistry

Prerequisites:
(CHM135H1/CHM139H1, CHM136H1/CHM138H1)/CHM151Y1,(MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1

Rationale:
Adding MAT157Y to the list of first year Math course prerequisite choices would allow student enrolment in this chemistry course without having to go through obtaining permission from the Department.

Consultation:
This addition is made in consultation with and with the approval of the Math Department.

CHM317H1: Introduction to Instrumental Methods of Analysis

Prerequisites:
CHM217H1 with a minimum grade of 63%;(MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1

Rationale:
Adding MAT157Y to the list of first year Math course prerequisite choices would allow student enrolment in this chemistry course without having to go through obtaining permission from the Department.

Consultation:
This addition is made in consultation with and with the approval of the Math Department.
3 New Courses:

**CSC303H1: Social and Information Networks**

**Contact Hours:**

- **Lecture:** 24
- **Tutorial:** 12

**Description:**

A course on how networks underlie the social, technological, and natural worlds, with an emphasis on developing intuitions for broadly applicable concepts in network analysis. Topics include: introductions to graph theory, network concepts, and game theory; social networks; information networks; the aggregate behaviour of markets and crowds; network dynamics; information diffusion; popular concepts such as "six degrees of separation," the "friendship paradox," and the "wisdom of crowds."

**Prerequisites:**

CSC263H1/CSC265H1, STA247H1/STA255H1/STA257H1/ECO227Y1, MAT221H1/MAT223H1/MAT240H1

**Corequisites:**

**Exclusions:**

CSCC46H3

**Recommended Preparation:**

**Breadth Requirements:**

The Physical and Mathematical Universes (5)

**Distribution Requirements:**

Science

**Competencies:**

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

**Experiential Learning:**

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

**Rationale:**

Based on CSCC46H3, with the same name, taught by Professor Ashton Anderson, and similar courses at other universities. This course is a complement to CSC304H1 (Algorithmic Game Theory and Mechanism Design).

**Consultation:**

Discussions at the Department of Computer Science's Undergraduate Committee. Confirmed no overlap with Sociology courses.

**Resources:**

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

**Overlap with Existing Courses:**

None

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

All Computer Science programs.
**CSC421H1: Neural Networks and Deep Learning**

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

**Description:**

**Prerequisites:**
- CSC411H1/STA314H1, MAT235Y1/MAT237Y1/MAT257Y1, MAT221H1/MAT223H1/MAT240H1

**Corequisites:**

**Exclusions:**
- CSC321H1

**Recommended Preparation:**

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

**Distribution Requirements:**
Science

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

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

**Rationale:**
Material in CSC321H1 has evolved so that it now belongs in a more advanced course (students are not ready for the current content by 3rd year). Students will benefit from the removal of material that is currently duplicated in CSC321H1 and CSC411H1, by making CSC411H1 a prerequisite.

**Consultation:**
Discussion at the Department of Computer Science's Undergraduate Committee.

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

**Overlap with Existing Courses:**

**Programs of Study for Which This Course Might be Suitable:**
All Computer Science programs.
JSC270H1: Data Science I

Contact Hours:
* Lecture: 24 / Practical: 24

Description:
This course is restricted to students in the Data Science Specialist program. Data exploration and preparation; data visualization and presentation; and computing with data will be introduced. Professional skills, such as oral and written communication, and ethical skills for data science will be introduced. Data science workflows will be integrated throughout the course. These topics will be explored through case studies and collaboration with researchers in other fields.

Prerequisites:
STA257H1, CSC207H1

Corequisites:
STA261H1, MAT237Y1/MAT257Y1, CSC236H1/CSC240H1

Exclusions:

Recommended Preparation:

Breadth Requirements:
The Physical and Mathematical Universes (5)

Distribution Requirements:

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

Experiential Learning:
* Research: notably; Other: notably:
* Nature of "Other" Experiential Learning: Experiential Study

Rationale:
The National Academies of Sciences, Engineering, Medicine interim report on “Envisioning the Data Science Discipline: The Undergraduate Perspective” states that, in addition to foundational skills (e.g., mathematics, computational and statistical thinking), translational skills are valuable for data science students.

It is important for data science education to incorporate real data, broad impact applications, and commonly deployed methods. (page 16)

Training as a data scientist involves more than completing courses in computer science and statistics. A double major, for example, will not give students the benefit of an integrated pathway of courses designed explicitly to teach data science theories and methods. A key aspect of The Data Science Specialist program is to provide students with a rich, integrated experiential learning component, which will develop students’ translational skills in topics such as data preparation, computational considerations involved in the statistical analysis of large-scale data sets, and the theory of
data science. These experiential learning outcomes will be achieved through the integrative courses.

This course is the first in a series of three courses that will scaffold experiential learning within the Data Science specialist program, and integrate ideas and techniques from computer science and statistics. “These courses will make this program unique among Data Science-focused programs currently available at other Canadian universities”.
(Appraisal Report for Undergraduate Specialist in Data Science, September 25, 2017).

Consultation:
A committee was formed in June 2015 to advise on the development of the data science program. Committee members included seven U of T faculty members from both Statistical Sciences and Computer Science, and data scientists working at U of T affiliated institutions and private industry. An advisory committee of nine faculty members from Statistical Sciences and Computer Science, and data scientists working in industry was also established to help the committee in developing this specialist program.

An early draft of the data science proposal was circulated to all chairs sitting on the Sciences Curriculum Committee, and received favourable feedback. The brief was also circulating to all units within Arts and Science that have a potential interest in Data Science.

Resources:
Instructors:
The course be co-taught by computer science and statistics.
TAs: A TA with statistical expertise and a TA with expertise in computer science will be required. Two TAs @ 60 hrs per TA.
Computing:
- Computer Science undergraduate computing resources will be sufficient to support the course.
- The course will also use cloud computing from a provider that offers programs for education such as Microsoft Azure or Amazon Web Services (AWS). Prof. Taback currently has a grant from Microsoft Azure that would meet the needs of this course.

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

Overlap with Existing Courses:

Programs of Study for Which This Course Might be Suitable:
Data science specialist program

Estimated Enrolment:
30-45

Instructor:
Nathan Taback

2 Course Modifications:

CSC411H1: Machine Learning and Data Mining

Prerequisites:
CSC263H1/CSC265H1, MAT(MAT135H1 135H1, MAT136H1 136H1)/MAT137Y1/MAT137Y1/MAT157Y1, STA247H1/STA255H1/STA257H1, MAT221H1/MAT223H1/MAT240H1

Exclusions:

Previous:
New: STA314H1

Rationale:

Consultation:
CSC418H1: Computer Graphics

Prerequisites:
CSC336H1/CSC350H1/CSC351H1/CSC373H1, (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1, MAT221H1/MAT223H1/MAT240H1, CSC209H1/proficiency in C or C++. Prerequisite C++: Prerequisite for Engineering students only: ECE345H1 or ECE352H1

Rationale:

Consultation:

1 Retired Course:

CSC321H1: Introduction to Neural Networks and Machine Learning

Rationale:
1 New Course:

**ESS223H1: Earth System Chemistry 1: Earth Materials**

<table>
<thead>
<tr>
<th>Impact on Programs:</th>
<th>This proposal triggers modifications in the unit's program(s)</th>
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<tbody>
<tr>
<td>Contact Hours:</td>
<td>Lecture: 24 / Tutorial: 24</td>
</tr>
<tr>
<td>Description:</td>
<td>This course introduces the basic principles of thermodynamics and kinetics and more specialized concepts used in the Earth Sciences, e.g., the forms and transfer of energy, the equation of states of gaseous, fluid and solid materials, thermodynamics of solutions, chemical equilibria of multicomponent systems, mineral solubility, phase diagrams, phase interface processes on mineral surfaces, and mass transport. The tutorials will include basic calculation exercises and some computational modeling used to understand fluid phase reactions and phase equilibria in the earth system. The course aims to provide a solid background for advanced courses in igneous and metamorphic petrology, aqueous geochemistry and geodynamics.</td>
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<tr>
<td>Prerequisites:</td>
<td>MAT135H1, MAT136H1, CHM135H1, ESS221H1, ESS262H1</td>
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<tr>
<td>Corequisites:</td>
<td></td>
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<tr>
<td>Exclusions:</td>
<td>ENV233H1</td>
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<td>Recommended Preparation:</td>
<td></td>
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<tr>
<td>Breadth Requirements:</td>
<td>The Physical and Mathematical Universes (5)</td>
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<tr>
<td>Distribution Requirements:</td>
<td>Science</td>
</tr>
<tr>
<td>Competencies:</td>
<td>Communication: slightly; Critical and Creative Thinking: notably; Information Literacy: slightly</td>
</tr>
<tr>
<td>Experiential Learning:</td>
<td>Quantitative Reasoning: extensively; Social and Ethical Responsibility: none</td>
</tr>
<tr>
<td>Research:</td>
<td>extensively; Other: none</td>
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<tr>
<td>Rationale:</td>
<td>This course was previously team taught with Chemistry as ENV233. However this experiment has failed as acknowledged by the School of the Environment, Chemistry and the Earth Science Departments. It has been agreed that the course will revert back to the ES-Department where it will be refocused to strengthen the ES related course content, specifically lay the groundwork for the chemistry needed in the 3rd and 4th year courses of the Earth Science curriculum.</td>
</tr>
<tr>
<td>Consultation:</td>
<td>The is proposal is the result of extensive discussions between the Earth Science and Chemistry Departments, as well as with the School of the Environment. This proposal was also extensively discussed within the ES curriculum committee and presented to the ES faculty members on Sept 21st.</td>
</tr>
</tbody>
</table>
Resources:
A 0.5 FCE teaching position, as well as lab space. Both will be provided by the Department of Earth Sciences.

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

Overlap with Existing Courses:

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

Estimated Enrolment:
40

Instructor:
TBD

1 Course Modification:

ESS452H1: Geophysical Imaging with Non-seismic Methods

Prerequisites:
Previous: PHY395H1, APM346H1
New:

Rationale:
We would like to remove the prerequisites for this course, following upon the recommendation of the course instructor.

Consultation:
Course instructor and Undergraduate Affairs Committee, November 3, 2017

1 Retired Course:

ENV233H1: Earth System Chemistry

Rationale:
1 Course Modification:

**EEB323H1: Evolutionary Genetics**

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

**Recommended Preparation:**
(MAT135H1, MAT136H1) / MAT135Y1/MAT136Y1/MAT137Y1/MAT137Y1

**Rationale:**

**Consultation:**

3 Retired Courses:

**EEB206H1: Studying Behaviour**

**Rationale:**

**EEB492H1: Internship in Ecology and Evolutionary Biology**

**Rationale:**

**EEB492Y1: Internship in Ecology and Evolutionary Biology**

**Rationale:**
2 New Courses:

GGR385H1: Special Topics in Geography

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<tbody>
<tr>
<td><strong>Lecture:</strong> 24</td>
</tr>
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</table>

**Description:**

Content in any given year varies by instructor. Students must meet the prerequisites set by the department (see the Geography website for details in May). The program in which this course can be used depends on its content.

