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

TO:	UTSC Academic Affairs Committee
SPONSOR: **CONTACT INFO:**	Prof. William A. Gough, Vice-Principal Academic and Dean 416-208-7027, vpdean.utsc@utoronto.ca
PRESENTER: **CONTACT INFO:**	Prof. Michael Souza: Acting Associate Dean, Undergraduate Programs and Curriculum, OVPD (416) 287-7191, adundergrad.utsc@utoronto.ca
DATE:	February 1, 2024 for February 8, 2024
AGENDA ITEM:	5

ITEM IDENTIFICATION:

Minor Modifications: Undergraduate Curriculum Changes - Sciences, UTSC (for approval)*

JURISDICTIONAL INFORMATION:

The UTSC Academic Affairs Committee (AAC) "is concerned with matters affecting the teaching, learning and research functions of the Campus (AAC *Terms of Reference*, 2021, Section 4)." Under section 5.6 of its terms of reference, the Committee is responsible for approval of "Major and minor modifications to existing degree programs." The AAC has responsibility for the approval of Major and Minor modifications to existing programs as defined by the U*niversity of Toronto Quality Assurance Process* (UTQAP, Section 3.1).

GOVERNANCE PATH:

1. UTSC Academic Affairs Committee [For Approval] (February 8, 2024)

HIGHLIGHTS:

This package includes minor modifications to undergraduate curriculum, submitted by the UTSC Sciences academic units identified below, which require governance approval. Minor modifications to curriculum are understood as those that do not have a significant impact on program or course learning outcomes. They require governance approval when they modestly change the nature of a program or course.

- The Department of Biological Sciences (Report: Biological Sciences)
    - 11 program modifications
        - SCMAJ1030B: MAJOR PROGRAM IN BIOLOGY (SCIENCE)

        - SCMAJ1150: MAJOR PROGRAM IN CONSERVATION AND BIODIVERSITY (SCIENCE)
        - SCMAJ0215: MAJOR PROGRAM IN HUMAN BIOLOGY (SCIENCE)
        - SCMAJ0220: MAJOR PROGRAM IN MOLECULAR BIOLOGY, IMMUNOLOGY AND DISEASE (SCIENCE)
        - SCMAJ1060: MAJOR PROGRAM IN PLANT BIOLOGY (SCIENCE)
        - SCSPE1150C: SPECIALIST (CO-OPERATIVE) PROGRAM IN CONSERVATION AND BIODIVERSITY (SCIENCE)
        - SCSPE1203C: SPECIALIST (CO-OPERATIVE) PROGRAM IN MOLECULAR BIOLOGY AND BIOTECHNOLOGY (SCIENCE)
        - SCSPE1150: SPECIALIST PROGRAM IN CONSERVATION AND BIODIVERSITY (SCIENCE)
        - SCSPE0215: SPECIALIST PROGRAM IN HUMAN BIOLOGY (SCIENCE)
        - SCSPE1030A: SPECIALIST PROGRAM IN INTEGRATIVE BIOLOGY (SCIENCE)
        - SCSPE1203: SPECIALIST PROGRAM IN MOLECULAR BIOLOGY AND BIOTECHNOLOGY (SCIENCE)
    - 1 new course
        - BIOB97H3: Bio-CURE: Course-based Undergraduate Research in Biological Sciences
    - 13 course modifications
        - BIOA01H3: Life on Earth: Unifying Principles
        - BIOA02H3: Life on Earth: Form, Function and Interactions
        - BIOC10H3: Cell Biology: Proteins from Life to Death
        - BIOC14H3: Genes, Environment and Behaviour
        - BIOC15H3: Genetics
        - BIOC17H3: Microbiology
        - BIOC19H3: Animal Developmental Biology
        - BIOC20H3: Principles of Virology
        - BIOC31H3: Plant Development and Biotechnology
        - BIOC35H3: Principles in Parasitology
        - BIOC39H3: Immunology
        - BIOC40H3: Plant Physiology
        - BIOD65H3: Pathologies of the Nervous System
- The Department of Physical & Environmental Sciences (Report: Physical & Environmental Sciences)
    - 4 program modifications
        - SCMAJ1076: MAJOR in ENVIRONMENTAL SCIENCE (SCIENCE)
        - SCSPE0351A: SPECIALIST in ENVIRONMENTAL GEOSCIENCE (SCIENCE)
        - SCSPE1076B: SPECIALIST in ENVIRONMENTAL PHYSICS (SCIENCE)
        - SCSPE0371: SPECIALIST in GLOBAL ENVIRONMENTAL CHANGE (SCIENCE)
    - 1 new course
        - EESC02H3: Invaded Environments
    - 4 course modifications
        - EESC16H3: Field Camp I
        - EESC22H3: Exploration Geophysics
        - EESC26H3: Seismology and Seismic Methods
        - EESD07H3: Field Camp II
- Arts & Science Co-op (Report: Arts & Science Co-op)

- 2 course retirements:
  - COPB36H3: Work Term in Biodiversity and its Field Assessment
  - COPC36H3: Co-op Work Term for Conservation and Biodiversity

FINANCIAL IMPLICATIONS:

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

RECOMMENDATION:

Be It Resolved:

THAT the proposed Sciences undergraduate curriculum changes for the 2024-25 academic year, as detailed in the respective curriculum reports, be approved.

DOCUMENTATION PROVIDED:

1. 2024-25 Curriculum Cycle Undergraduate Minor Curriculum Modifications for Approval Report: Biological Sciences, dated February 8, 2024.
2. 2024-25 Curriculum Cycle Undergraduate Minor Curriculum Modifications for Approval Report: Physical & Environmental Sciences, dated February 8, 2024.

UNIVERSITY OF TORONTO SCARBOROUGH

2024-25 Curriculum Cycle
Undergraduate Minor Curriculum Modifications for Approval
February 8, 2024

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Report: Biological Sciences

11 Program Modifications

SCMAJ1030B: MAJOR PROGRAM IN BIOLOGY (SCIENCE)

Completion Requirements:

Program Requirements
This program consists of 8.0 required credits.

First Year
1. 1.0 Credit of Introductory Biology Courses
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions

2. 1.0 Credit of Introductory Chemistry Courses
CHMA10H3 Introductory Chemistry I: Structure and Bonding
[CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms or CHMA12H3 Advanced General Chemistry]

3. 0.5 Credit in Mathematics or Statistics
Choose from:
MATA29H3 Calculus I for the Life Sciences
MATA30H3 Calculus I for Physical Sciences
STAB22H3 Statistics I
PSYB07H3 Data Analysis in Psychology

Second Year
4. 3.0 Credits of Biology Core Courses
BIOB10H3 Cell Biology
BIOB11H3 Molecular Aspects of Cellular and Genetic Processes
BIOB34H3 Animal Physiology
BIOB38H3 Plants and Society
BIOB50H3 Ecology
BIOB51H3 Evolutionary Biology

BIOB90H3 Integrative Research Poster Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOB90H3 is a graduation requirement for students in this program. Concurrent enrolment in at least one of the BIO B-level courses listed above is required for enrolment in BIOB90H3. Please see BIOB90H3 in the Calendar for important information.

5. 0.5 Credit of Biology Core Labs
Choose from:
BIOB12H3 Cell and Molecular Biology Laboratory
BIOB32H3 Animal Physiology Laboratory
BIOB33H3 Human Development and Anatomy Laboratory
BIOB52H3 Ecology and Evolutionary Biology Laboratory

Third Year
6. 1.5 Credits of Additional C-level Biology Courses
Choose from: Any BIO C-level courses offered by the department.
Note: NROC34H3 (Neuroethology) may also be used toward fulfilling this requirement.

BIOC90H3 Integrative Multimedia Documentary Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOC90H3 is a graduation requirement for students in this program. Concurrent enrolment in one of the participating BIO C-level courses is required for enrolment in BIOC90H3. Please see BIOC90H3 in the Calendar for important information.

Fourth Year
7. 0.5 Credit of Additional D-Level Biology Courses
Choose from: Any BIO D-level courses offered by the department. Note: that this includes the Biology Supervised Studies and Directed Research courses (BIOD95H3, BIOD98Y3 and BIOD99Y3).

Description of Proposed Changes:
Adding CHMA12H3 as an option

Rationale:
Chemistry offers two different Chemistry courses for the 2nd half of Chemistry. Many students are choosing to take CHMA12H3 instead of CHMA11H3. We are broadening student choice where they can complete either CHMA11H3 or CHMA12H3. This will also assist students who are double majoring in Chemistry programs and Biological Sciences programs.

Impact:
None

Consultations:
DCC July 28, 2023
S. Dalili October 16, 2023

Resource Implications:
None

SCMAJ1150: MAJOR PROGRAM IN CONSERVATION AND BIODIVERSITY (SCIENCE)

Completion Requirements:

Program Requirements
This program consists of 8.5 required credits.

First Year
1. 1.0 Credit of Introductory Biology Courses
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions

2. 1.0 Credit of Introductory Chemistry Courses
CHMA10H3 Introductory Chemistry I: Structure and Bonding
[CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms or CHMA12H3 Advanced General Chemistry]

3. 0.5 Credit in Mathematics or Statistics
Choose from:
MATA29H3 Calculus I for the Life Sciences
MATA30H3 Calculus I for Physical Sciences
STAB22H3 Statistics I
PSYB07H3 Data Analysis in Psychology

Second Year
4. 3.0 Credits of Biology Core Courses
BIOB10H3 Cell Biology
BIOB11H3 Molecular Aspects of Cellular and Genetic Processes
BIOB34H3 Animal Physiology
BIOB38H3 Plants and Society
BIOB50H3 Ecology
BIOB51H3 Evolutionary Biology

BIOB90H3 Integrative Research Poster Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOB90H3 is a graduation requirement for students in this program. Concurrent enrolment in at least one of the BIO B-level courses listed above is required for enrolment in BIOB90H3. Please see BIOB90H3 in the Calendar for important information.

5. 0.5 Credit of Biology Core Labs
BIOB52H3 Ecology and Evolutionary Biology Laboratory

Third Year
6. 1.0 Credit of Ecology & Evolution Foundation Courses
Choose from:
BIOC16H3 Evolutionary Genetics and Genomics
BIOC50H3 Macroevolution
BIOC52H3 Field Ecology
BIOC61H3 Community Ecology and Environmental Biology
BIOC63H3 Conservation Biology

7. 1.0 Credit of Other C-level Courses
Choose from:
BIOC37H3 Plants: Life on the Edge
BIOC40H3 Plant Physiology
BIOC51H3 Tropical Biodiversity Field Course
BIOC54H3 Animal Behaviour

BIOC58H3 Biological Consequences of Global Change
BIOC59H3 Advanced Population Ecology
BIOC60H3 Winter Ecology
BIOC62H3 Role of Zoos and Aquariums in Conservation
BIOC65H3 Environmental Toxicology
(BIOC67H3) Inter-University Biology Field Course
EESC04H3 Biodiversity and Biogeography
EESC30H3 Environmental Microbiology

BIOC90H3 Integrative Multimedia Documentary Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOC90H3 is a graduation requirement for students in this program. Concurrent enrolment in one of the participating BIO C-level courses is required for enrolment in BIOC90H3. Please see BIOC90H3 in the Calendar for important information.