**Prerequisites:**

**Corequisites:**

**Exclusions:**

**Recommended Preparation:**

**Breadth Requirements:**

**Distribution Requirements:**

**Competencies:**

*Communication: none*; *Critical and Creative Thinking: none*; *Information Literacy: none*;

*Quantitative Reasoning: none*; *Social and Ethical Responsibility: none*

**Experiential Learning:**

*Research: none*; *Other: none*

**Rationale:**

In the last few years we have experienced an issue with our 3rd-year Special Topics course GGR300H1. We have only one such course and this had posed a problem when we have offered more than one Special Topics course in any one year. It produces administrative and scheduling difficulties for the Undergraduate Student Advisor, and confusion for students as it is not clear which Special Topics courses can be used for specific programs.

We plan on replacing our single 3rd-year Special Topics course with four program-specific Special Topics courses, and one extra in the event we need to offer two Special Topics courses for the same program in the same term. This will have two positive effects. First, the fact that they are program specific allows students to know which programs they can be used towards. This will ensure that the course is being credited to students programs correctly. Second, it allows us to offer more than one Special Topics course in a term. This also allows students to register for more than one. This will do away with the confusion that students have noted when more than one GGR300H1 is taught in any year and allows the Student Advisor to oversee a more streamlined administrative process.

No Breadth Requirement or Distribution Requirement designation has been assigned as the course could be BR=3 or BR=4 or BR=5/Soc Sci or Science, based on course content in any given year.

**Consultation:**
### GGR386H1: Special Topics in Geographic Information Systems

**Contact Hours:**
- Lecture: 24

**Description:**
Content in any given year varies by instructor. Students must meet the prerequisites set by the department (see the Geography website for details in May). Can be used towards GIS, Human Geography, and Environmental Geography programs.

**Prerequisites:**

**Corequisites:**

**Exclusions:**

**Recommended Preparation:**

**Breadth Requirements:**

**Distribution Requirements:**

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

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

**Rationale:**
In the last few years we have experienced an issue with our 3rd-year Special Topics course GGR300H1. We have only one such course and this had posed a problem when we have offered more than one Special Topics course in any one year. It produces administrative and scheduling difficulties for the Undergraduate Student Advisor, and confusion for students as it is not clear which Special Topics courses can be used for specific programs.

We plan on replacing our single 3rd-year Special Topics course with four program-specific Special Topics courses, and one extra in the event we need to offer two Special Topics courses for the same program in the same term. This will
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No Breadth Requirement or Distribution requirement designation has been assigned as the course could be BR=3 or BR=5/Soc Sci or Science, based on course content in any given year.

**Consultation:**

**Resources:**

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

**Overlap with Existing Courses:**

**Programs of Study for Which This Course Might be Suitable:**
- Geographic Information Systems Minor
- Human Geography - Specialist, Major, Minor,
- Environmental Geography - Specialist, Major, Minor

**Estimated Enrolment:**
- 60

**Instructor:**
11 Course Modifications:

**MGY200H1: Current Topics in Molecular Genetics and Microbiology**

**Prerequisites:**
BIO120H1, BIO230H1/BIO255H1

**Corequisites:**
Previous: BIO260H1/HMB265H1
New:

**Rationale:**

**Consultation:**

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**MGY311Y1: Molecular Biology**

**Prerequisites:**
BIO120H1, BIO230H1/BIO255H1, BCH242Y1 (Note: BCH210H1 may be acceptable with permission of instructor)

**Rationale:**

**Consultation:**

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**MGY314H1: Principles of Genetic Analysis I**

**Description:**

Laboratory experiments in genetics, with the focus on microbial and prokaryotic genetics. Topics and experiments include mutagenesis and genetic selection, linkage and recombination, genetic crosses, gene regulation, suppressor analyses, and genetic mapping. (Lab fee: $25)

**Prerequisites:**
BIO230H1/BIO255H1, BIO260H1/HMB265H1

**Rationale:**

**Consultation:**

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**MGY315H1: Principles of Genetic Analysis II**

**Description:**

Laboratory experiments in eukaryotic genetics, using two of the most powerful eukaryotic model systems, the yeast
Saccharomyces cerevisiae and fruit fly Drosophila melanogaster. The course follows MGY314H1; topics include analysis of genetic networks and pathways, meiotic segregation analysis, recombination mapping, genetic crosses, and phenotypic analyses. (Lab fee: $25)

Prerequisites: BIO230H1/BIO255H1, BIO260H1/HMB265H1, MGY314H1/MGY340H1

Rationale:

Consultation:

MGY340H1: Molecular Genetics

Prerequisites: BIO120H1, BIO130H1; BIO220H1, BIO230H1/BIO255H1, BIO260H1/HMB265H1

Rationale:

Consultation:

MGY350H1: Model Organisms to Disease

Prerequisites: BIO120H1, BIO230H1/BIO255H1, BIO260H1/HMB265H1

Rationale:

Consultation:

MGY360H1: Whole-Genome Sequencing and Analysis Laboratory

Prerequisites: BIO230H1/BIO255H1, BIO260H1/HMB265H1

Rationale:

Consultation:

MGY377H1: Microbiology I: Bacteria

Prerequisites: BCH210H1/BCH242Y1, BCH242Y1; BIO120H1, BIO230H1/BIO255H1

Rationale:

Consultation:
**MGY378H1: Microbiology II: Viruses**

**Description:**

Detailed study of viruses in terms of structure, classification, replication and interaction with the host. Basis for advanced study in virology. Requires some familiarity with molecular and cellular biology immunology. A concurrent course in immunology (IMM340H1, IMM350H1) or (IMM341H1, IMM351H1 IMM334Y1/335Y1) is recommended.

**Prerequisites:**

BCH210H1/BCH242Y1; BIO120H1, BIO230H1/BIO255H1; BIO230H1, BIO260H1/HMB265H1

**Rationale:**

**Consultation:**

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**MGY379Y1: Microbiology Laboratory**

**Description:**

Laboratory experiments will teach important concepts and provide students with hands-on experience in working safely with medically-important bacteria and viruses. Analysis of the results will help to develop skills in data analysis. Valuable not only for advanced work in microbiology but also in related fields that make use of bacteria and viruses as research tools. Topics include molecular techniques for identification and characterization of bacteria and viruses, biofilms, antibiotic resistance, site-directed mutagenesis, communication of bacteria with each other and their environment, propagation and assay of viruses, host response to infection, viral vectors. (Lab fee: $50) vectors.

**Prerequisites:**

BIO120H1, BIO230H1/BIO255H1, BIO260H1/HMB265H1

**Rationale:**

**Consultation:**

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**MIJ485H1: Vaccines and Immunity**

**Prerequisites:**

(IMM340H1 IMM350H1/IMM341H1), IMM351H1 (IMM350H1 IMM334Y1/IMM351H1 IMM335Y1), MGY377H1, MGY378H1

**Rationale:**

**Consultation:**
2 New Courses:

NEW106H1: Science and Social Justice I

Contact Hours:
  Lecture: 12  /  Seminar: 24

Description:
  Exploring key themes and different kinds of knowledge implied by the notion of “learning without borders”, this interdisciplinary course looks at how scientific knowledge and technology are mobilized to deal with global problems such as disease, mental health, discrimination, economic inequality and threats to our environment.

Prerequisites:
  Admission to New One

Corequisites:

Exclusions:
  INI, SMC, TRI, UC, VIC, WDW One, Munk One; NEW101H1/NEW102H1/NEW103H1/NEW104H1/NEW105H1

Recommended Preparation:
  None

Breadth Requirements:
  Society and its Institutions (3)

Distribution Requirements:
  Social Science

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

Experiential Learning:
  Research: none; Other: none

Rationale:
  Provides first-year students with an introduction to university study in a small group setting

Consultation:

Resources:
  Sessional Instructor(S)
  Budget Implications: The academic unit will provide the resources required for this course from existing budget.

Overlap with Existing Courses:
  Intentional connections to key themes in New College programs in order to make first-year students aware of these often unfamiliar interdisciplinary fields of study.

Programs of Study for Which This Course Might be Suitable:

Estimated Enrolment:
  25
NEW116H1: Science and Social Justice II

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<tr>
<th>Contact Hours:</th>
<th>Lecture: 12</th>
<th>Seminar: 24</th>
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**Description:**
Building on the integrated learning from any New One I course, this course considers the scientific debates and social justice implications of selected contemporary transnational issues such as climate change, pandemics, gender identities, disability, and pharmaceutical research. Research projects allow students to focus on an issue of particular interest.

**Prerequisites:**
NEW101H1/NEW102H1/NEW103H1/NEW104H1/NEW105H1, or permission of the New One Coordinator

**Corequisites:**

**Exclusions:**
INI, SMC, TRI, UC, VIC, WDW One, Munk One; NEW111H1/NEW112H1/NEW113H1/NEW114H1/NEW115H1

**Recommended Preparation:**
None

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

**Distribution Requirements:**
Social Science

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

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

**Rationale:**
Provides first-year students with an introduction to university study in a small group setting.

**Consultation:**

**Resources:**
- Sessional Instructor(s)
- **Budget Implications:** The academic unit will provide the resources required for this course from existing budget.

**Overlap with Existing Courses:**
Intentional connections to key themes in New College programs in order to make first-year students aware of these often unfamiliar interdisciplinary fields of study.

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

**Estimated Enrolment:**
25
New College

Instructor:
TBD
1 New Course:

**PCL490H1: Advanced Topics in Pharmacology and Toxicology**

**Contact Hours:**
- Lecture: 12
- Seminar: 12

**Description:**
An opportunity to expand on innovative and unique topics in Pharmacology and Toxicology that are not already extensively addressed. The course will reveal the dynamic nature of the field and the diverse interests of our faculty. Students will be introduced to leading edge topics and research within the discipline of Pharmacology and Toxicology.