Fourth Year
8. 0.5 Credit of D-level Courses
Choose from:
BIOD25H3 Genomics
BIOD26H3 Fungal Biology & Pathogenesis
BIOD34H3 Conservation Physiology
BIOD43H3 Animal Movement and Exercise
BIOD45H3 Animal Communication
BIOD48H3 Ornithology
BIOD52H3 Biodiversity and Conservation
BIOD53H3 Special Topics in Animal Behaviour
BIOD54H3 Applied Conservation Biology
BIOD55H3 Experimental Animal Behaviour
BIOD59H3 Models in Ecology, Epidemiology and Conservation
BIOD60H3 Spatial Ecology
BIOD62H3 Symbiosis: Interactions Between Species
BIOD63H3 From Individuals to Ecosystems: Advanced Topics in Ecology
BIOD66H3 Causes & Consequences of Biodiversity
BIOD67H3 Inter-University Biology Field Course
EESD15H3 Fundamentals of Site Remediation

Description of Proposed Changes:
Adding CHMA12H3 as an option

Rationale:
Chemistry offers two different Chemistry courses for the 2nd half of Chemistry. Many students are choosing to take CHMA12H3 instead of CHMA11H3. We are broadening student choice where they can complete either CHMA11H3 or CHMA12H3. This will also assist students who are double majoring in Chemistry programs and Biological Sciences programs.

Impact:
None

Consultations:
DCC July 28, 2023
S. Dalili October 16, 2023

Resource Implications:
None

SCMAJ0215: MAJOR PROGRAM IN HUMAN BIOLOGY (SCIENCE)

Completion Requirements:

Program Requirements:
This program consists of 8.5 credits.

Required Courses and Suggested Course Sequence

First Year
1. 1.0 Credit of Introductory Biology Courses
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions

2. 1.0 Credit in Introductory Chemistry Courses
CHMA10H3 Introductory Chemistry I: Structure and Bonding
[CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms or CHMA12H3 Advanced General Chemistry]

3. 1.0 Credit in Introductory Psychology Courses
PSYA01H3 Introduction to Biological and Cognitive Psychology
PSYA02H3 Introduction to Clinical, Developmental, Personality and Social Psychology

4. 0.5 Credit in Mathematics or Statistics
Choose From:
MATA29H3 Calculus I for the Life Sciences
MATA30H3 Calculus I for Physical Sciences
STAB22H3 Statistics I
PSYB07H3 Data Analysis in Psychology

Second Year

5. 2.5 Credits of Biology Core Courses
BIOB10H3 Cell Biology
BIOB11H3 Molecular Aspects of Cellular and Genetic Processes
BIOB34H3 Animal Physiology
BIOB50H3 Ecology
BIOB51H3 Evolutionary Biology

BIOB90H3 Integrative Research Poster Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOB90H3 is a graduation requirement for students in this program. Concurrent enrolment in at least one of the BIO B-level courses listed above is required for enrolment in BIOB90H3. Please see BIOB90H3 in the Calendar for important information.

6. 0.5 Credit in a Biology Core Lab
Choose From:
BIOB32H3 Animal Physiology Laboratory
BIOB33H3 Human Development and Anatomy

Third/Fourth Years
7. 1.5 Credits of C-Level Courses
Choose From:
BIOC10H3 Cell Biology: Proteins from Life to Death
BIOC14H3 Genes, Environment and Behaviour
BIOC15H3 Genetics
BIOC16H3 Evolutionary Genetics and Genomics
BIOC17H3 Microbiology
BIOC19H3 Animal Developmental Biology
BIOC20H3 Principles of Virology
BIOC21H3 Vertebrate Histology: Cells and Tissues
BIOC32H3 Human Physiology I
BIOC34H3 Human Physiology II
BIOC35H3 Principles of Parasitology
BIOC39H3 Immunology
BIOC54H3 Animal Behaviour
BIOC58H3 Biological Consequences of Global Change
BIOC65H3 Environmental Toxicology

BIOC90H3 Integrative Multimedia Documentary Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOC90H3 is a graduation requirement for students in this program. Concurrent enrolment in one of the participating BIO C-level courses is required for enrolment in BIOC90H3. Please see BIOC90H3 in the Calendar for important information.

8. 0.5 Credit of D-Level ~~Biology~~ Courses
Choose From:
BIOD06H3 Advanced Topics in Neural Basis of Motor Control
BIOD07H3 Advanced Topics and Methods in Neural Circuit Analysis
BIOD08H3 Theoretical Neuroscience
BIOD12H3 Protein Homeostasis
BIOD15H3 Mechanisms of Gene Regulation in Health and Disease
BIOD17H3 Seminars in Cellular Microbiology
BIOD19H3 Epigenetics in Health and Disease
BIOD20H3 Special Topics in Virology
BIOD24H3 Human Stem Cell Biology and Regenerative Medicine
BIOD25H3 Genomics
BIOD26H3 Fungal Biology and Pathogenesis
BIOD27H3 Vertebrate Endocrinology
BIOD29H3 Pathobiology of Human Disease
BIOD32H3 Human Respiratory Pathophysiology
BIOD33H3 Comparative Animal Physiology
BIOD35H3 Sports Science
BIOD43H3 Animal Movement and Exercise
BIOD59H3 Models in Ecology, Epidemiology and Conservation
BIOD65H3 Pathologies of the Nervous System
BIOD95H3 Supervised Study in Biology (topic must be human-related and approved by the program supervisor)
HLTD44H3 Environmental Contaminants, Vulnerability and Toxicity

Description of Proposed Changes:
Adding CHMA12H3 as an option. Adding HLTD44H3 to D level bin options and removing Biology from the header to include the HLT course.

Rationale:
Chemistry offers two different Chemistry courses for the 2nd half of Chemistry. Many students are choosing to take CHMA12H3 instead of CHMA11H3. We are broadening student choice where they can complete either CHMA11H3 or CHMA12H3. This will also assist students who are double majoring in Chemistry programs and Biological Sciences programs.
Adding HLTD44H3: Health and Society has modified the prerequisites to include Biology courses that are already part of this program and therefore students can take this course without taking additional prerequisites. The topics are human focused giving students more options in the Human Biology program.

Impact:
None

Consultations:

DCC July 28, 2023
DCC Health and Society October 17, 2023
S. Dalili October 16, 2023

Resource Implications:
None

SCMAJ0220: MAJOR PROGRAM IN MOLECULAR BIOLOGY, IMMUNOLOGY AND DISEASE (SCIENCE)

Completion Requirements:

Program Requirements
This program consists of 8.5 credits.

First Year
1. 1.0 Credit of Introductory Biology Courses
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions

2. 1.0 Credit of Introductory Chemistry Courses
CHMA10H3 Introductory Chemistry I: Structure and Bonding
[CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms or CHMA12H3 Advanced General Chemistry]

3. 0.5 Credit in Mathematics or Statistics
Choose from:
MATA29H3 Calculus I for the Life Sciences
MATA30H3 Calculus I for Physical Sciences
STAB22H3 Statistics I
PSYB07H3 Data Analysis in Psychology

Second Year
4. 2.5 Credits of Biology Core Courses
BIOB10H3 Cell Biology
BIOB11H3 Molecular Aspects of Cellular and Genetic Processes
BIOB34H3 Animal Physiology
BIOB50H3 Ecology
BIOB51H3 Evolutionary Biology

BIOB90H3 Integrative Research Poster Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOB90H3 is a graduation requirement for students in this program. Concurrent enrolment in at least one of the BIO B-level courses listed above is required for enrolment in BIOB90H3. Please see BIOB90H3 in the Calendar for important information.

5. 0.5 Credit in a Biology Core Lab
Choose From:
BIOB12H3 Cell and Molecular Biology Laboratory
BIOB32H3 Animal Physiology Laboratory
BIOB33H3 Human Development and Anatomy

Third/Fourth Years
6. 1.5 Credit of Required C-level Courses
BIOC17H3 Microbiology
BIOC20H3 Principles of Virology
BIOC39H3 Immunology

7. 1.0 Credit of Additional C-level Courses
Choose from:
BIOC10H3 Cell Biology: Proteins from Life to Death
BIOC12H3 Biochemistry I: Proteins & Enzymes
BIOC13H3 Biochemistry II: Bioenergetics and Metabolism
BIOC14H3 Genes, Environment and Behaviour
BIOC15H3 Genetics
BIOC19H3 Animal Developmental Biology
BIOC31H3 Plant Development and Biotechnology
BIOC35H3 Principles of Parasitology

BIOC90H3 Integrative Multimedia Documentary Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOC90H3 is a graduation requirement for students in this program. Concurrent enrolment in one of the participating BIO C-level courses is required for enrolment in BIOC90H3. Please see BIOC90H3 in the Calendar for important information.

8. 0.5 credit of D-level Biology Courses
Choose from:
BIOD12H3 Protein Homeostasis
BIOD13H3 Herbology: The Science Behind Medicinal Plants
BIOD15H3 Mechanisms of Gene Regulation in Health and Disease
BIOD17H3 Seminars in Cellular Microbiology
BIOD19H3 Epigenetics in Health and Disease
BIOD20H3 Special Topics in Virology

BIOD23H3 Special Topics in Cell Biology
BIOD24H3 Human Stem Cell Biology and Regenerative Medicine
BIOD25H3 Genomics
BIOD26H3 Fungal Biology and Pathogenesis
BIOD27H3 Vertebrate Endocrinology
BIOD29H3 Pathobiology of Human Disease

Description of Proposed Changes:
Adding CHMA12H3 as an option

Rationale:
Chemistry offers two different Chemistry courses for the 2nd half of Chemistry. Many students are choosing to take CHMA12H3 instead of CHMA11H3. We are broadening student choice where they can complete either CHMA11H3 or CHMA12H3. This will also assist students who are double majoring in Chemistry programs and Biological Sciences programs.

Impact:
none

Consultations:
DCC July 28, 2023
S. Dalili October 16, 2023

Resource Implications:
None

SCMAJ1060: MAJOR PROGRAM IN PLANT BIOLOGY (SCIENCE)

Completion Requirements:

Program Requirements
Students are required to complete a total of 8.5 credits.

Required Courses and Suggested Course Sequence:

First Year
1. 1.0 Credit of Introductory Biology Courses
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions

2. 1.0 Credit of Introductory Chemistry Courses
CHMA10H3 Introductory Chemistry I: Structure and Bonding
[CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms or CHMA12H3 Advanced General Chemistry]

3. 0.5 Credit of Statistics Courses
Choose From:
STAB22H3 Statistics I
PSYB07H3 Data Analysis in Psychology

Second Year
4. 2.5 Credits of Biology Core Courses
BIOB10H3 Cell Biology
BIOB11H3 Molecular Aspects of Cellular and Genetic Processes
BIOB38H3 Plants and Society
BIOB50H3 Ecology
BIOB51H3 Evolutionary Biology

BIOB90H3 Integrative Research Poster Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOB90H3 is a graduation requirement for students in this program. Concurrent enrolment in at least one of the BIO B-level courses listed above is required for enrolment in BIOB90H3. Please see BIOB90H3 in the Calendar for important information.

5. 0.5 Credit of Biology Core Labs
Choose From:
BIOB12H3 Cell and Molecular Biology Laboratory
BIOB52H3 Ecology and Evolutionary Biology Laboratory

Third Year
6. 1.5 Credits of C-level Plant Courses
BIOC31H3 Plant Development and Biotechnology
BIOC37H3 Plants: Life on the Edge
BIOC40H3 Plant Physiology

Third/ Fourth Year
7. 1.0 Credit of Additional C-level Courses
Choose From:
BIOC12H3 Biochemistry I: Proteins and Enzymes
BIOC13H3 Biochemistry II: Bioenergetics and Metabolism
BIOC15H3 Genetics
BIOC17H3 Microbiology
BIOC35H3 Principles in Parasitology
BIOC50H3 Macroevolution
BIOC52H3 Field Ecology
BIOC61H3 Community Ecology and Environmental Biology

BIOC90H3 Integrative Multimedia Documentary Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOC90H3 is a graduation requirement for students in this program. Concurrent enrolment in one of the participating BIO C-level courses is required for enrolment in BIOC90H3. Please see BIOC90H3 in the Calendar for important information.

Fourth Year
8. 0.5 Credit of D-level Biology Courses
Choose From:
BIOD12H3 Protein Homeostasis
BIOD13H3 Herbology: The Science Behind Medicinal Plants
BIOD21H3 Advanced Molecular Biology Laboratory
BIOD26H3 Fungal Biology and Pathogenesis
BIOD30H3 Plant Research and Biotechnology: Addressing Global Problems
BIOD37H3 Biology of Plant Stress
BIOD62H3 Symbiosis: Interactions Between Species

Note: Students who are interested in research or graduate studies can choose to take BIOC99H3, BIOD95H3, BIOD98Y3 or BIOD99Y3 supervised study courses with faculty to obtain additional research experience and training in plant biology.

Description of Proposed Changes:
Adding CHMA12H3 as an option

Rationale:
Chemistry offers two different Chemistry courses for the 2nd half of Chemistry. Many students are choosing to take CHMA12H3 instead of CHMA11H3. We are broadening student choice where they can complete either CHMA11H3 or CHMA12H3. This will also assist students who are double majoring in Chemistry programs and Biological Sciences programs.

Impact:
None

Consultations:
DCC July 28, 2023
S. Dalili October 16, 2023

Resource Implications:
None

SCSPE1150C: SPECIALIST (CO-OPERATIVE) PROGRAM IN CONSERVATION AND BIODIVERSITY (SCIENCE)

Completion Requirements:

The program requires students to complete a total of 14.5 credits.

A. Required Courses

First Year

1. 1.0 Credit of Introductory Biology Courses
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions

2. 1.0 Credit of Introductory Chemistry Courses
CHMA10H3 Introductory Chemistry I: Structure and Bonding
[CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms or CHMA12H3 Advanced General Chemistry]

3. 1.0 Credit in Mathematics
Choose from:
[MATA29H3 Calculus I for the Life Sciences and MATA35H3 Calculus II for Biological Sciences] or
[MATA30H3 Calculus I for Physical Sciences and MATA36H3 Calculus II for Physical Sciences]

4. 0.5 Credit in Physics
Choose from:
PHYA10H3 Physics I for the Physical Sciences
PHYA11H3 Physics I for the Life Sciences

5. 0.5 Credit in Computer Science
Choose from:
CSCA08H3 Introduction to Computer Science I (most appropriate course for Computer Science students)
CSCA20H3 Introduction to Programming (most appropriate course for non-Computer Science students)

Second Year

6. 3.0 Credits of Biology Core Courses
BIOB10H3 Cell Biology
BIOB11H3 Molecular Aspects of Cellular and Genetic Processes
BIOB34H3 Animal Physiology
BIOB38H3 Plants and Society
BIOB50H3 Ecology
BIOB51H3 Evolutionary Biology
BIOB90H3 Integrative Research Poster Project (CR/NCR 0.0 credit)*

*Note: Completion of BIOB90H3 is a graduation requirement for students in this program. Concurrent enrolment in at least one of the BIO B-level courses listed above is required for enrolment in BIOB90H3. Please see BIOB90H3 in the Calendar for important information.

7. 0.5 Credit of Biology Core Labs
BIOB52H3 Ecology and Evolutionary Biology Laboratory

8. 0.5 Credit in Statistics
Choose from:
STAB22H3 Statistics I
PSYB07H3 Data Analysis in Psychology

Third Year

9. 2.5 Credits of C-level Ecology and Evolution Foundation Courses
BIOC16H3 Evolutionary Genetics and Genomics
BIOC50H3 Macroevolution
BIOC52H3 Field Ecology
BIOC61H3 Community Ecology and Environmental Biology
BIOC63H3 Conservation Biology

Third/Fourth Year

10. 4.0 credits of C- & D-level courses from Bins 1 and 2 below. This must include at least 1.0 credit from each bin and at least 1.0 credit total at the D-level.

Bin 1: C- & D-level Ecology and Evolution Courses
Choose from:
BIOC29H3 Introductory Mycology
BIOC51H3 Tropical Biodiversity Field Course
BIOC58H3 Biological Consequences of Global Change
BIOC60H3 Winter Ecology
BIOC65H3 Environmental Toxicology
BIOD25H3 Genomics
BIOD52H3 Biodiversity and Conservation
BIOD54H3 Applied Conservation Biology
BIOD55H3 Experimental Animal Behaviour
BIOD59H3 Models in Ecology, Epidemiology and Conservation
BIOD60H3 Spatial Ecology
BIOD62H3 Symbiosis: Interactions Between Species
BIOD63H3 From Individuals to Ecosystems: Advanced Topics in Ecology
BIOD66H3 Causes and Consequences of Biodiversity
BIOD67H3 Inter-University Biology Field Course
EESC04H3 Biodiversity and Biogeography

Bin 2: C- & D-level Organismal Biology Courses
Choose from:
BIOC37H3 Plants: Life on the Edge
BIOC40H3 Plant Physiology
BIOC54H3 Animal Behaviour
BIOC59H3 Advanced Population Ecology
BIOC62H3 Role of Zoos and Aquariums in Conservation
BIOD26H3 Fungal Biology & Pathogenesis
BIOD34H3 Conservation Physiology
BIOD37H3 Biology of Plant Stress
BIOD43H3 Animal Movement and Exercise
BIOD45H3 Animal Communication
BIOD48H3 Ornithology
BIOD53H3 Special Topics in Animal Behaviour
EESC30H3 Environmental Microbiology
BIOC90H3 Integrative Multimedia Documentary Project (CR/NCR 0.0 credit)*

***Note:** Completion of BIOC90H3 is a graduation requirement for students in this program. Concurrent enrolment in one of the participating BIO C-level courses is required for enrolment in BIOC90H3. Please see BIOC90H3 in the Calendar for important information.

B. Senior Research Courses (optional)
Students interested in graduate research are encouraged to take one or more of the independent research courses offered in Biological Sciences as part of their degree.
BIOD95H3 Supervised Study in Biology
BIOD98Y3 Directed Research in Biology
BIOD99Y3 Directed Research in Biology

Co-op Work Term Requirements

Students must satisfactorily complete Co-op work term(s) as follows: three 4-month work terms, one 4-month work term and one 8-month work term, or one 12-month work term. To be eligible for their first work term, students must be enrolled in the Specialist (Co-op) Program in Conservation and Biodiversity and have completed at least 7.0 credits, achieve a cumulative GPA of 2.5 or higher, and complete COPB50H3 and COPB51H3.

1. To be eligible for the first work term (COPB36H3), students must be enrolled in the Specialist (Co-operative) program in Conservation and Biodiversity and have completed at least 7.0 credits, achieve a cumulative GPA of 2.5 or higher.
2. To be eligible for the second and third work terms (COPC36H3), students must have completed at least 10.0 credits, including BIOB50H3 and BIOB51H3.

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

Co-op Course Requirements
In addition to their academic program requirements, Co-op students complete the following Co-op specific courses as part of their degree:

- First Work Term and Preparation course: COPB36H3
- Co-op Preparation courses: COPB50H3 and COPB51H3 (completed in first year)
- Work Term Search courses: COPB52H3 (semester prior to first second work term), COPC98H3 (semester prior to second third work term), and COPC99H3 (semester prior to third work term)
- Co-op Work Term courses: COPC30H3 COPC36H3 (each semester a student is on work term)

These courses are designed to prepare students for their job search and work term experience, and to maximize the benefits of their Co-op work terms. They must be completed in sequence, and fall into three categories: Co-op Preparation courses (COPB50H3 & COPB51H3) are completed in first year, and cover a variety of topics intended to assist students in developing the skills and tools required to secure a work term; Work Term Search Courses (COPB52H3, COPC98H3, & COPC99H3) are completed in the semester prior to each work term, and support students while competing for work terms that are appropriate to their program of study, as well as preparing students for the transition into and how to succeed the workplace; Co-op Work Term courses (COPC30H3) are completed during each semester that a student is on work term, and support students' success while on work term, as well as connecting their academics and the workplace experience.

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

For information on fees, status in Co-op programs, and certification of completion of Co-op programs, see the Co-operative Programs section or the Arts and Science Co-op section in the UTSC *Calendar*.