**Prerequisites:**
- PCL302H1, STA288H1 (or equivalent)

**Corequisites:**

**Exclusions:**

**Recommended Preparation:**
- PCL469H1

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

**Distribution Requirements:**
- Science

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

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

**Rationale:**
This program elective course will provide an opportunity to reflect on the research and expertise of our associated faculty. Currently within the program there is no one course that has the flexibility to allow students to delve into special topics that reflect these talents and interests. The course would provide senior students an opportunity to build on their knowledge and gain deeper insight into ground-breaking ideas and applicable knowledge within the Pharmacology and Toxicology discipline which they can leverage for their next step towards their long-term career path. The course will utilize active learning strategies to further develop students skills and experiences.

**Consultation:**
Presented to Basic Medical Sciences FOM Committee.

**Resources:**
- Instructors, TAs, Active Learning space

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

**Overlap with Existing Courses:**
No significant overlap.

**Programs of Study for Which This Course Might be Suitable:**
Specialists and Majors in the final year of studies with the Department. Fourth year students in other Life Science programs with the appropriate background.

**Estimated Enrolment:**
40

**Instructor:**
TBD

## 2 Course Modifications:

**PCL200H1: Drugs & the Brain**

**Exclusions:**
PSY396H1, PCL302H1, BCH210H1, BCH242Y1

**Rationale:**

**Consultation:**

**PCL475Y1: Neuropsychopharmacology**

**Prerequisites:**
- **Previous:**
- **New:** A minimum of 9.0 FCE

**Rationale:**

**Consultation:**

## 1 Retired Course:

**PCL465H1: Advanced Toxicology Laboratory**

**Rationale:**
# 2 Course Modifications:

## PHY131H1: Introduction to Physics I

<table>
<thead>
<tr>
<th>Contact Hours:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous: <em>Lecture:</em> 24 / <em>Practical:</em> 20</td>
</tr>
<tr>
<td>New: <em>Lecture:</em> 36 / <em>Practical:</em> 20</td>
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</table>

<table>
<thead>
<tr>
<th>Prerequisites:</th>
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</thead>
<tbody>
<tr>
<td>Previous: MCV4U Calculus &amp; Vectors / MHF4U Functions &amp; Calculus</td>
</tr>
<tr>
<td>New:</td>
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</table>

<table>
<thead>
<tr>
<th>Corequisites:</th>
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</thead>
<tbody>
<tr>
<td>MAT135H1/MAT137Y1/MAT157Y1 recommended, but may be required prerequisite in 2nd year Physics courses</td>
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<table>
<thead>
<tr>
<th>Recommended Preparation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCV4U Calculus &amp; Vectors/MHF4U Functions &amp; Calculus, SPH4U Physics and SCH4U Chemistry</td>
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<thead>
<tr>
<th>Rationale:</th>
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<tbody>
<tr>
<td>Consultation:</td>
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## PHY132H1: Introduction to Physics II

<table>
<thead>
<tr>
<th>Contact Hours:</th>
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<tbody>
<tr>
<td>Previous: <em>Lecture:</em> 24 / <em>Practical:</em> 20</td>
</tr>
<tr>
<td>New: <em>Lecture:</em> 36 / <em>Practical:</em> 20</td>
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<table>
<thead>
<tr>
<th>Corequisites:</th>
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<tbody>
<tr>
<td>MAT136H1/MAT137Y1/MAT157Y1 recommended, but may be required prerequisite in 2nd year Physics courses</td>
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<table>
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<tr>
<th>Rationale:</th>
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<tr>
<td>Consultation:</td>
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</table>

## 1 Retired Course:

## PHY495H1: Research Topic in Geophysics

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<th>Rationale:</th>
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</table>
# 1 Course Modification:

**PSY201H1: Statistics I**

<table>
<thead>
<tr>
<th>Exclusions:</th>
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</thead>
<tbody>
<tr>
<td>ECO220Y1/ECO227Y1/EEB225H1/GGR270H1/HMB325H1/POL232H1/POL242Y1/SOC202H1/STA220H1/STA248H1/STA288H1</td>
</tr>
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<table>
<thead>
<tr>
<th>Rationale:</th>
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<tr>
<th>Consultation:</th>
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</thead>
</table>
2 New Courses:

JSC270H1: Data Science I

Contact Hours:
Lecture: 24 / Practical: 24

Description:
This course is restricted to students in the Data Science Specialist program. Data exploration and preparation; data visualization and presentation; and computing with data will be introduced. Professional skills, such as oral and written communication, and ethical skills for data science will be introduced. Data science workflows will be integrated throughout the course. These topics will be explored through case studies and collaboration with researchers in other fields.

Prerequisites:
STA257H1, CSC207H1

Corequisites:
STA261H1, MAT237Y1/MAT257Y1, CSC236H1/CSC240H1

Exclusions:

Recommended Preparation:

Breadth Requirements:
The Physical and Mathematical Universes (5)

Distribution Requirements:

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

Experiential Learning:
Research: notably; Other: notably;
Nature of "Other" Experiential Learning: Experiential Study

Rationale:
The National Academies of Sciences, Engineering, Medicine interim report on “Envisioning the Data Science Discipline: The Undergraduate Perspective” states that, in addition to foundational skills (e.g., mathematics, computational and statistical thinking), translational skills are valuable for data science students.

It is important for data science education to incorporate real data, broad impact applications, and commonly deployed methods. (page 16)

Training as a data scientist involves more than completing courses in computer science and statistics. A double major, for example, will not give students the benefit of an integrated pathway of courses designed explicitly to teach data science theories and methods. A key aspect of The Data Science Specialist program is to provide students with a rich, integrated experiential learning component, which will develop students’ translational skills in topics such as data preparation, computational considerations involved in the statistical analysis of large-scale data sets, and the theory of data science. These experiential learning outcomes will be achieved through the integrative courses.
This course is the first in a series of three courses that will scaffold experiential learning within the Data Science specialist program, and integrate ideas and techniques from computer science and statistics. “These courses will make this program unique among Data Science-focused programs currently available at other Canadian universities”. (Appraisal Report for Undergraduate Specialist in Data Science, September 25, 2017).

Consultation:
A committee was formed in June 2015 to advise on the development of the data science program. Committee members included seven U of T faculty members from both Statistical Sciences and Computer Science, and data scientists working at U of T affiliated institutions and private industry. An advisory committee of nine faculty members from Statistical Sciences and Computer Science, and data scientists working in industry was also established to help the committee in developing this specialist program.

An early draft of the data science proposal was circulated to all chairs sitting on the Sciences Curriculum Committee, and received favourable feedback. The brief was also circulating to all units within Arts and Science that have a potential interest in Data Science.

Resources:
Instructors:
The course be co-taught by computer science and statistics.
TAs: A TA with statistical expertise and a TA with expertise in computer science will be required. Two TAs @ 60 hrs per TA.
Computing:
- Computer Science undergraduate computing resources will be sufficient to support the course.
- The course will also use cloud computing from a provider that offers programs for education such as Microsoft Azure or Amazon Web Services (AWS). Prof. Taback currently has a grant from Microsoft Azure that would meet the needs of this course.

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

Overlap with Existing Courses:

Programs of Study for Which This Course Might be Suitable:
Data science specialist program

Estimated Enrolment:
30-45

Instructor:
Nathan Taback

STA314H1: Statistical Methods for Machine Learning I

Contact Hours:
Lecture: 36 / Tutorial: 12

Description:
Statistical methods for supervised and unsupervised learning from data: training error, test error and cross-validation; classification, regression, and logistic regression; principal components analysis; stochastic gradient descent; decision trees and random forests; k-means clustering and nearest neighbour methods. Computational tutorials will support the efficient application of these methods.

Prerequisites:
STA238H1/STA248H1/STA255H1/STA261H1, CSC108H1/CSC120H1/CSC121H1/CSC148H1, MAT223H1/MAT240H1

Corequisites:
Exclusions:  
CSC411H1

Recommended Preparation:  
MAT235Y1/MAT237Y1/MAT257Y1

Breadth Requirements:  
The Physical and Mathematical Universes (5)

Distribution Requirements:

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

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

Rationale:  
Machine learning methods in statistical practice continue to become more prominent. Currently, the Department of Statistical Sciences has only one dedicated course in the statistical aspects of machine learning, STA414H1. We plan to augment this by offering a 3rd year course, STA314H1, which will introduce statistical methods for machine learning and computational skills. STA414H1 will then become a more advanced version of the current course, with more focus on the theoretical foundations and more advanced methods at the interface of current research.

The current curriculum renewal project in statistics has a key goal of enhancing the computational skills of our students and giving them greater exposure to computationally intensive methods, and this course sequence will play an important role.

We expect that demand for this course will be high.

Consultation:  
The course has been developed in consultation and in parallel to developments in the Department of Computer Science.

It was developed in response to needs identified by:  
• A survey of alumni and current undergraduate students in statistics, carried out in the fall of 2016. Responses to this survey indicated a strong desire and demand for a course of this nature.  
• The most recent instructors of the 4th year course (STA414H1), who designed this course to support the development of skills and knowledge they discovered that their students were lacking.  
• The curriculum renewal project in the Department of Statistical Sciences. The creation of this course has been strongly endorsed at meetings of the curriculum renewal committee, the undergraduate committee, and the department.

Resources:  
Teaching assistants to support marking and to provide tutorials to develop computational skills (approximately 7 teaching assistants x 50 hours).  

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

Overlap with Existing Courses:  
The Department of Computer Science offers its own sequence of courses in machine learning and both departments are re-designing our courses in parallel.

Each department will have its own introductory machine learning course. The course in the Department of Statistical Sciences with leverage the statistical knowledge of our students, with extra emphasis on supporting students with weaker computational skills, and the course in the Department of Computer Science will leverage the computational abilities of the computer science students. These courses (STA314H1 and CSC411H1) will be exclusions.

Each department will continue to offer more advanced specialized courses in machine learning, for which either of the introductory courses (STA314H1 or CSC411H1) can serve as the prerequisite in machine learning.
### Programs of Study for Which This Course Might be Suitable:
Statistics, Actuarial Science, Computer Science

### Estimated Enrolment:
300

### Instructor:
David Duvenaud, Dan Simpson

### 3 Course Modifications:

#### STA130H1: An Introduction to Statistical Reasoning and Data Science

**Corequisites:**
- MAT135H1/MAT136H1/MAT137Y1/MAT157Y1, CSC108H1/CSC120H1/CSC121H1/CSC148H1

**Exclusions:**
- Any of STA220H1/STA255H1/STA248H1/STA261H1/ECO220Y1/ECO227Y1 taken previously or concurrently

**Rationale:**

**Consultation:**

#### STA414H1: Statistical Methods for Data Mining and Machine Learning

**Title:**
Statistical Methods for **Data Mining and Machine Learning II**

**Description:**

**Previous:**

**New:**
Probabilistic foundations of supervised and unsupervised learning methods such as naive Bayes, mixture models, and logistic regression. Gradient-based fitting of composite models including neural nets. Exact inference, stochastic variational inference, and Markov chain Monte Carlo. Variational autoencoders and generative adversarial networks.