Enrolment Requirements:

Enrolment in the program is limited. Students may apply to enter the program after completing 4.0 credits, which must include the following courses: BIOA01H3, BIOA02H3, CHMA10H3, CHMA11H3, and [MATA29H3 or MATA30H3 or MATA35H3 or MATA36H3]; students must also have achieved a cumulative GPA of at least 2.75.
Students apply to the Co-op Specialist Program in Conservation and Biodiversity after completing a minimum of 4.0 credits, including 1.0 credit in Biology (excluding BIOA11H3), 1.0 credit in Chemistry, and 0.5 credit in Mathematics (excluding MATA02H3) or Statistics and with a minimum cumulative grade point average (CGPA) of at least 2.5.

Current Co-op Students:
Students admitted to a Co-op Degree Program in their first year of study (i.e. Life Sciences Co-op) may request this Co-op Subject POSt on ACORN only after completion of 4.0 credits; in addition, students must meet the minimum enrolment requirements for entry as noted above for this program. Students must also submit a formal application to the department to be considered for the program. This includes a one-page statement for why they are suitable candidates to take the program. Short-listed students will be invited to an oral interview to determine interest and eligibility.

Prospective Co-op Students:
Prospective Co-op students (i.e., those not yet admitted to a Co-op Degree POSt) must submit a program request on ACORN, and meet the minimum qualifications noted above. Deadlines follow the Limited Enrolment Program Application Deadlines set by the Office of the Registrar each year. Failure to submit the program request on ACORN will result in that student's application not being considered. Students must also submit a formal application to the department to be considered for the program. This includes a one-page statement for why they are suitable candidates to take the program. Short-listed students will be invited to an oral interview to determine interest and eligibility.

Description of Proposed Changes:
Updating enrolment requirements
Removing COPB36H3
Adding CHMA12H3 Advanced General Chemistry as an option

Rationale:
Changing the enrolment requirements at the request of co-op to make all requirements consistent across all of our programs. We are removing COPB36H3 as a course due to the recent changes making all of our programs including the Major in Conservation and Biodiversity co-op programs. This will ensure all of our co-op programs are consistent with work term requirements. Chemistry offers two different Chemistry courses for the 2nd half of Chemistry. Many students are choosing to take CHMA12H3 instead of CHMA11H3. We are broadening student choice where they can complete either CHMA11H3 or CHMA12H3. This will also assist students who are double majoring in Chemistry programs and Biological Sciences programs.

Impact:
None

Consultations:
DCC July 28, 2023
Co-op program approvals 2022-2023 to be applied to students entering in 2023/2024 Academic year
S. Dalili Oct 16, 2023
Co-op office consulted re: work term prerequisites; Oct 18, 2023 (entered in CM by curriculum staff)

Resource Implications:
None

SCSPE1203C: SPECIALIST (CO-OPERATIVE) PROGRAM IN MOLECULAR BIOLOGY AND BIOTECHNOLOGY (SCIENCE)

Completion Requirements:

Program Requirements
The program requires students to complete a total of 14.5 credits.

First Year
1. 1.0 Credit of Introductory Biology Courses
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions

2. 1.0 Credit of Introductory Chemistry Courses
CHMA10H3 Introductory Chemistry I: Structure and Bonding
[CHMA11H3 Introductory Chemistry I: Reactions and Mechanisms or CHMA12H3 Advanced General Chemistry]

3. 1.0 Credit in Mathematics
Choose from:
[MATA29H3 Calculus I for the Life Sciences or MATA30H3 Calculus I for Physical Sciences]
and
[MATA35H3 Calculus II for Biological Sciences or MATA36H3 Calculus II for Physical Sciences]

4. 1.0 Credit in Physics
[PHYA10H3 Physics I for the Physical Sciences or PHYA11H3 Physics I for the Life Sciences]
[PHYA21H3 Physics II for the Physical Sciences or PHYA22H3 Physics II for the Life Sciences]

5. 0.5 Credit in Statistics
Choose from:
STAB22H3 Statistics I (this course could also be taken in the second year)
PSYB07H3 Data Analysis in Psychology (this course could also be taken in the second year)

Second Year
6. 3.0 Credits of Biology Core Courses
BIOB10H3 Cell Biology
BIOB11H3 Molecular Aspects of Cellular and Genetic Processes
BIOB34H3 Animal Physiology
BIOB38H3 Plants and Society
BIOB50H3 Ecology
BIOB51H3 Evolutionary Biology
BIOB90H3 Integrative Research Poster Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOB90H3 is a graduation requirement for students in this program. Concurrent enrolment in at least one of the BIO B-level courses listed above is required for enrolment in BIOB90H3. Please see BIOB90H3 in the Calendar for important information.

7. 0.5 Credit of Biology Core Labs
BIOB12H3 Cell and Molecular Biology Laboratory

8. 1.0 Credit of Organic Chemistry Courses
CHMB41H3 Organic Chemistry I
CHMB42H3 Organic Chemistry II

Note: Computer Science might be taken in this year and will enhance Co-op placement options.

Third Year
9. 3.5 Credits of Biology C-level Courses
BIOC12H3 Biochemistry I: Proteins and Enzymes
BIOC13H3 Biochemistry II: Bioenergetics and Metabolism
BIOC15H3 Genetics
BIOC17H3 Microbiology
BIOC20H3 Principles of Virology
BIOC23H3 Practical Approaches to Biochemistry
BIOC39H3 Immunology (can be completed in third or fourth year)

10. 0.5 Credit in Computer Science
Choose from:
CSCA08H3 Introduction to Computer Science I (most appropriate course for computer science students)
CSCA20H3 Introduction to Programming (most appropriate course for non-computer science students)

Third/Fourth Year
11. 0.5 Credit of Cognate Biology Courses
Choose from:
BIOC10H3 Cell Biology: Proteins from Life to Death
BIOC14H3 Genes, Environment and Behaviour
BIOC19H3 Animal Developmental Biology
BIOC21H3 Vertebrate Histology: Cells and Tissues
BIOC31H3 Plant Development and Biotechnology
BIOC35H3 Principles of Parasitology
BIOC40H3 Plant Physiology

BIOC70H3 An Introduction to Bias in the Sciences
BIOD37H3 Biology of Plant Stress
BIOC90H3 Integrative Multimedia Documentary Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOC90H3 is a graduation requirement for students in this program. Concurrent enrolment in one of the participating BIO C-level courses is required for enrolment in BIOC90H3. Please see BIOC90H3 in the Calendar for important information.

Fourth Year
12. 0.5 Credit in Advanced Molecular Techniques
BIOD21H3 Advanced Molecular Biology Laboratory

13. 0.5 Credit of D-level Research-Oriented "Cell & Molecular" Course Work
Choose from:
BIOD12H3 Protein Homeostasis
BIOD13H3 Herbology: The Science Behind Medicinal Plants
BIOD15H3 Mechanisms of Gene Regulation in Health and Disease
BIOD17H3 Seminars in Cellular Microbiology
BIOD19H3 Epigenetics in Health and Disease
BIOD20H3 Special Topics in Virology
BIOD22H3 Molecular Biology of the Stress Response
BIOD23H3 Special Topics in Cell Biology
BIOD24H3 Human Stem Cell Biology and Regenerative Medicine
BIOD25H3 Genomics
BIOD26H3 Fungal Biology and Pathogenesis
BIOD27H3 Vertebrate Endocrinology
BIOD29H3 Pathobiology of Human Disease
BIOD30H3 Plant Research and Biotechnology: Addressing Global Problems
BIOD95H3 Supervised Study in Biology
BIOD98Y3 Directed Research in Biology
Note: Any of these courses not used to satisfy this requirement can be used to fulfill the '0.5 credit of Cognate Biology Courses.'

Co-op Work Term Requirements

Students must satisfactorily complete Co-op work term(s) as follows: three 4-month work terms, one 4-month work term and one 8-month work term, or one 12-month work term. To be eligible for their first work term, students must be enrolled in the Specialist (Co-op) Program in Molecular Biology and Biotechnology and have completed at least 7.0 credits, achieve a cumulative GPA of 2.5 or higher, and complete COPB50H3 and COPB51H3. Completion of BIOB10H3, BIOB11H3, BIOB12H3, CHMB41H3 and CHMB42H3 are strongly recommended prior to second work term.

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

Co-op Course Requirements

In addition to their academic program requirements, Co-op students complete the following Co-op specific courses as part of their degree:

- Co-op Preparation courses: COPB50H3 and COPB51H3 (completed in first year)
- Work Term Search courses: COPB52H3 (semester prior to first work term), COPC98H3 (semester prior to second work term), and COPC99H3 (semester prior to third work term)
- Co-op Work Term courses: ~~COPC36H3~~ COPC30H3 (each semester a student is on work term)

These courses are designed to prepare students for their job search and work term experience, and to maximize the benefits of their Co-op work terms. They must be completed in sequence, and fall into three categories: Co-op Preparation courses (COPB50H3 & COPB51H3) are completed in first year, and cover a variety of topics intended to assist students in developing the skills and tools required to secure a work term; Work Term Search Courses (COPB52H3, COPC98H3, & COPC99H3) are completed in the semester prior to each work term, and support students while competing for work terms that are appropriate to their program of study, as well as preparing students for the transition into and how to succeed the workplace; Co-op Work Term courses (~~COPC36H3~~ COPC30H3) are completed during each semester that a student is on work term, and support students' success while on work term, as well as connecting their academics and the workplace experience.

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

For information on fees, status in Co-op programs, and certification of completion of Co-op programs, see the Co-operative Programs section or the Arts and Science Co-op section in the UTSC *Calendar*.

Enrolment Requirements:

~~The minimum qualifications for entry are 7.0 credits, which must include the following courses: BIOA01H3, BIOA02H3, CHMA10H3, CHMA11H3, [[MATA29H3 and MATA35H3], or [MATA30H3 and MATA36H3]], [PHYA10H3 or PHYA11H3]; and a cumulative GPA of at least 2.75.~~
Students apply to the Specialist Program in Molecular Biology and Biotechnology after completing a minimum of 4.0 credits, including 1.0 credit in Biology (excluding BIOA11H3), 1.0 credit in Chemistry, and 0.5 credit in Mathematics (excluding MATA02H3) or Statistics and with a minimum cumulative grade point average (CGPA) of at least 2.5

Current Co-op Students:
Students admitted to a Co-op Degree POSt in their first year of study must request a Co-op Subject POSt on ACORN upon completion of 4.0 credits and must meet the minimum qualifications for entry as noted above.

Prospective Co-op Students:
Prospective Co-op students (i.e., those not yet admitted to a Co-op Degree POSt) must submit a program request on ACORN, and meet the minimum qualifications noted above. Deadlines follow the Limited Enrolment Program Application Deadlines set by the Office of the Registrar each year. Failure to submit the program request on ACORN will result in that student's application not being considered.

Description of Proposed Changes:
Updating enrolment requirements Adding CHMA12H3 as an option

Rationale:
Chemistry offers two different Chemistry courses for the 2nd half of Chemistry. Many students are choosing to take CHMA12H3 instead of CHMA11H3. We are broadening student choice where they can complete either CHMA11H3 or CHMA12H3. This will also assist students who are double majoring in Chemistry programs and Biological Sciences programs.
Changing the enrolment requirements at the request of co-op to make all requirements consistent across all of our programs. (Retirement of COPC36H3 and introducing COPC30H3)
Removed numbered calendar section 6B.5 referenced in the Academic Calendar.

Impact:
None

Consultations:
DCC July 28, 2023
Co-op program approvals 2022-2023 to be applied to students entering in 2023/2024 Academic year
S. Dalili October 16, 2023

Resource Implications:
None

SCSPE1150: SPECIALIST PROGRAM IN CONSERVATION AND BIODIVERSITY (SCIENCE)

Completion Requirements:

Program Requirements
This program consists of 14.5 required credits.

A. Required Courses

First Year
1. 1.0 Credit of Introductory Biology Courses
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions

2. 1.0 Credit of Introductory Chemistry Courses
CHMA10H3 Introductory Chemistry I: Structure and Bonding
[CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms or CHMA12H3 Advanced General Chemistry]

3. 1.0 Credit in Mathematics
Choose from:
[MATA29H3 Calculus I for the Life Sciences or MATA30H3 Calculus I for Physical Sciences]
and
[MATA35H3 Calculus II for Biological Sciences or MATA36H3 Calculus II for Physical Sciences]

4. 0.5 Credit in Physics
Choose from:
PHYA10H3 Physics I for the Physical Sciences
PHYA11H3 Physics I for the Life Sciences

5. 0.5 Credit in Computer Science
Choose from:
CSCA08H3 Introduction to Computer Science I (most appropriate course for computer science students)
CSCA20H3 Introduction to Programming (most appropriate course for non-computer science students)

Second Year
6. 3.0 Credits of Biology Core Courses
BIOB10H3 Cell Biology
BIOB11H3 Molecular Aspects of Cellular and Genetic Processes
BIOB34H3 Animal Physiology
BIOB38H3 Plants and Society
BIOB50H3 Ecology
BIOB51H3 Evolutionary Biology
BIOB90H3 Integrative Research Poster Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOB90H3 is a graduation requirement for students in this program. Concurrent enrolment in at least one of the BIO B-level courses listed above is required for enrolment in BIOB90H3. Please see BIOB90H3 in the Calendar for important information.

7. 0.5 Credit of Biology Core Labs
BIOB52H3 Ecology and Evolutionary Biology Laboratory

8. 0.5 Credit in Statistics
Choose from:
STAB22H3 Statistics I
PSYB07H3 Data Analysis in Psychology

Third Year
9. 2.5 Credits of C-level Ecology and Evolution Foundation Courses
BIOC16H3 Evolutionary Genetics and Genomics
BIOC50H3 Macroevolution
BIOC52H3 Field Ecology
BIOC61H3 Community Ecology and Environmental Biology
BIOC63H3 Conservation Biology

Third/Fourth Year
10. 4.0 credits of C- & D-level courses from Bins 1 and 2 below. This must include at least 1.0 credit from each bin and at least 1.0 credit total at the D-level.

Bin 1: C- & D-level Ecology and Evolution Courses
Choose from:
BIOC51H3 Tropical Biodiversity Field Course
BIOC58H3 Biological Consequences of Global Change
BIOC60H3 Winter Ecology
BIOC65H3 Environmental Toxicology
(BIOC67H3) Inter-University Biology Field Course
BIOD25H3 Genomics
BIOD52H3 Biodiversity and Conservation
BIOD54H3 Applied Conservation Biology
BIOD55H3 Experimental Animal Behaviour
BIOD59H3 Models in Ecology, Epidemiology and Conservation
BIOD60H3 Spatial Ecology
BIOD62H3 Symbiosis: Interactions Between Species
BIOD63H3 From Individuals to Ecosystems: Advanced Topics in Ecology
BIOD66H3 Causes and Consequences of Biodiversity
BIOD67H3 Inter-University Biology Field Course
EESC04H3 Biodiversity and Biogeography

Bin 2: C- & D-level Organismal Biology Courses
Choose from:
BIOC29H3 Introductory Mycology
BIOC37H3 Plants: Life on the Edge
BIOC40H3 Plant Physiology
BIOC54H3 Animal Behaviour
BIOC59H3 Advanced Population Ecology
BIOC62H3 Role of Zoos and Aquariums in Conservation
BIOC70H3 An Introduction to Bias in the Sciences
BIOD26H3 Fungal Biology & Pathogenesis
BIOD34H3 Conservation Physiology
BIOD37H3 Biology of Plant Stress
BIOD43H3 Animal Movement and Exercise
BIOD45H3 Animal Communication
BIOD48H3 Ornithology
BIOD53H3 Special Topics in Animal Behaviour
EESC30H3 Environmental Microbiology
BIOC90H3 Integrative Multimedia Documentary Project (CR/NCR 0.0 credit)*
*__Note__: Completion of BIOC90H3 is a graduation requirement for students in this program. Concurrent enrolment in one of the participating BIO C-level courses is required for enrolment in BIOC90H3. Please see BIOC90H3 in the Calendar for important information.

B. Senior Research Courses (optional)
Students interested in graduate research are encouraged to take one or more of the independent research courses offered in Biological Sciences as part of their degree.
BIOD95H3 Supervised Study in Biology
BIOD98Y3 Directed Research in Biology
BIOD99Y3 Directed Research in Biology

Description of Proposed Changes:
Adding CHMA12H3 as an option

Rationale:
Chemistry offers two different Chemistry courses for the 2nd half of Chemistry. Many students are choosing to take CHMA12H3 instead of CHMA11H3. We are broadening student choice where they can complete either CHMA11H3 or CHMA12H3. This will also assist students who are double majoring in Chemistry programs and Biological Sciences programs.

Impact:
None

Consultations:
DCC July 28, 2023
S. Dalili Oct 16, 2023

Resource Implications:
None

SCSPE0215: SPECIALIST PROGRAM IN HUMAN BIOLOGY (SCIENCE)

Completion Requirements:

Program Requirements
This Program consists of 15.0 credits.

Required Courses and Suggested Course Sequence

First Year
1. 1.0 credit in Introductory Biology Courses
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions

2. 1.0 credit in Introductory Chemistry Courses
CHMA10H3 Introductory Chemistry I: Structure and Bonding
[CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms or CHMA12H3 Advanced General Chemistry]

3. 1.0 credit in Mathematics
[MATA29H3 Calculus I for the Life Sciences or MATA30H3 Calculus I for Physical Sciences]
and
[MATA35H3 Calculus II for Biological Sciences or MATA36H3 Calculus II for Physical Sciences]

4. 1.0 credit in Introductory Physics Courses
PHYA11H3 Physics I for the Life Sciences
PHYA22H3 Physics II for the Life Sciences

5. 0.5 credit in Statistics
Choose From:
STAB22H3 Statistics I
PSYB07H3 Data Analysis in Psychology

Second Year
6. 3.0 credits in Biology Core Courses
BIOB10H3 Cell Biology
BIOB11H3 Molecular Aspects of Cellular and Genetic Processes
BIOB34H3 Animal Physiology
BIOB38H3 Plants and Society
BIOB50H3 Ecology
BIOB51H3 Evolutionary Biology
BIOB90H3 Integrative Research Poster Project (CR/NCR 0.0 credit)*
*__Note__: Completion of BIOB90H3 is a graduation requirement for students in this program. Concurrent enrolment in at least one of the BIO B-level courses listed above is required for enrolment in BIOB90H3. Please see BIOB90H3 in the Calendar for important information.

7. 1.0 credit in Biology Core Labs
BIOB32H3 Animal Physiology Laboratory
BIOB33H3 Human Development and Anatomy Laboratory

8. 1.0 credit in Organic Chemistry Courses
CHMB41H3 Organic Chemistry I
CHMB42H3 Organic Chemistry II

Third/Fourth Years
9. 2.5 credits in C-level Biology Core Courses
Choose From:
BIOC15H3 Genetics
BIOC17H3 Microbiology
BIOC20H3 Principles of Virology
BIOC32H3 Human Physiology I
BIOC34H3 Human Physiology II
BIOC39H3 Immunology

10. 1.5 credits in Additional C-level Biology Courses
Choose From:
BIOC10H3 Cell Biology: Proteins from Life to Death
BIOC12H3 Biochemistry I: Proteins and Enzymes
BIOC13H3 Biochemistry II: Bioenergetics and Metabolism
BIOC14H3 Genes, Environment and Behaviour
BIOC16H3 Evolutionary Genetics and Genomics
BIOC19H3 Animal Developmental Biology
BIOC21H3 Vertebrate Histology: Cells and Tissues
BIOC35H3 Principles of Parasitology
BIOC40H3 Plant Physiology
BIOC58H3 Biological Consequences of Global Change
BIOC65H3 Environmental Toxicology
BIOC70H3 An Introduction to Bias in the Sciences
BIOC90H3 Integrative Multimedia Documentary Project (CR/NCR 0.0 credit)*
*__Note__: Completion of BIOC90H3 is a graduation requirement for students in this program. Concurrent enrolment in one of the participating BIO C-level courses is required for enrolment in BIOC90H3. Please see BIOC90H3 in the Calendar for important

information.