**Prerequisites:**
- STA314H1/CSC411H1 (beginning Fall 2019), STA302H1, CSC108H1/CSC120H1/CSC121H1/CSC148H1, MAT235Y1, STA302H1/MAT237Y1/MAT257Y1 CSC411H, MAT223H1/MAT240H1 STA303H1 (recommended)

**Exclusions:**
- Previous:
- New: CSC412H1

**Recommended Preparation:**

**Previous:**
- New: STA303H1

**Rationale:**
This proposal is for a modification of an existing course, in response to the proposed creation of a new course STA314H1: Statistical Methods for Machine Learning I. The title, calendar description, and prerequisites are being modified.

Consultation:
The course has been developed in consultation and in parallel to developments in the Department of Computer Science.

STA437H1: Methods for multivariate data

<table>
<thead>
<tr>
<th>Prerequisites:</th>
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<tbody>
<tr>
<td>STA302H1/STA352Y1 (MAT224H1/MAT247H1 recommended)</td>
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</table>

Rationale:

Consultation:
1 New Course:

TRN141Y1: Environmental Science and Pathways to Sustainability

| Contact Hours: | Seminar: 48 |

**Description:**

This course introduces students to fundamental issues in environmental science with a multi-disciplinary focus on human impacts on physical and biological systems, and on identifying pathways to sustainability. Key themes will include energy and resources, climate change, land use, contaminants and protecting biodiversity in the context of the Anthropocene. The course challenges students to apply the scientific method to environmental monitoring, research and problem solving through project design, data collection and analysis. The course also emphasizes information literacy, skills to distinguish science from pseudo-science, and considerations around representation of environmental science in the media.

**Prerequisites:**

**Corequisites:**

TRN140Y1

**Exclusions:**

Innis One, Munk One, New One, SMC One, UC One, Vic One, Woodsworth One

**Recommended Preparation:**

**Breadth Requirements:**

Living Things and Their Environment (4), The Physical and Mathematical Universes (5)

**Distribution Requirements:**

**Competencies:**

*Communication:* extensively; *Critical and Creative Thinking:* extensively; *Information Literacy:* extensively

*Quantitative Reasoning:* extensively; *Social and Ethical Responsibility:* extensively

**Experiential Learning:**

*Research:* notably; *Other:* none

**Rationale:**

Current gap in first year programming within Trinity One. Developed in close consultation with the School of the Environment. This provides students with an interdisciplinary experience.

**Consultation:**

Developed in close consultation with the School of the Environment, Trinity College Arts and Science Committee and Senate.

**Resources:**

Instructor stipends

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

**Overlap with Existing Courses:**
<table>
<thead>
<tr>
<th><strong>Trinity College</strong></th>
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<tbody>
<tr>
<td><strong>Programs of Study for Which This Course Might be Suitable:</strong></td>
</tr>
<tr>
<td>Trinity One</td>
</tr>
<tr>
<td><strong>Estimated Enrolment:</strong></td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td><strong>Instructor:</strong></td>
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<tr>
<td>TBA</td>
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</tbody>
</table>
20 Course Modifications:

HAJ453H1: AIDS: A Global Perspective

Prerequisites:

Previous: 14 FCE complete, AND either ( HMB302H1 / HMB303H1/ HMB322H1/ HMB323H1/ HMB342H1 ) OR (0.5 FCE from a ANT300+ level course from Group B- Evolutionary)

New: 14 FCE complete, ANT208H1 / BIO220H1/PHS300H1/JNH350H1

Rationale:

the pre-requisite line as it was written was impossible to enforce; students from other units expressed interest in the course, but if they were non-science students we had no way to ensure that assessments were equitable. Further, the split pre-requisite (either/or) was difficult to for Degree Explorer to assess properly. BIO220H1 is required for all three HMB Programs that take this course, and it is also required for the Biological Anthropology program, whose students share priority enrolment with HMB students into this course. JNH350H1 is another HMB joint course about AIDS and PHS300H1 is a Dalla Lana undergraduate course that seems a number of students take, and then are interested in taking further courses that discuss HIV/AIDS.

Consultation:

Consultation with HMB faculty; feedback requested from Anthropology September 29; Dr. Lehman said there was no need to change the pre-requisite and if it was too much work for HMB, ANT could do the pre-requisite checks. HMB replied saying it was not just the tedium of the task, it's the equity of the matter. We proposed on October 4 that we add ANT208H1 to the streamlined pre-req line, and at this time we are waiting for a response.

HMB300H1: Neurobiology of Behaviour

Description:

This intermediate course in neuroscience course focuses on higher brain functions and the mechanisms underlying human and animal behaviours. Topics may include the emerging role of the gut microbiome's impact on behaviour advanced neurophysiological, pathogens that alter neuronal development neuroanatomical and the biological genetic basis of mindfulness various cortical functions, including learning and placebos. In addition memory, "mirroring", the impact that exercise and sleep play in modulating these behaviours are examined executive function. Common experimental Experimental techniques used in neuroscience research such as electrophysiological recordings, brain imaging and cellular genetics neurogenetics are emphasized.

Prerequisites:

BIO230H1 HMB200H1/BIO255H1, HMB200H1 HMB220H1/PSY290H1; BIO230H1/PSL300H1/CJH332H1 BIO255H1

Rationale:

update of the course description to better reflect how course is taught and change to pre-requisites to allow a more diverse cohort acknowledging that we have other HMB students interested in this course, but who do not need to take HMB200H1 for their programs and the neurophysiology they need to know prior to taking this course is taught (in varying degrees) in a number of courses across the Faculty of Arts & Science. This pre-requisite change will open the course up to more students.

Consultation:

consultation with the professor and feedback from students

HMB301H1: Biotechnology

Prerequisites:
### Proposals Pertaining to Freestanding Programs

**Previous:** HMB201H1  
**New:** HMB265H1 / BIO260H1

**Rationale:**
This course is broadly popular with other HMB programs and life science programs and as the HMB:Genetics program is quite small there is always space after priorities drop, and we are unable to enforce the HMB201H1 pre-requisite. The unit simply wants students in the course to have a basic understanding of genetics, and HMB265H1/BIO260H1 is sufficient for this, and is a program requirement in the majority of life science programs within the Faculty of Arts & Science.

**Consultation:**
discussions with HMB faculty

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### HMB312H1: Laboratory in Health and Disease

**Description:**
A laboratory course based on current research techniques for students in the HMB: Health & Disease and HMB: Global Health programs. Lab topics which may include basic microbiology, molecular biology and animal cell culture techniques, immunocytochemistry, changes in gene expression microarrays, and histological techniques. (Lab Materials Fee: $51)

**Prerequisites:**  
9 FCE complete, HMB202H1/HMB203H1/HMB204H1, HMB265H1/BIO260H1, BIO230H1/BIO255H1

**Corequisites:**  
- **Previous:** PSL301H1  
- **New:** BCH210H1

**Rationale:**
update to pre-requisites to better match content in course (and acknowledge that this course will be moved to F-term so the PSL301H1 co-req is not possible as PSL301H1 is a S-term course)

**Consultation:**
consultation with course instructor(s) and Teaching Lab coordinator and HMB Faculty

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### HMB314H1: Laboratory in Human Biology

**Description:**
Students analyze whole body, cellular, and molecular responses to stress. Techniques range from those standard in medical practice (e.g., fitness measures, blood pressure, lung function) to current those used in cutting-edge research techniques laboratories (e.g., changes in gene expression microarrays). Students gain technical and analytical skills as they work at the bench use these laboratory techniques to design and carry out individual and group experiments. (Lab Materials Fee: $50)

**Prerequisites:**  
9 FCE complete, HMB200H1/HMB201H1/HMB202H1/HMB203H1/HMB204H1/HMB220H1, HMB265H1/BIO260H1, BIO230H1/BIO255H1

**Corequisites:**  
PSL300H1, PSL301H1

**Rationale:**
# Proposals Pertaining to Freestanding Programs

## HMB342H1: Epidemiology of Health & Disease

**Prerequisites:**  
- 9 FCE complete, BIO120H1, BIO130H1, HMB200H1/HMB201H1/HMB202H1/HMB203H1/HMB204H1  

**Recommended Preparation:**  
- STA288H1, HMB325H1 or other statistics course  

**Rationale:**  
- Updating pre-requisites so they are enforceable because this course opens up beyond HMB students and right now it's a free for all and really pre-requisites should either be enforced or not exist or be modified so that they are enforceable but also ensuring students have the necessary background to succeed in the course.  

**Consultation:**  
- Discussion with HMB faculty and program office

## HMB401H1: Biomedical Advances & Technologies

**Description:**  
This course introduces life science students to biomedical advances and technologies in medicine, including drug patents, medical device implants, diagnostic and medical device software. Limitations of patent protection in commercializing medical products, and limitations to scalability may also be discussed. Specific topics vary from year to year and will be based on the course instructor's area(s) of expertise.  

**Prerequisites:**  
- 14 FCE complete, HMB301H1/HMB321H1/BCH311H1/CSB349H1/MGY311Y1/PSL350H1, HMB201H1/HMB202H1/HMB203H1/HMB204H1  

**Rationale:**  
- Expanding pre-requisite line (in with minor program modification)  

**Consultation:**  
- Consultation with HMB faculty

## HMB402H1: Topics in Translational Medicine

**Description:**  
The bridge between basic scientific research and clinical practice integrates fundamental knowledge about molecular/cellular mechanisms and clinical disorders to increase the potential for new medical treatments, therapies and interventions as well as understanding of disease processes. Specific topics vary from year to year. Case applications delivered by experts illustrate how promising laboratory discoveries transform medicine and will be based on the course instructor's area(s) of expertise. Medical science:  

**Prerequisites:**  
- 14 FCE complete, BCH210H1, BIO230H1/BIO255H1, HMB302H1/HMB312H1/HMB314H1/HMB322H1/BCH311H1/CSB349H1/MGY311Y1/PSL350H1, and HMB202H1/HMB203H1/HMB204H1  

**Recommended Preparation:**
### Proposals Pertaining to Freestanding Programs

<table>
<thead>
<tr>
<th>Course Codes</th>
<th>Rationale:</th>
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</thead>
<tbody>
<tr>
<td>CSB349H1/BCH311H1/CSB349H1/PSL350H1</td>
<td>Updating course description to emphasize that topics vary from year to year, and updating pre-requisite line to be more inclusive of our diverse HMB programs but also to ensure enrolment controls are not bypassed.</td>
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<table>
<thead>
<tr>
<th>Consultation:</th>
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<tbody>
<tr>
<td>consultation with HMB Faculty and past course instructor, William Ju. Consultation with Tom Mackay and Stella Ip on how to fairly regulate course enrolment and enrolment control bypassing.</td>
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### HMB420H1: Seminar in Neurobiology of Behaviour

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<th>Description:</th>
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<tr>
<td>This seminar course focuses on recent research into the neurobiology underlying human behaviour. A variety of normal and abnormal human behaviours are studied which may include: voluntary action; action; moral cognition; hedonism; aggression; mental health; addiction; the impact of the gut microbiome on brain development and health.</td>
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<tr>
<th>Prerequisites:</th>
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<tr>
<td>14 FCE complete, HMB200H1, HMB300H1, HMB310H1/HMB320H1/HMB360H1/ANA300Y1/CJH332H1 (formerly CSB332H1)</td>
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<tr>
<th>Rationale:</th>
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<tr>
<td>As the neuroscience program has been realigned to better prepare students for future research and careers in neuroscience, both neurobehaviour and neuroanatomy are now required courses, and thus the program can pedagogically require either/both as a pre-requisite (as opposed to the current pre-requisite which acknowledged students only needed one of those courses. Now they are all required).</td>
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<th>Consultation:</th>
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<tbody>
<tr>
<td>Consultation with both instructors of the course, and consultation with governance regarding the two courses used (one for each instructor as they teach the course materials from different view points)</td>
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### HMB421H1: Seminar in Fundamental Genetics and its Applications

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<th>Description:</th>
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<tr>
<td>Theme based lecture and seminar course underlining current medical research in relation to the areas of genes; genetics and biotechnology. Topics vary yearly.</td>
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<tr>
<th>Prerequisites:</th>
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<tbody>
<tr>
<td>14 FCE complete, HMB265H1, HMB301H1/HMB311H1/HMB314H1/BIO260H1 HMB321H1, HMB201H1, cGPA 2.5</td>
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<table>
<thead>
<tr>
<th>Recommended Preparation:</th>
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<tbody>
<tr>
<td>Previous:</td>
</tr>
<tr>
<td>New: HMB321H1/ BCH311H1/ CSB349H1/ MGY311Y1/ PSL350H1</td>
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<tr>
<th>Rationale:</th>
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<tbody>
<tr>
<td>Consultation with course instructor</td>
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<tr>
<th>Consultation:</th>
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<tbody>
<tr>
<td>Consultation with course instructor</td>
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</table>
HMB430H1: Trends in Neuroscience

**Description:**

Current research covering the breadth of neuroscience is showcased by members of the Collaborative Program in Neuroscience. Topics vary yearly, but these topical reports cover the spectrum from molecular through genetic, cellular, developmental, systems, behavioural and modelling. As well, approaches to studying neurodegenerative diseases and clinical neurophysiology are introduced.

**Prerequisites:**

14 FCE complete, HMB200H1, CJH332H1, HMB300H1/HMB310H1/HMB320H1/JHA410H1 HMB360H1/ANA300Y1 CJH332H1 (formerly CSB332H1)

**Rationale:**

updating pre-requisite line so students better prepared for course (and adding administrative pre-requisite of HMB200H1)

**Consultation:**

Consultation with course instructors and consultation with Tom Mackay and Stella Ip on ways to combat bypass enrollment attempts.

HMB431H1: Innovation in Applied Genetics

**Description:**

This course explores innovation in research and technology in the field of applied genetics. Specific topics vary from year to year and will be based on the course instructor's area(s) of expertise.

**Prerequisites:**

14 FCE complete, HMB321H1, HMB201H1/HMB202H1/HMB203H1/HMB204H1 a HMB300-level course

**Corequisites:**

Previous: HMB325H1/ STA288H1/ STA220H1/ PSY201H1
New:

**Recommended Preparation:**

Previous: HMB301H1
New:

**Rationale:**

updating pre-requisite

**Consultation:**

discussion with HMB Faculty

HMB432H1: Topics in Histology & Histopathology

**Prerequisites:**

14 FCE complete, HMB302H1/HMB312H1/HMB314H1/HMB322H1; cGPA 2.5

**Recommended Preparation:**

Previous: BCH311H1/CSB349H1/MGY311Y1/PSL350H1
New:
Proposals Pertaining to Freestanding Programs

Rationale:
- updating pre-req line and adding recommended preparation line

Consultation:
- consultation with the instructor.

HMB434H1: Complementary & Integrative Medicine

Description:
Introduction to complementary and alternative medical therapies. Topics include, Traditional Chinese Medicine, Naturopathy, Ayurvedic, and Mind-Body Practices. Biological Physiological mechanisms will be emphasized and therapies will be critically analyzed from an evidence-based research perspective. Integrating alternative therapies into Western practices with a focus on personalized medicine will be discussed.

Prerequisites:
- 14 FCE complete, BCH210H1, BIO230H1/BIO255H1, HMB302H1/HMB303H1/HMB312H1/HMB314H1/HMB322H1/HMB323H1/HMB342H1, and HMB202H1/HMB203H1/HMB204H1

Rationale:
- Update to pre-requisite line to better ensure students are prepared and to help mitigate enrollment bypassing attempts

Consultation:
- consultation with course instructor, and with Tom Mackay and Stella Ip.

HMB435H1: Selected Topics in Molecular Cell Biology

Description:
Theme-based lecture and seminar course underlining current basic science research in the area of molecular and cell biology, focusing on cell migration and its relevance as related to human health and disease. Topics may focus on the impact of fundamental processes underlying (e.g., cell migration) on the cell biology, cellular and molecular aspects of physiology and pathophysiology of cell motility in a variety of systems(e.g.; immune, nervous system, cancer context).

Prerequisites:
- 14 FCE complete, BCH311H1/CSB349H1/MGY311Y1 PSL350H1/PSL350H1 BCH311H1

Rationale:
- update to course description to better match focus of course and re-ordering pre-reqs so alpha order.

Consultation:
- consultation with course instructor

HMB436H1: Medical and Veterinary Mycology

Contact Hours:
- Previous: Lecture: 16 / Practical: 6 / Seminar: 8
- New: Lecture: 24

Prerequisites:
- 14 FCE complete, HMB265H1/BIO260H1, BIO220H1

Exclusions:
Proposals Pertaining to Freestanding Programs

**Previous:** BOT405H1

**New:**

**Rationale:**
update to pre-requisite/exclusion line to ensure students recognize this is a ecological-focused course and BOT405H1 has not been offered for quite some time so is being removed as part of clean up. Hours updated to reflect how course is taught already

**Consultation:**
consultation with the course instructors, HMB Faculty.

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**HMB437H1: The Biology of the Human Metallome**

**Description:**

This course will discuss how heavy metals are integral to organ function through various biological pathways, the importance of metal regulation and control and its relationship with gene transcription. An introduction of metallo-therapeutics will also be featured, ranging from neurodegenerative therapies to cancer treatment.

**Prerequisites:**
14 FCE complete, HMB265H1/BIO260H1, BIO230H1/BIO255H1, BCH210H1

**Recommended Preparation:**
**Previous:** BCH210H1

**New:**

**Rationale:**
Update to pre-requisite as planned when course first proposed; BCH210H1 is required for all HMB programs as it is, and it is a very good preparation for the course.

**Consultation:**
Consultation with the course instructor.

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**HMB440H1: Dementia**

**Description:**

(This course is not offered for the 2017-2018 academic year)

This course, featuring a service-learning component, explores dementia. In patients with dementia, intellectual, social and occupational functioning deteriorate. The course addresses the multi-disciplinary aspects of dementia(clinical, genetic, molecular, social)with a focus on the most common cause of dementia, Alzheimer's disease. 

A short application to enrol in this course is required. Information may be found via the Human Biology Program website.

**Prerequisites:**
14 FCE complete, HMB265H1/BIO260H1, PSL300H1, HMB300H1/HMB301H1/HMB302H1/HMB310H1/HMB311H1/HMB312H1/HMB320H1/HMB321H1/ANA300Y1 HMB322H1

**Rationale:**
### Proposals Pertaining to Freestanding Programs

update of pre-requisite to demonstrate what course covers and to ensure students are covering relevant topics that will help prepare them for course.

**Consultation:**
consultation with course instructor.

---

#### HMB441H1: Genetics of Human Disease

**Description:**
This advanced course aims to provide students with Toronto researchers present current, in-depth knowledge of insight into the genetics of specific human diseases. including: single gene (e.g., Huntington disease, cystic fibrosis), multifactorial chromosome (e.g., Alzheimer’s disease, Down syndrome), and non-Mendelian multifactorial inheritance (e.g., mitochondrial DNA-related; heart disease) disorders, and how the use of genetics to elucidate disease mechanisms can lead to treatments and personalized medicine in order to improve healthcare.

**Prerequisites:**
14 FCE complete, HMB265H1/BIO260H1, BCH210H1, HMB301H1/HMB302H1/HMB321H1 HMB311H1/ HMB322H1 HMB312H1/BCH311H1 HMB314H1/CSB349H1 HMB321H1/MGY311Y1 HMB321H1/PSL350H1, and HMB201H1/HMB202H1/HMB203H1/HMB204H1 HMB322H1

**Recommended Preparation:**
HMB301H1/HMB321H1, PSL300H1, PSL301H1

**Rationale:**
adjustment of course description to set better expectations among students looking to take this course (feedback from students regularly comments they did not realize it would be "so advanced in genetics") and updating pre-requisites so students are better prepared and adding the administrative pre-requisite to mitigate enrolment bypassing attempts

**Consultation:**
Consultation with HMB faculty and course instructor of course.

---

#### HMB450H1: Neurodevelopmental Disorders and Diseases

**Description:**
Proper development of the human brain is essential for human health. This course will examine how neurodevelopment failures contribute to neurological disorders and diseases, such as including epilepsy and autism. Current research from basic, translational, and clinical perspectives will be examined using case studies. The impact of neurodevelopmental disorders and diseases on the individual and community will be discussed.

**Prerequisites:**
14 FCE complete, HMB200H1, HMB300H1/HMB310H1/HMB320H1/ANA300Y1 CSH32H1 (formerly CSB332H1)

**Rationale:**
Update to pre-requisite to ensure students are better prepared; can now do this update as neuroanatomy required for program requirements. Also updated administrative controls to mitigate enrollment bypassing attempts.