11. 1.0 credit in D-level Biology Courses
Choose From:
BIOD06H3 Advanced Topics in Neural Basis of Motor Control
BIOD07H3 Advanced Topics and Methods in Neural Circuit Analysis
BIOD12H3 Protein Homeostasis
BIOD13H3 Herbology: The Science Behind Medicinal Plants
BIOD15H3 Mechanisms of Gene Regulation in Health and Disease
BIOD17H3 Seminars in Cellular Microbiology
BIOD19H3 Epigenetics in Health and Disease
BIOD20H3 Special Topics in Virology
BIOD24H3 Human Stem Cell Biology and Regenerative Medicine
BIOD25H3 Genomics
BIOD26H3 Fungal Biology and Pathogenesis
BIOD27H3 Vertebrate Endocrinology
BIOD29H3 Pathobiology of Human Disease
BIOD32H3 Human Respiratory Pathophysiology
BIOD33H3 Comparative Animal Physiology
BIOD35H3 Sports Science
BIOD37H3 Biology of Plant Stress
BIOD43H3 Animal Movement and Exercise
BIOD59H3 Models in Ecology, Epidemiology and Conservation
BIOD65H3 Pathologies of the Nervous System

12. 0.5 credit in Psychology or Health Studies
Choose From:
HLTA02H3 Foundations in Health Studies I
HLTA03H3 Foundations in Health Studies II
HLTB15H3 Introduction to Health Research Methodology
HLTB16H3 Introduction to Public Health
(HLTB17H3) Conceptual Models of Health
HLTB20H3 Contemporary Human Evolution and Variation
(HLTB21H3) Infectious Diseases
HLTB22H3 Biological Determinants of Health
HLTB40H3 Health Policy and Health Systems
HLTD44H3 Environmental Contaminants, Vulnerability and Toxicity
PSYA01H3 Introduction to Biological and Cognitive Psychology
PSYA02H3 Introduction to Clinical, Developmental, Personality and Social Psychology

Description of Proposed Changes:
Adding CHMA12H3 as an alternative to CHMA11H3 Adding HLTD44H3 as an option in bin 12 – Psychology or Health Studies

Rationale:
Chemistry offers two different Chemistry courses for the 2nd half of Chemistry. Many students are choosing to take CHMA12H3 instead of CHMA11H3. We are broadening student choice where they can complete either CHMA11H3 or CHMA12H3. This will also assist students who are double majoring in Chemistry programs and Biological Sciences programs. Adding HLTD44H3: Health and Society has modified the prerequisites to include Biology courses that are already part of this program and therefore students can take this course without taking additional prerequisites. The topics are human focused giving students more options in the Human Biology program.

Impact:
None

Consultations:
DCC September 27, 2023
S. Dalili October 16, 2023
DCC Health and Society October 17, 2023

Resource Implications:
None

SCSPE1030A: SPECIALIST PROGRAM IN INTEGRATIVE BIOLOGY (SCIENCE)

Completion Requirements:

Program Requirements
This program consists of 14.5 required credits.

First Year
1. 1.0 Credit of Introductory Biology Courses
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions

2. 1.0 Credit of Introductory Chemistry Courses
CHMA10H3 Introductory Chemistry I: Structure and Bonding
[CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms or CHMA12H3 Advanced General Chemistry]

3. 1.0 Credit in Mathematics
Choose from:
[MATA29H3 Calculus I for the Life Sciences or MATA30H3 Calculus I for Physical Sciences]
and

[MATA35H3 Calculus II for Biological Sciences or MATA36H3 Calculus II for Physical Sciences]

4. 0.5 Credit in Physics
Choose from:
PHYA10H3 Physics I for the Physical Sciences
PHYA11H3 Physics I for the Life Sciences

5. 0.5 Credit in Computer Science
Choose from:
CSCA08H3 Introduction to Computer Science I (most appropriate course for computer science students)
CSCA20H3 Introduction to Programming (most appropriate course for non-computer science students)

Second Year
6. 3.0 Credits of Biology Core Courses
BIOB10H3 Cell Biology
BIOB11H3 Molecular Aspects of Cellular and Genetic Processes
BIOB34H3 Animal Physiology
BIOB38H3 Plants and Society
BIOB50H3 Ecology
BIOB51H3 Evolutionary Biology
BIOB90H3 Integrative Research Poster Project (CR/NCR 0.0 credit)*
*__Note__: Completion of BIOB90H3 is a graduation requirement for students in this program. Concurrent enrolment in at least one of the BIO B-level courses listed above is required for enrolment in BIOB90H3. Please see BIOB90H3 in the Calendar for important information.

7. 0.5 Credit of Biology Core Labs
Choose from:
BIOB12H3 Cell and Molecular Biology Laboratory
BIOB32H3 Animal Physiology Laboratory
BIOB33H3 Human Development and Anatomy Laboratory
BIOB52H3 Ecology and Evolutionary Biology Laboratory

8. 0.5 Credit in Statistics
Choose from:
STAB22H3 Statistics I
PSYB07H3 Data Analysis in Psychology

Third/Fourth Year
9. 2.5 Credits of Biology Foundation Courses
BIOC15H3 Genetics
BIOC17H3 Microbiology
[BIOC37H3 Plants: Life on the Edge or BIOC40H3 Plant Physiology]
BIOC54H3 Animal Behaviour
BIOC61H3 Community Ecology

10. 1.0 Credit of Advanced Courses in Cellular and Organismal Biology
Choose from:
BIOC12H3 Biochemistry I: Proteins and Enzymes
BIOC13H3 Biochemistry II: Bioenergetics and Metabolism
BIOC20H3 Principles of Virology
BIOC21H3 Vertebrate Histology: Cells and Tissues
BIOC23H3 Practical Approaches to Biochemistry
BIOC29H3 Introductory Mycology
BIOC32H3 Human Physiology I
BIOC34H3 Human Physiology II
[BIOC37H3 Plants: Life on the Edge or BIOC40H3 Plant Physiology; whichever course is not used to fulfill Biology Foundation course requirement]
BIOC39H3 Immunology
BIOC65H3 Environmental Toxicology
BIOC70H3 An Introduction to Bias in the Sciences
NROC34H3 Neuroethology

11. 1.0 Credit of Advanced Courses in Ecology and Conservation
Choose from:
BIOC50H3 Macroevolution
BIOC51H3 Tropical Biodiversity Field Course
BIOC52H3 Ecology Field Course
BIOC58H3 Biological Consequences of Global Change
BIOC59H3 Advanced Population Ecology
BIOC60H3 Winter Ecology
BIOC62H3 Role of Zoos and Aquariums in Conservation
BIOC63H3 Conservation Biology
(BIOC67H3) Inter-University Biology Field Course
EESC04H3 Biodiversity and Biogeography

12. 1.0 Credit of Advanced Courses in Genes and Development
Choose from:
BIOC10H3 Cell Biology: Proteins from Life to Death
BIOC14H3 Genes, Environment and Behaviour
BIOC16H3 Evolutionary Genetics and Genomics

BIOC19H3 Animal Developmental Biology
BIOC31H3 Plant Development and Biotechnology
BIOC90H3 Integrative Multimedia Documentary Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOC90H3 is a graduation requirement for students in this program. Concurrent enrolment in one of the participating BIO C-level courses is required for enrolment in BIOC90H3. Please see BIOC90H3 in the Calendar for important information.

13. 1.0 Credit of D-Level Biology Courses
Choose from:
Any BIO D-level course offered by the Biological Sciences department.

Description of Proposed Changes:
Adding CHMA12H3 as an option

Rationale:
Chemistry offers two different Chemistry courses for the 2nd half of Chemistry. Many students are choosing to take CHMA12H3 instead of CHMA11H3. We are broadening student choice where they can complete either CHMA11H3 or CHMA12H3. This will also assist students who are double majoring in Chemistry programs and Biological Sciences programs.

Impact:
None

Consultations:
DCC July 28, 2023
S. Dalili October 16, 2023

Resource Implications:
None

SCSPE1203: SPECIALIST PROGRAM IN MOLECULAR BIOLOGY AND BIOTECHNOLOGY (SCIENCE)

Completion Requirements:

Program Requirements
This program consists of 14.5 required credits.

First Year
1. 1.0 Credit of Introductory Biology Courses
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions

2. 1.0 Credit of Introductory Chemistry Courses
CHMA10H3 Introductory Chemistry I: Structure and Bonding
[CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms or CHMA12H3 General Chemistry]

3. 1.0 Credit in Mathematics
Choose from:
[MATA29H3 Calculus I for the Life Sciences or MATA30H3 Calculus I for Physical Sciences]
and
[MATA35H3 Calculus II for Biological Sciences or MATA36H3 Calculus II for Physical Sciences]

4. 1.0 Credit in Physics
[PHYA10H3 Physics I for the Physical Sciences or PHYA11H3 Physics I for the Life Sciences]
[PHYA21H3 Physics II for the Physical Sciences or PHYA22H3 Physics II for the Life Sciences]
and
0.5 Credit in Statistics
Choose from:
STAB22H3 Statistics I (this course could also be taken in the second year)
PSYB07H3 Data Analysis in Psychology (this course could also be taken in the second year)

Second Year
5. 3.0 Credits of Biology Core Courses
BIOB10H3 Cell Biology
BIOB11H3 Molecular Aspects of Cellular and Genetic Processes
BIOB34H3 Animal Physiology
BIOB38H3 Plants and Society
BIOB50H3 Ecology
BIOB51H3 Evolutionary Biology
BIOB90H3 Integrative Research Poster Project (CR/NCR 0.0 credit)*
***Note**: Completion of BIOB90H3 is a graduation requirement for students in this program. Concurrent enrolment in at least one of the BIO B-level courses listed above is required for enrolment in BIOB90H3. Please see BIOB90H3 in the Calendar for important information.

6. 0.5 Credit of Biology Core Labs
BIOB12H3 Cell and Molecular Biology Laboratory

7. 1.0 Credit of Organic Chemistry Courses
CHMB41H3 Organic Chemistry I
CHMB42H3 Organic Chemistry II

Third Year

8. 3.5 Credits of Biology C-level Courses
BIOC12H3 Biochemistry I: Proteins & Enzymes
BIOC13H3 Biochemistry II: Bioenergetics and Metabolism
BIOC15H3 Genetics
BIOC17H3 Microbiology
BIOC20H3 Principles of Virology
BIOC23H3 Practical Approaches to Biochemistry
BIOC39H3 Immunology (can be completed in third or fourth year)

9. 0.5 Credit in Computer Science
Choose from:
CSCA08H3 Introduction to Computer Science I (most appropriate course for computer science students)
CSCA20H3 Introduction to Programming (most appropriate course for non-computer science students)
(computer science could also be taken in an earlier year)

Third/Fourth Year
10. 0.5 Credit of Cognate Biology Courses
Choose from:
BIOC10H3 Cell Biology: Proteins from Life to Death
BIOC14H3 Genes, Environment and Behaviour
BIOC19H3 Animal Developmental Biology
BIOC21H3 Vertebrate Histology: Cells and Tissues
BIOC31H3 Plant Development and Biotechnology
BIOC35H3 Principles of Parasitology
BIOC40H3 Plant Physiology
BIOC70H3 An Introduction to Bias in the Sciences
BIOD37H3 Biology of Plant Stress
BIOC90H3 Integrative Multimedia Documentary Project (CR/NCR 0.0 credit)*
*__Note__: Completion of BIOC90H3 is a graduation requirement for students in this program. Concurrent enrolment in one of the participating BIO C-level courses is required for enrolment in BIOC90H3. Please see BIOC90H3 in the Calendar for important information.