**Consultation:**
Consultation with course instructor and Tom Mackay and Stella Ip.

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#### 2 Retired Courses:
HMB325H1: Statistics Applied to Human Biology

**Rationale:**
As the unit is now offering a joint course with the Department of Statistical Sciences (STA288H1) that is geared for life science students, it is not necessary to continue to offer a second statistics course.

**Consultation:**
Discussions with Governance Fall 2016 when developing STA288H1; discussions with HMB Faculty when 2017-2018 HMB programs were in development; part of the discussions with Statistics and Pharmacology when working on the course proposal and development for STA288H1.

HMB395Y1: Human Biology Research Project

**Rationale:**
For years, HMB395Y1 was used for third year students and HMB499Y1 was used for fourth year students who did the research project during the academic term but the two "courses" were coordinated as one, with PIs from one course acting as second readers on assessments from students in the other course (they were matched up based on topics, not by course section) and students in both HMB395Y1 and HMB499Y1 were assessed based on the same grading matrix. Further, students are not allowed to do more than two research projects with HMB (excluding the international research projects which are open to all students, HMB394Y1 and HMB396Y1), but there were three codes: HMB395Y1, HMB499Y1, and HMB496Y1 which was the summer project code, but not coordinated or assessed any differently than HMB395Y1 and HMB499Y1.

To recognize that a student in third year could be capable of doing the same caliber of research as a fourth year (and already being assessed as such) last year HMB moved to re-title HMB496Y1 and HMB499Y1 "Research Project I and II" respectively. They are now both offered in the summer and during the academic term. As such, the need for a third research project code is not necessary.

**Consultation:**
Discussion with HMB faculty and students when developing 2017-2018 HMB programs (December 2015-September 2016); Discussions with Governance ~January 2017 when submitting re-titling proposals for HMB496Y1 and HMB499Y1 during the 2016-2017 Curriculum Cycle.
Science Curriculum Committee
Abbreviated Review Proposals By Unit
1 Course Modification:

**AST251H1: Life on Other Worlds**

<table>
<thead>
<tr>
<th>Contact Hours:</th>
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<tbody>
<tr>
<td>Previous: <em>Lecture:</em> 24</td>
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<tr>
<td>New: <em>Lecture:</em> 24 / <em>Tutorial:</em> 12</td>
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<tr>
<th>Prerequisites:</th>
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<tbody>
<tr>
<td>Previous:</td>
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<tr>
<td>New: AST101H1/AST201H1</td>
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</table>
5 Course Modifications:

**BCH210H1: Biochemistry I: Proteins, Lipids and Metabolism**

**Prerequisites:**
Successful completion of (CHM135H1, CHM136H1) or (CHM138H1, CHM139H1)/CHM151Y1. NOTE: CHM1** with COURSE EXCLUSION TO CHM135H1 AND CHM136H1 meet the Prerequisite requirement for BCH210H1. CHM110H5 & CHM120H5 (UTM) are equivalent to CHM135H1 CHM135H1 ONLY. CHMA10H3 & CHMA11H3 (UTSC) are equivalent to CHM135H1 ONLY. CHMB41H3/CHMB42H3 (UTSC) are equivalent to CHM136H1 ONLY. CHM242H5 (UTM) is equivalent to CHM136H1 ONLY. Students with a SDF in CHM135H1/CHM136H1/CHM138H1/CHM139H1 are not permitted to enrol in BCH210H1 until a final passing grade (50%) appears on the transcript.

**Exclusions:**
BCH242Y1, [CHM361H5 (UTM) and CHM362H5 (UTM)], [BIOC12H3 (UTSC) and BIOC13H3 (UTSC)], CHMB62H3 (UTSC)

**BCH242Y1: Introduction to Biochemistry**

**Description:**
An introductory course that will serve as the foundation for BCH courses taken in Third and Fourth years by students specializing in biochemistry and related specialist programs. The major topics include protein structure, enzyme mechanisms, cellular and molecular biology, lipid and membrane structure and function, and carbohydrate, lipid, and amino acid metabolism and bioenergetics. Please note that there are five laboratories accompanying this course. (Lab fees: $10)

**Prerequisites:**
(CHM135H1, CHM136H1) or (CHM138H1, CHM139H1)/CHM151Y1

**Exclusions:**
BCH210H1 and BCH311H1, [CHM361H5 (UTM) and CHM362H5 (UTM)], [BIOC12H3 (UTSC) and BIOC13H3 (UTSC)], CHMB62H3 (UTSC)

**BCH370H1: Laboratory Course in Biochemical Techniques**

**Description:**
This course reinforces theoretical principles through experiments that encompass pH and buffers, spectrophotometry, chromatography, protein electrophoresis, enzyme kinetics and DNA isolation and analysis. Intended for students who are not proceeding further in biochemistry. It is highly recommended that students take this course in their third year as space is limited and priority will go to third-year students. cGPA of 2.5 is required for non-Biochemistry Majors and Specialists. This course will be offered in the FALL & WINTER terms. No enrolment will be permitted after the start of class. (Enrolment limited.) (Lab fees: $50)

**BCH377H1: Biochemistry Laboratory I**

**Description:**
An introduction to fundamental laboratory techniques in modern biochemistry. Experiments illustrate and develop the concepts described in lecture courses and serve as a foundation for more advanced training in biochemistry laboratory courses. Enrollment in this course is generally restricted to students enrolled in the Biochemistry, Immunology, and Molecular Genetics & Microbiology (Genetics Stream) Specialist programs. (Lab fees: $25)

**BCH478H1: Advanced Biochemistry Laboratory**

**Description:**

Experiments extend students’ technical abilities as well as their knowledge and application of practical theory. This course is designed as an advanced successor in a progression of biochemistry laboratory experiences in BCH242Y1, BCH377H1 and BCH378H1 that will equip students with a spectrum of practical abilities that are of vital importance in scientific research. (Lab fees: $25)
23 Course Modifications:

**BIO255H1: Cell and Molecular Biology with Advanced Laboratory**
Abbreviated Title: Advanced Cell & Molec Bio Mol

**CSB201H1: Molecular Biology, Biotechnology and You**
Abbreviated Title: Molec Mol Bio , Biotech & You

**CSB202H1: Further Exploration in Biotechnology**
Abbreviated Title: Explore Biotechnology Biotechnol

**CSB299Y1: Research Opportunity Program**
Abbreviated Title: Research Rsch Opportunity Prg

**CSB327H1: Extracellular Matrix Dynamics and Associated Pathologies**
Abbreviated Title: Matrix Dynamic Pathologies Patho

**CSB330H1: Techniques in Molecular and Cell Biology**
Abbreviated Title: Molec Tech Mol & Cell Bio Techniques

**CSB348H1: Laboratory in Comparative Animal Physiology**
Abbreviated Title: Lab in Comparative Comp Animal Phys

Contact Hours:
- **Previous**: Lecture: 12 / Practical: 36
- **New**: Practical: 48

**CSB349H1: Eukaryotic Gene Expression**
Abbreviated Title: Eukaryotic Gene Expression Express

**CSB351Y1: Introductory Virology**
Abbreviated Title: Introductory Introduct Virology
Prerequisites:
BIO230H1/BIO240H1/BIO241H1 BIO241H/BIO255H1

CSB399Y1: Research Opportunity Program
Abbreviated Title:
Research Opportunity Prg

CSB427H1: Drosophila as a Model in Cancer Research
Abbreviated Title:
Drosophila Model of & Cancer

CSB428H1: Advanced Cell Biology II: Cell Polarity and Cytoskeletal Dynamics
Description:
This advanced course covers cell polarity and cytoskeletal dynamics emphasizing current literature. For each topic, the course examines (1) the proteins involved, (2) their interactions and regulation, and (3) how they organize specific cellular structures. The coordination of these complexes required for orchestrating complex cellular processes are addressed. These important topics of cell biology are pursued with question-driven lectures, and both round-table discussions and group presentations of research papers.
Prerequisites:
Minimum grade of 73% in BCH311H1/CSB349H1/MGY311Y1, minimum grade of 73% in CSB328H1/CSB329H1/CSB331H1/CSB340H1

CSB432H1: Advanced Topics in Cellular Neurophysiology
Abbreviated Title:
Advanced Neurophysiology Neurophys

CSB435H1: Regulatory Networks and Systems in Molecular Biology
Abbreviated Title:
Regul Networks In Molec Bio

CSB445H1: Topics in Sleep Research
Abbreviated Title:
Topics in Sleep Research

CSB450H1: Proteomics in Systems Biology
Abbreviated Title:
Proteomics in Systems Biology Sys Bio

CSB452H1: Molecular Plant-Microorganism Interactions
Abbreviated Title:
Mol Plant-Microb Interactions Int
CSB460H1: Plant Signal Transduction

Abbreviated Title:
Plant Signal Transduction

CSB472H1: Computational Genomics and Bioinformatics

Abbreviated Title:
Comput Genomics Bioinformatics

CSB474H1: Methods in Genomics and Proteomics

Abbreviated Title:
Previous: Meth Genome Proteome
New: Genomic & Proteomic Methods

CSB490H1: Team-Based Learning: Current Topics in Cell and Molecular Biology

Abbreviated Title:
Team Learn: Cell and Molec Bio

Description:
Previous:
CSB490H1 will build on the team-based learning approaches learned in CSB490H1 to develop the laboratory and team-work skills needed to succeed in the workplace, particularly the multi-disciplinary environment that characterizes modern biological research. CSB491H1 is a team-based research course with emphasis on questions in the fields of protein biochemistry, enzymology, structural biology, metabolic engineering and protein-protein interaction. Students will form semester-long laboratory research teams to evaluate hypotheses that were developed into a research proposal in CSB490H1.

New:
CSB491H1 will build on molecular biology and biochemistry approaches acquired in CSB350H1 to investigate the role of metabolic enzymes in plants. Students participating in this course will develop laboratory and team-work skills that are desirable for them to function in a research laboratory and in the workplace. The course will integrate current molecular biology techniques, including designing and characterizing mutants made with CRISPR / Cas9, identifying protein interactors, and performing structural and mechanistic analysis of metabolic enzymes.