Fourth Year
11. 0.5 Credit in Advanced Molecular Techniques
BIOD21H3 Advanced Molecular Biology Laboratory

12. 0.5 credit of D-level Research-oriented "Cell & Molecular" Course Work
Choose from:
BIOD12H3 Protein Homeostasis
BIOD13H3 Herbology: The Science Behind Medicinal Plants
BIOD15H3 Mechanisms of Gene Regulation in Health and Disease
BIOD17H3 Seminars in Cellular Microbiology
BIOD19H3 Epigenetics in Health and Disease
BIOD20H3 Special Topics in Virology
BIOD22H3 Molecular Biology of the Stress Response
BIOD23H3 Special Topics in Cell Biology
BIOD24H3 Human Stem Cell Biology and Regenerative Medicine
BIOD25H3 Genomics
BIOD26H3 Fungal Biology and Pathogenesis
BIOD27H3 Vertebrate Endocrinology
BIOD29H3 Pathobiology of Human Disease
BIOD30H3 Plant Research and Biotechnology: Addressing Global Problems
BIOD95H3 Supervised Study in Biology
BIOD98Y3 Directed Research in Biology
Note: Any of these courses not used to satisfy this requirement may be used to fulfill the '0.5 Credit of Cognate Biology Courses'.

Description of Proposed Changes:
Adding CHMA12H3 as an option

Rationale:
Chemistry offers two different Chemistry courses for the 2nd half of Chemistry. Many students are choosing to take CHMA12H3 instead of CHMA11H3. We are broadening student choice where they can complete either CHMA11H3 or CHMA12H3. This will also assist students who are double majoring in Chemistry programs and Biological Sciences programs.

Impact:
None

Consultations:
DCC July 28, 2023
S. Dalili October 16, 2023

Resource Implications:
None

1 New Course

BIOB97H3: Bio-CURE: Course-based Undergraduate Research in Biological Sciences

Description:

This course-based undergraduate research experience (CURE) in biological sciences will introduce students to the process of scientific inquiry as they engage in a hypothesis-driven research project with an emphasis on student-driven discovery, critical thinking, and collaboration. Students will learn to effectively access, interpret, and reference scientific literature as they formulate their research question and create an experimental design. Students will gain hands-on experience in research techniques and apply concepts in research ethics, reproducibility, and quantitative analyses to collect and interpret data.

Corequisites:

BIOB11H3 and at least one of BIOB10H3, BIOB34H3, BIOB38H3, BIOB50H3, BIOB51H3

Exclusions:

None

Enrolment Limits:

48

Notes:

Have completed no more than 11 credits towards a degree program at the time of enrolment.

Course Experience:

University-Based Experience

Methods of Assessment:

Assessment methods:
Wk 2, Course LOs 1A, 1B, 1E, 1J: Literature search and citation in-class exercise (individual submission) followed by in-class group discussion and worksheet
Wk 3, Course LOs 1A, 1B, 1C, 1D, 1E: Topic Introduction with Annotated Bibliography (Individual submission)
Wk 4, Course LOs 1A, 1C, 1D, 1E, 1F, 1G, 1J: Worksheet outlining hypothesis and experimental design (groupwork submission, includes questions related to technical vs biological replicates, types of bias,)
Wk 5, Course LOs 1A, 1C, 1D, 1E, 1F, 1G, 1J: Presentation of hypothesis and experimental design (Group Presentation)
Wk 5, Course LOs 1C, 1E, 1K: Constructive Peer feedback on Presentations (Feedback comments assessed for participation/quality. Feedback exercise is meant to help students reflect on their own work and the work of their peers and does not contribute the grading of their peers)
Wks 2-3 and 6-10, Course LOs 1E, 1F, 1G, 1H, 1I: Assessment of lab notebooks
Wks 2-3 and 6-10, Course LOs 1F, 1G, 1H, 1I: Assessment of lab performance (participation, safety, attention to detail, clean-up)
Wk 10, Course LOs 1A, 1B, 1C, 1D, 1E, 1J: In class activities analyzing published figures and identifying effective visual communication strategies
Wk 11, Course LOs 1C, 1D, 1I, 1K: Peer review exercise on figures and results section (in-class, participation/completion grading)
Wk 12, Course LOs 1B, 1C, 1D, 1E, 1I, 1J: Presentation of main findings, impact, and future directions (group presentation)
Wk 12, Course LOs 1B, 1C, 1K: Peer feedback on Presentations (Feedback comments assessed for participation/quality. Feedback exercise is meant to help students reflect on their own work and the work of their peers and does not contribute to presentation grades)
Wk 12, Course LOs 2A, 2B, 3A, 3B: Reflection on research experience and potential career interests. Submitted following an information session and guided class discussion on research-related career paths.
Wk 12, Course LOs 1A, 1B, 1C, 1D, 1E, 1I, 1K: Final lab report (journal-style article) (individual submission)
As this course is focused on skill development, communication, and teamwork, all activities in the course contribute in some way to career preparedness (Course LO 2A). Additionally, there are mentored discussions targeted to awareness of potential careers, ideas for next steps, and reflections on students feelings about research and their interests moving forward.
Based on previously published studies, Science Identity and Academic Motivation (Course LOs 2B, 3A, 3B) are expected to be promoted by the act of participating in research and creating experiments/results. Doing this as part of a team/community is expected to further increase the sense of belonging to a community of scientists. Valuing science and understanding the process of scientific discovery is expected to enhance motivation and performance in other courses. These outcomes are more difficult to measure using the in-course assessments described above, but survey-based or interview-based tools will be used to assess the impact of the course on student attitudes toward research, career preparedness, academic motivation, and science identity. These tools will be implemented in the first few years of running the course to ensure that the intended learning outcomes are met.

The final assessment scheme will appear in the course syllabus.
The anticipated weighting is as follows, but may be subject to change:
20% - Participation (includes numerous graded and pass/fail assignments such as peer feedback, In-class worksheets, reflections, lab notebooks, and lab performance)
15% - Introduction & Annotated Bibliography
15% - Experimental Design (worksheet and presentation)
15% - Final Presentation
35% - Final Lab report

Breadth Requirements:

Natural Sciences

University of Toronto Scarborough

Credit Value:

fixed: 0.5

Learning Outcomes:

1. Research skills:
   1A) Demonstrate ability to understand and use scientific literature to formulate original research questions
   1B) Employ critical thinking to examine both published figures and original experimental data.
   1C) Identify a valid scientific argument (e.g., recognizing when rigorous scientific evidence supports a hypothesis)
   1D) Apply scientific knowledge to justify inferences, predictions, and conclusions based on scientific data
   1E) Effectively exchange ideas using oral, written, and visual forms of communication
   1F) Develop effective problem-solving and scientific thinking skills through experiment design, implementation and iteration
   1G) Apply an understanding of research ethics in the design of reproducible experiments and unbiased analyses.
   1H) Learn to use fundamental techniques and equipment as relevant to research projects in various biology subdisciplines

1I) Effectively use various types of software for image, data, and statistical analysis
1J) Demonstrate effective teamwork
1K) Provide constructive peer feedback and demonstrate ability to use peer feedback in own work

2. Career preparedness and academic motivation:
2A) Evaluate interest in pursuing a career involving research
2B) Reflect on their academic motivations and report on the impact of experiential learning on these motivations

3. Science identity:
3A) Evaluate enjoyment of the research process and develop positive attitudes towards fundamental research
3B) Report on sense of belonging to the scientific community

Connection to program level learning outcomes:
Learning to analyze primary literature (Course LOs 1A, 1B, 1C), supports development of the following program level learning outcomes:

- Acquire and collate the information and data relevant to a given biological question, and objectively interpret these data to draw an informed conclusion
- Dissect the different formats of scientific communication (reviews, original papers, short communication, oral presentations, posters).
- Read and interpret figures, graphs, tables.
- Evaluate recent advances in biological knowledge, and recognize the limits of the scientific process, including the inherent uncertainty in scientific knowledge, data and models. Applying information from scientific literature to generate a testable hypothesis and experimental design (Course LOs 1A, 1C, 1D, 1F, 1G) supports development of the following program level learning outcomes:
- Formulate hypotheses and develop strategies to investigate them.
- Develop new inquiries, methodologies and testable hypotheses based on analysis of data.
- Design controlled experiments using appropriate methodology and instrumentation.
- Identify the gaps of knowledge in scientific literature.
- Explain the importance of reproducible results.

Conducting experiments and analyzing and interpreting data, (Course LOs 1F, 1G, 1H, 1I) supports development of the following program level learning outcomes:

- Engage in scientific inquiry and explain how scientific knowledge is discovered and validated.
- Employ accurate and effective note taking skills in the laboratory.
- Follow appropriate scientific practices in collecting data, and in ensuring data are shared with others as appropriate.
- Acquire and collate the information and data relevant to a given biological question, and objectively interpret these data to draw an informed conclusion
- Describe how data are collected and archived.
- Demonstrate both professional work habits and ethical conduct, when working individually, or as part of a team
- Explain the importance of reproducible results.
- Differentiate between objective and subjective interpretation of data.
- Employ proper statistical methods to analyze and predict patterns in biological data.

Presenting hypothesis, experimental design, and analysis and interpretation of data using oral, visual, and written formats (Course LOs 1A, 1B, 1C, 1D, 1E, 1F, 1G, 1I) supports development of the following program level learning outcomes:

- Defend hypotheses and data to an audience employing appropriate scientific terminology.
- Ethically identify the contributions of others' work within the written, oral, and visual work that the student has produced, through the use of proper citations.
- Acquire and collate the information and data relevant to a given biological question, and objectively interpret these data to draw an informed conclusion
- Evaluate recent advances in biological knowledge, and recognize the limits of the scientific process, including the inherent uncertainty in scientific knowledge, data and models.
- Differentiate between objective and subjective interpretation of data.
- Identify and depict patterns in biological data
- Represent data using effective visuals.
- Disseminate biological information in oral presentation format.
- Apply quantitative reasoning and scientific principles to describe or explain phenomena in the natural world and to conserving the diversity of life.
- Describe the relevance and limitations of model systems/ organisms and methodologies.
- Acquire and collate the information and data relevant to a given biological question, and objectively interpret these data to draw an informed conclusion
- Disseminate biological information in a written paper format.
- Engage in iterative scientific writing within a course.
- Demonstrate ability to meet deadlines and expectations based on self-directed learning and teamwork.

Engaging in group work and giving and receiving peer feedback (Course LOs 1J, 1 K) supports development of the following program level learning outcomes:

- Work effectively and collaboratively with others (from diverse varied academic and cultural backgrounds).
- Demonstrate both professional work habits and ethical conduct, when working individually, or as part of a team.
- Engage in iterative scientific writing within a course.
- Demonstrate ability to meet deadlines and expectations based on self-directed learning and teamwork.
- Develop effective teamwork skills including:
    - o leadership skills o attentive listening
    - o utilizing appropriate methods for conflict resolution and managing group dynamics
    - o accepting and providing constructive criticism

Promoting science identity, academic motivation, and career preparedness through exposure to research and increased knowledge of research-related careers (Course LOs 2A, 2B, 3A, 3B) supports development of the following program level learning outcomes:

- Be a strong advocate for biology and research.