Prerequisites:
CSB350H1 CSB490H1 with a minimum grade of 77% and approval of the instructor

CSB491H1: Team-Based Research: Research in Cell and Molecular Biology

Abbreviated Title:
Team Research: Cell and Molec

Description:

CSB497H1: Independent Research in Cell and Systems Biology I

Description:
An original research project (a literature review alone is not sufficient) requiring the prior consent of a member of the Department to supervise the project. The topic is to be mutually agreed upon by the student and supervisor. They must arrange the time, place, and provision of any materials and submit to the Undergraduate Office a signed form of agreement outlining details prior to being enrolled. In the Fall or Winter sessions, a commitment of 8-10 hours per week is expected for research and related course activities. If spread over both the Fall and Winter sessions, a commitment of 4-5 hours per week is expected. In the Summer Session, the number of hours doubles (16-20 per week) as the length of the term is halved compared to the Fall or Winter term. Many students spend more than this amount of time as they become immersed in their project. This course is normally open only to fourth year students with adequate background in Cell and Systems Biology. Course requirements include a final report, and either an oral presentation (Summer and Fall sessions) or a poster presentation (Winter session). Monthly workshops are scheduled and highly recommended. Details for enrollment are available at http://csb.utoronto.ca/undergraduate-studies/undergraduate-courses/undergraduate-course-level-400/. (Lab Materials Fee:$25). Not eligible for CR/NCR option.
1 Course Modification:

**CHM222H1: Introduction to Physical Chemistry (formerly CHM225Y1)**

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<th>Prerequisites:</th>
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<tr>
<td>[(CHM135H1/CHM139H1, CHM136H1/CHM138H1)/ CHM151Y1 with a minimum grade of 63%), (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1, (PHY131H1, PHY132H1)/(PHY151H1, PHY152H1)</td>
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<th>Exclusions:</th>
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<tr>
<td>CHM220H1/CHM225Y1, CHMB20H3, <strong>CHMB21H3</strong>, CHM221H5, JCP221H5</td>
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</table>
1 Course Modification:

**CSC343H1: Introduction to Databases**

Exclusions:
- Previous: CSC434H1
- New: CSC443H1
1 Course Modification:

ESS311H1: Aqueous Geochemistry

Title:
Earth System Chemistry 2 : Aqueous Geochemistry
12 Course Modifications:

**EEB214H1: Evolution and Adaptation**
Exclusions:
- BIO120H1/BIO150Y1

**EEB215H1: Conservation Biology**
Exclusions:
- BIO120H1/BIO150Y1

**EEB255H1: Essentials of Biodiversity Science and Conservation Biology**
**Title:** Essentials of Biodiversity Science and Conservation Biology

**EEB263H1: Comparative Vertebrate Anatomy**
Exclusions:
- Previous: EEB263Y1
  - New:

**EEB266H1: Animal Diversity: Invertebrates**
Exclusions:
- Previous: EEB265Y1
  - New:

**EEB267H1: Animal Diversity: Vertebrates**
Exclusions:
- Previous: EEB265Y1
  - New:

**EEB319H1: Population Ecology**
**Description:**
Abundance and distribution of populations; population growth and regulation; fluctuations, stochasticity and chaos; meta-population persistence and extinction; age and stage-structured populations; interactions within and between species; optimal harvesting; spread of infectious diseases. Labs include experiments and computer simulations. (Lab materials fee: $25 - will not be charged in 2016-17)

**EEB362H1: Macroevolution**
**Description:**
Explored periods of time, integrate large-scale evolutionary studies, functional biology, and experiments to link emergent evolutionary patterns to underlying evolutionary processes. Topics include: speciation origins of species and their adaptations; historical biogeography, phylogenetic inference co-evolution, adaptive vs. non-adaptive community evolution, evolutionary constraints radiations and extinctions, diversification fossils and extinction, evolutionary innovations, historical biogeography macroevolutionary patterns, and the relationship between role of evolutionary history information in conservation and ecology biodiversity initiatives. Tutorials will illustrate common analytical approaches emphasize methods used to macroevolutionary investigation reconstruct phylogenetic relationships and provide in-depth exploration the sequence of landmark studies in macroevolution. character evolution:

EEB460H1: Molecular Evolution and Genomics

Contact Hours:
Previous: Lecture: 24 / Tutorial: 12
New: Lecture: 36

EEB466H1: Approaches to the Study of Biodiversity

Prerequisites:
BIO220H1: EEB365H1 (highly recommended) or at least one organismal course from EEB266H1/ EEB267H1/ EEB268H1/ EEB330H1/ EEB331H1/EEB365H1/ EEB380H1/ EEB382H1/ EEB384H1/ EEB386H1/ EEB388H1

EEB495H1: Seminar in Ecology and Evolutionary Biology

Description:
Seminar course in ecology and evolutionary biology, emphasizing critical thinking and the synthesis of ideas crossing disciplinary boundaries. Group discussions among peers, facilitated by faculty, and student presentations. Discussions include critical analysis of research and review articles in the primary literature. Evaluation based on presentations, participation in class discussions, and written assignments. A half-course offered in both Fall and Winter sessions. (Note students may take this course only once.) sessions:

ENV234H1: Environmental Biology: Structure and Function of Ecosystems (formerly ENV234Y1)

Description:
This multidisciplinary course draws on elements from geology, soil science, and ecology to understand past and present environments and human impacts on landscapes and ecosystems. Emphasis on the structure, functioning and connectivity of aquatic and terrestrial ecosystems. Field trips and labs. Mandatory day-long field trip on a Friday or Saturday in late September or early October(students choose which day; a small fee of approximately $15 may be charged for field trip transportation.)(Lab Materials Fee:$25)
1 Course Modification:

MGY428H1: Functional Genomics

Description:

A broad-ranging course that covers many aspects of genomics and functional genomics, which is the discipline of defining and attributing function to all of the heritable material of an organism on a genome-wide scale, as applied to microbes, invertebrates and vertebrates. The primary and review literature will be the basis of all lectures.
3 Course Modifications:

PCL366H1: Basic Pharmacology and Toxicology Laboratory

Description:

Through practical hands-on laboratory experiments and tutorials, students will be introduced to some basic experimental techniques and laboratory skills that are used within pharmacology and toxicology research. (Ancilliary lab fee $25). This course results from the splitting of PCL365Y and PCL471Y and provides students an opportunity to develop introductory and basic laboratory skills.

PCL461H1: Advanced Pharmacology Laboratory

Title:
Advanced Pharmacology and Toxicology Laboratory

Abbreviated Title:
Adv Pharm & Tox Pharmacology Lab

Description:

Advanced laboratory exercises and discussions through tutorials and presentations in selected areas of pharmacology. Enrollment in this course is generally restricted to students enrolled in the Pharmacology Specialist and Pharmacology and Biomedical Toxicology Specialist programs. (Ancillary lab fee $25).

PCL491H1: Clinical Pharmacology Principles and Practice

Contact Hours:
Previous: Lecture: 8 / Practical: 24
New: Lecture: 8 / Practical: 24 / Tutorial: 8

Description:

This course will examine the practical and experimental aspects of clinical pharmacology and toxicology. Through practical applications and experiments, students will develop their knowledge in Good Laboratory Practice/Good Clinical Practice, critical evaluation and analysis skills through performing pharmacokinetic experiments (evaluating Vd, half-life, and clearance); examining case studies and primary literature in regards to drug-drug interactions and adverse drug reactions.

This elective course can apply towards their program requirements in our Specialist and Major streams and will only be available to fourth year students. The course will meet a need for expanding students’ comprehension in clinical pharmacology and pharmacokinetics in a hands-on, practical and advanced manner. Students will be evaluated on both written and oral communication skills, team work as well as data analysis and interpretation and critical thinking skills.
<table>
<thead>
<tr>
<th>Pharmacology &amp; Toxicology (MED), Department of</th>
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<tr>
<td>(Ancillary lab fee $25)</td>
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</table>
8 Course Modifications:

ENV237H1: Physics of the Changing Environment A

Description:

The course will cover basic physics of environmental processes and of measurement techniques in the atmosphere, the ocean, lake-land-forest systems, and other biological systems. It will place its work in the context of climate change and other aspects of environmental change. This course is solely intended for students in the Environmental Science Major program who have NOT completed a previous first year physics core course, who are in one of the following programs: Environmental Science Major, Environmental Geosciences Specialist or Earth and Environmental Systems Major.

ENV238H1: Physics of the Changing Environment B

Description:

The course will cover basic physics of environmental processes and of measurement techniques in the atmosphere, the ocean, lake-land-forest systems, and other biological systems. It will place its work in the context of climate change and other aspects of environmental change. This course is solely intended for students in the Environmental Science Major program who have completed a previous first year physics core course, who are in one of the following programs: Environmental Science Major, Environmental Geosciences Specialist or Earth and Environmental Systems Major.

PHY254H1: Mechanics: From Oscillations to Chaos

Title:

Previous: Mechanics: From Oscillations to Chaos
New: Classical Mechanics

Abbreviated Title:
Classical Mechanics Oscillations Chaos

Prerequisites:
PHY132H1/PHY152H1 (PHY152H1 recommended), (MAT135H1, MAT136H1)/MAT137Y1/MAT157Y1

Recommended Preparation:
MAT244H1/MAT267H1, PHY224H1

PHY354H1: Classical Mechanics

Title:
Advanced Classical Mechanics

PHY392H1: Physics of Climate

Prerequisites:
PHY231H1/PHY250H1/PHY252H1, MAT235Y1/MAT237Y1/MAT257Y1
PHY407H1: Computational Physics

**Corequisites:**
- Any **PHY300-level lecture course in Physics**: **PHY407H1** may be taken in third or fourth year course in Physics

PHY408H1: Time Series Analysis

**Corequisites:**
- Any third or fourth year third-year lecture course in Physics

PHY487H1: Condensed Matter Physics

**Description:**

Introduction to foundational the concepts of condensed matter physics used in the solid state modern treatment of solids. Main topics The student is assumed to be covered familiar with elementary quantum mechanics. Topics include: crystal structure, the reciprocal lattice, x-ray diffraction, crystal binding, lattice vibrations the free electron model, phonons and electrons in solids periodic potential, Fermi surfaces lattice vibrations, energy bands electrons and holes, semiconductors and magnetism. Special topics to be surveyed: superconductivity and nanoelectronic transport.; metals.

**Prerequisites:**
- **PHY256H1** PHY356H1, PHY252H1, PHY250H1
# 3 Course Modifications:

## STA304H1: Surveys, Sampling and Observational Data (formerly STA322H1)

**Prerequisites:**
- ECO220Y1/ECO227Y1/GGR270H1/PSY201H1/SOC300H1/SOC202H1/STA220H1/STA255H1/STA261H1/STA248H1/STA238H1/EEB225H1

## STA347H1: Probability

**Prerequisites:**
- STA247H1/STA255H1 (70%)/STA257H1/ECO227Y1, MAT223H1/MAT240H1, MAT240H1;
- MAT235Y1/MAT237Y1/MAT257Y1 (Note: STA257H1 and MAT237Y1/MAT257Y1; (MAT223H1, MAT223H1 MAT224H1)/MAT240H1, MAT237Y1/MAT257Y1 are very strongly recommended)

## STA490Y1: Statistical Consultation, Communication, and Collaboration (formerly STA490H1)

**Title:** Statistical Consultation, Communication, and Collaboration (formerly STA490H1 formerly STA490H1)

**Prerequisites:**
- STA303H1, STA304H1/STA305H1, STA355H1 (Permission of instructor. Priority is given to students completing all requirements of the Applied Statistics specialist program.)
Proposals Pertaining to Freestanding Programs

20 Course Modifications:

CJH332H1: Neurobiology of the Synapse (Formerly CSB332H1)

Title: Cellular and Molecular Neurobiology of the Synapse (Formerly CSB332H1)

Description:
Examination of all aspects of the synapse in both the peripheral and central nervous systems of invertebrates and vertebrates. Topics include: neuroplasticity, synapse formation, synaptic transmission, synaptic modulation, learning and memory, and the molecular biological basis of neurodegenerative neurological disorders.

HMB200H1: Introduction to Neuroscience

Exclusions:
Previous: HMB220H1

New:

HMB202H1: Introduction to Health and Disease

Description:
An introductory course in Health and Disease using an interdisciplinary approach that integrates bacteriology and virology with other aspects of developmental human biology, including chronic disease and neoplasia with perspectives from the Social Sciences. An exploration of the key concepts and approaches that are necessary for understanding the dynamic nexus of human health and disease. (Lab Fees: $50)

HMB203H1: Introduction to Global Health

Description:
An introductory course covering the theories, operational components and strategies of implementing primary health care in resource-poor settings developing countries. Topics may include education, control of vector-borne diseases, essential drug provision, maternal and child health, and nutrition, and incorporation of alternative and complementary technologies, community participation and deployment of health service providers.

HMB310H1: Laboratory in Neuroscience

Description:
A laboratory course based on current research techniques for students in the Neuroscience program Specialist and Major programs. Lab topics may include human brain imaging and disorders, animal behaviour, electrophysiology, and cell culture, and changes in gene expression during neuronal microarray analysis of neural development. (Lab
Proposals Pertaining to Freestanding Programs

Materials Fee:$51)

Prerequisites:
9 FCE complete, HMB200H1/HMB220H1/PSY290H1, HMB265H1/BIO260H1, BIO230H1/BIO255H1

Exclusions:
PSY399H1/HMB311H1/HMB312H1/HMB314H1/PSY359H1

HMB311H1: Laboratory in Fundamental Genetics and its Applications

Description:
A laboratory course based on current research techniques for students in the Fundamental Genetics and its Applications specialist and major programs. Lab topics may include basic microbiology; molecular biology and animal cell culture techniques, nutrigenomics; an overview and microarray analysis of microarrays and a CRISPR module altered gene expression. (Lab Materials Fee:$51)

HMB320H1: Neuroanatomy

Contact Hours:
  Previous: Lecture: 24 / Practical: 16 / Tutorial: 8
  New: Lecture: 24 / Practical: 10 / Tutorial: 4

Description:
This is a rigorous, introductory course that addresses presents the structure functional and comparative anatomy of the vertebrate central nervous system with an emphasis on functional human neuroanatomy brain. It is designed for students who intend to continue with studies in the Neurosciences and related areas.

Prerequisites:
9 FCE complete, PSL300H1, HMB200H1/HMB220H1/PSY290H1, BIO230H1/BIO255H1

HMB322H1: Topics in Health & Disease

Prerequisites:
9 FCE complete, HMB202H1/HMB203H1/HMB204H1, BIO230H1/BIO255H1, PSL300H1

HMB360H1: Neurogenomics

Description:
Genetic basis of both the normal and abnormal development function of the nervous system and its function. Topics Lecture topics include the regulation of neural gene expression, the role regulation of epigenetics on chromatin and neuron function, genome wide association studies and disorders of brain and behaviour, optogenetic and pharmacogenetic techniques to probe neural circuit function. Tutorials emphasize critical analysis of primary research.

Prerequisites:
Proposals Pertaining to Freestanding Programs

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<th>Course Code</th>
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<th>Description:</th>
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<tr>
<td>HMB422H1</td>
<td>Seminar in Health &amp; Disease</td>
<td><strong>Previous:</strong> This course focuses on current medical research related to human disease. Faculty from the Department of Anesthesia, Faculty of Medicine present their own preoperative research. The potentially profound health effects of anesthesia, pain management, and the control of the cardiorespiratory system essential for most surgery are also highlighted. <strong>New:</strong> This course focuses on various medical research related to human disease. Topics vary based on course instructor’s area of expertise.</td>
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**Prerequisites:**
- 14 FCE complete, PSL300H1, PSL301H1, HMB302H1/HMB322H1, and HMB202H1 HMB312H1/HMB203H1 HMB314H1/HMB204H1 HMB322H1

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<td>HMB452H1</td>
<td>Personalized Medicine</td>
<td><strong>Previous:</strong> Clinical medicine is making rapid progress in predicting individual patients’ disease risk, prevention, diagnosis and treatment. This new health care delivery requires overcoming major science and policy challenges to pave the way for its navigation by professionals and patients. Focus is on the significance of current breakthrough applications (e.g., nanoscale DNA sequencing). <strong>New:</strong> The bridge between basic scientific research and clinical practice integrates fundamental knowledge about molecular/cellular mechanisms and clinical disorders to increase the potential for new medical treatments, therapies and interventions as well as understanding of disease processes. Specific topics vary from year to year and will be based on the course instructor’s area of expertise.</td>
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**Prerequisites:**
- 14 FCE complete, HMB302H1/HMB312H1/HMB321H1, HMB201H1/HMB202H1/HMB203H1/HMB204H1

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<td>HMB470H1</td>
<td>Exercise and Sports Medicine</td>
<td>14 FCE complete, PSL300H1, PSL301H1, HMB200H1/HMB201H1/HMB202H1/HMB203H1/HMB204H1 a HMB300-level course</td>
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<td>HMB471H1</td>
<td>Performance Enhancement</td>
<td>14 FCE complete, PSL300H1, HMB200H1/HMB201H1/HMB202H1/HMB203H1/HMB204H1 a HMB 300-level</td>
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HMB472H1: Exercise Physiology

Prerequisites:
14 FCE complete, PSL300H1, PSL301H1, HMB200H1/HMB201H1/HMB202H1/HMB203H1/HMB204H1 a HMB300-level course

HMB473H1: Exercise and Mental Health

Description:
This course, featuring a service-learning component, discusses how mental well-being is a critical element of total health. We explore the evidence underpinning the role of physical activity in the avoidance of mental disorders, recovery from mental disorders, and the quality of life of those with or without mental disorders.

A short application to enrol in this course is required. Information may be found via the Human Biology Program website.

Prerequisites:
14 FCE complete, PSL300H1, PSL301H1; a HMB300-level course

HMB474H1: Dental Sciences

Description:
Dentistry is one of the oldest branches of medicine responsible for the treatment of diseases of oral cavity. This course will introduce students to the key concepts as well as the latest research in the dental sciences, including but not limited to craniofacial structures, bone physiology, odontogenesis, pathogenesis of oral diseases, and technology in dental sciences.

Prerequisites:
14 FCE complete, BIO230H1/BIO255H1, PSL300H1, PSL301H1, HMB200H1/HMB201H1/HMB202H1/HMB203H1/HMB204H1

HMB489H1: Advanced Laboratory in Human Biology

Description:
Building on their experience in 3rd-year labs, students participate in inquiry-based laboratory experiments in diverse areas of current human biology research. Open to students in any Human Biology program. Please see Human Biology Program Website for subtopic details, which vary from year to year. (Lab Materials Fee:$51)
HMB496Y1: Research Project in Human Biology

Description:

A independent research project course for students enrolled in a Human Biology program, is supervised by a faculty member appointed in a faculty or division at St. George Campus (Faculties of the Faculty of Arts & and Science, or the Faculty of Medicine, Engineering, Dalla Lana School of Public Health, etc.). Open to third and fourth year students.

Students are responsible Not eligible for securing their own supervisor CR/NCR option. Should a HMB Specialist require help securing a supervisor, the request must be made by email to the Human Biology Program Office no later than July 20 for Academic year projects and January 30 for Summer projects.

Completed applications Applications for this course are due to the Human Biology Program Office by September 1 for Academic year projects and May 1 for Summer projects. Please see no later than 15 days prior to the application on the Special Enrolment Courses page on the HMB Website.

Not eligible for CR/NCR option. first day of summer F-term:

Prerequisites:

Previous: 9 FCE complete, a 300+ level laboratory course, HMB200H1 / HMB201H1/ HMB202H1/ HMB203H1/ HMB204H1, HMB265H1/BIO260H1, BIO230H1, cGPA 3.0 or higher (if you are a 3rd year student) / cGPA 2.5 or higher (if you are a, and permission of the Human Biology Program

New: Permission of the Human Biology Program; please refer to the Human Biology Program website for more details

Exclusions:

Students are not permitted to do a HMB research project concurrently with another research project and students are allowed to do no more than 2.0 FCE from HMB-coded research project courses:

Recommended Preparation:

Previous: 0.5 FCE or more in any statistics course

New:

HMB499Y1: Research Project in Human Biology II

Description:

A research project course for students enrolled in a Human Biology program, is supervised by a faculty member appointed in a faculty or division at St. George Campus (Faculties of the Faculty of Arts & and Science, or the Faculty of Medicine, Engineering, Dalla Lana School of Public Health, etc.) Not eligible for CR/NCR option.

Students Applications for this course are responsible for securing their own supervisor. Should a HMB Specialist require help securing a supervisor, the request must be made by email due to the Human Biology Program Office no later than July 20 for Academic year projects and January 30 for Summer projects.
Proposals Pertaining to Freestanding Programs

Completed applications for this course are due 15 days prior to the first day of F-term. For more information please check the application on the Special Enrolment Courses page on the HMB Website.

Not eligible for CR/NCR option.

Prerequisites:
- HMB496Y1, and permission of the program

Exclusions:
- Students are not permitted to do a HMB research project concurrently with another research project and students are allowed to do no more than 2.0 FCE from HMB-coded research project.

Recommended Preparation:
- Previous: 0.5 FCE or more in any statistics course
- New:

JHA410H1: Clinical Neuroimaging

Prerequisites:
- 9 FCE complete, PSL300H1, BIO230H1, HMB200H1/HMB220H1/PSY290H1/ANA300Y1

Recommended Preparation:
- Previous:
- New: HMB320H1