- Become a self-directed, life-long learner.
- Demonstrate awareness of career options including academic career trajectories.

Topics Covered:

Week 1 Topics:
- Intro to course structure and scientific method
- Discussion of research-related career paths
- Hands-on training in essential lab skills
- Overview of available research themes (and some review of key concepts)
- Division of class into research themes
- Intro to literature searches and correct and ethical use of citations
- Literature search and citation exercise (individual assessment) followed by in-class group discussion and worksheet

Weeks 2 and 3 Topics:
- Split students within each research theme into smaller groups based on research question interests
- Literature analysis exercise comparing the structure of introduction sections and identifying the research question (homework/individual assessment, followed by group discussion + and in-class worksheet)
- Brainstorming on hypothesis development and experimental design
- Hands-on introduction to available assays, equipment, experimental systems, and reagents

Weeks 4 and 5 Topics:
- Lecture/discussions on research ethics, bias, replication/ reproducibility, and rigor
- Experimental design groupwork
- Submission of experimental design worksheet
- Group presentations and constructive peer feedback
- Revise experimental design and add additional detail as needed to create final protocol

Weeks 6-9 Topics
- Expectations for lab notebooks
- Instruction on writing methods sections (vs protocols)
- write methods (outside of class)
- In class peer review of methods and discussion
- Perform experiments in lab
- Begin data analysis and construction of figures

Week 10 topics
- Instruction and guided practice in analyzing data, interpreting and using statistics, and creating figures
- Required elements of figure legends
- In class activities analyzing published figures to identifying effective visual communication strategies
- Instruction/support on writing results section

Week 11 Topics:
- Instruction/support on writing discussion section and abstract
- Writing exercise: Editing for clarity, conciseness and flow
- Draft of results section due and peer review of figures and results (participation/completion grading)
- Work on final group presentations (instruction on scientific presentations)

Week 12 Topics:
- Student presentations and peer feedback
- Reflection on research experience, potential career interests, and discussion of ways to gain further research experience

Rationale:

We are designing this course to address inequalities in access to research-based learning across our undergraduate population. This aligns with the Intentional Inclusion value outlined in the UTSC Strategic Plan (pg. 14). This course will broaden access to research experience for undergraduates across our programs and align with program level learning outcomes that are expectations for all of our programs. As such, we are not designing this as a requirement for any single program, but rather for supporting student learning, skill development and career progression across all of our programs.

Engagement in undergraduate research is recognized as a high impact practice that improves student success in STEM disciplines, especially for those from underrepresented groups.
1,2,3 Students who participate in research often have greater confidence in their ability to complete a STEM degree, identify as part of the scientific community and retain positive perceptions of the value of fundamental research.
4,5,6 Traditionally, students gain research experience through one-on-one mentored opportunities (e.g., undergraduate thesis), which are limited in number. Access to research opportunities favors students who are already aware of the benefits of engaging in research, have high cGPAs (even when the literature suggests that cGPAs are poor predictors of research potential), and who typically do not have personal or financial constraints that would prevent them from seeking out volunteer or mentored research experiences.7

Course-Based Undergraduate Experiences (CUREs)7 are one way to provide equitable access to research for larger numbers of students. CUREs emphasize collaboration and immerse students in discovery by exploring original research questions of interest to the scientific community, often from defining a hypothesis all the way to analyzing data and suggesting future avenues of work.

8. The literature on CUREs in biology suggests cognitive, affective, psychosocial, and career relevant learning gains for participating students.9,10

Inspired by this literature, this CURE course for biology students will initiate students into the processes of research and offer multiple research exploration themes aligned with departmental research foci. This is well aligned with our departmental and institutional goals of equity and inclusion and diversifying the scientific community, as well as the Students-as-Partners value outlined in the UTSC Strategic Plan (pg. 14) as we are using a student-partnered approach to developing the research themes offered in the course. Work-study undergraduate students have a key role in designing and testing the research projects and provide valuable perspectives on the needs, abilities, and priorities of the undergraduates who will enroll in the course. This partnered approach will function as a department-wide initiative to expand undergraduate research opportunities.

Finally, we underscore the alignment of this course proposal with Recommendation 1 from the external review report for our department (November 2020), which states: “The reviewers recommend that the Department explore formalizing research aspects of the curriculum, and that teaching stream faculty in particular receive appropriate access to labs and other resources to support program quality and undergraduate research.” This course seeks to accomplish our departmental commitment, stated

as:“[_…]the expansion of course-based research opportunities is an important area of potential growth[_…].” There is hence considerable department support for this course offering. We have also received from the Experiential Learning Fund (ELF) and Learning and Education Advancement Fund (LEAF) to support our development of this course.

Literature cited:
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3. Jones MT, Barlow AE, Villarejo M. Importance of undergraduate research for minority persistence and achievement in biology. J High Educ. 2010;81:82–115.
4. Harrison M, Dunbar D, Ratmansky L, Boyd K, Lopatto D (2011). Classroom-based science research at the introductory level: changes in career choices and attitude. CBE Life Sci Educ 10, 279-286.
5. Brownell SE, Kloser MJ, Fukami T, Shavelson R (2012). Undergraduate biology lab courses: comparing the impact of traditionally based “cookbook” and authentic research-based courses on student lab experiences. J Coll Sci Teach 41, 18-27.
6. Jordan TC, Burnett SH, Carson S, Caruso SM, Clase K, DeJong RJ, Dennehy JJ, Denver DR, Dunbar D, Elgin SCR, et al. (2014). A broadly implementable research course in phage discovery and genomics for first-year undergraduate students. MBio 5, e01051-13.
7. Bangera G, Brownell SE. Course-based undergraduate research experiences can make scientific research more inclusive. CBE Life Sci Educ. 2014 Winter;13(4):602-6.
8. Auchincloss LC, Laursen SL, Branchaw JL, Eagan K, Graham M, Hanauer DI, Lawrie G, McLinn CM, Pelaez N, Rowland S, Towns M, Trautmann NM, Varma-Nelson P, Weston TJ, Dolan EL. Assessment of course-based undergraduate research experiences: a meeting report. CBE Life Sci Educ. 2014;13(1):29–40.
9. Corwin LA, Graham MJ, Dolan EL. Modeling course-based undergraduate research experiences: an agenda for future research and evaluation. CBE Life Sci Educ. 2015 Mar 2;14(1):es1.
10. Seymour E, Hunter AB, Laursen SL, DeAntoni T (2004). Establishing the benefits of research experiences for undergraduates in the sciences: first findings from a three-year study. Sci Educ 88, 493-534.

Consultation:
March 31st 2023 – Consultation with Dr. Shelley Brunt, Associate Chair, Undergraduate Affairs.
April 5th 2023 – Consultation with Katherine Larson, Vice-Dean, Teaching, Learning and Undergraduate Programs; Zohreh Shahbazi, Acting Director, Centre for Teaching and Learning; Martha Harris, Academic Programs Officer.
July 28th 2023– Course proposal reviewed by departmental curriculum committee.
September 28th 2023– Course proposal revised and reviewed again by departmental curriculum committee.

Resources:
The course will be taught by regular faculty and requires each TA would have 105 hours per laboratory section of responsibilities per semester (anticipating three lab sections). We will be requesting an increase in funds for the TA positions as they cannot be covered with our current budget. We will have an ancillary fee. Tony will consult with the Dean's office regarding the fee.

January 12, 2024 - OVPD commits to provide additional TA support required for 2 sections in Fall 2024 and one section in Winter 2025 with an understanding that Biology’s overall FCE enrolment will increase in 2024-25 and that the departmental TA budget does not have sufficient funds to cover it.

Programs of Study for Which This Course Might be Suitable:
Given the resource intensive nature of this limited enrolment course, we do not foresee expanding enrolment beyond students in biology degree programs at this time.

Estimated Enrolment:
48

Instructor:
Dr. Emily Bell

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

13 Course Modifications

BIOA01H3: Life on Earth: Unifying Principles

Prerequisites:

[Grade 12 Biology or BIOA11H3] and [Grade 12 Advanced Functions or Grade 12 Calculus and Vectors or Grade 12 Data Management or the Online Mathematics Preparedness Course]

Rationale:
We are adding grade 12 Data Management as an option for the mathematics prerequisite as this course provides appropriate background for success in Biological Sciences programs. This will expand acceptable high school math equivalents and provide more opportunities for students to gain access to first year biology who did not take two or more math courses in high school.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

BIOA02H3: Life on Earth: Form, Function and Interactions

Prerequisites:

[Grade 12 Biology or BIOA11H3] and [Grade 12 Advanced Functions or Grade 12 Calculus and Vectors or Grade 12 Data Management or the Online Mathematics Preparedness Course]

Rationale:
We are adding grade 12 Data Management as an option for the mathematics prerequisite as this course provides appropriate background for success in Biological Sciences programs. This will expand acceptable high school math equivalents and provide more opportunities for students to gain access to first year biology who did not take two or more math courses in high school.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

BIOC10H3: Cell Biology: Proteins from Life to Death

Prerequisites:
BIOB10H3 and BIOB11H3

Rationale:
We are adding BIOB10H3 - Cell Biology back as a prerequisite as the prerequisite for BIOB11H3 - Molecular Aspects of Cellular and Genetic Processes is changing and will no longer be BIOB10H3.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

BIOC12H3: Biochemistry I: Proteins and Enzymes

Prerequisites:
BIOB10H3 and BIOB11H3 and CHMB41H3

Rationale:
We are adding BIOB10H3 - Cell Biology back as a prerequisite as the prerequisite for BIOB11H3 - Molecular Aspects of Cellular and Genetic Processes is changing and will no longer be BIOB10H3.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

BIOC14H3: Genes, Environment and Behaviour

Prerequisites:
BIOB10H3 and BIOB11H3

Rationale:
We are adding BIOB10H3 - Cell Biology back as a prerequisite as the prerequisite for BIOB11H3 - Molecular Aspects of Cellular and Genetic Processes is changing and will no longer be BIOB10H3.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

BIOC15H3: Genetics

Prerequisites:
BIOB10H3 and BIOB11H3 and [PSYB07H3 or STAB22H3]

Rationale:
We are adding BIOB10H3 - Cell Biology back as a prerequisite as the prerequisite for BIOB11H3 - Molecular Aspects of Cellular and Genetic Processes is changing and will no longer be BIOB10H3.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

BIOC17H3: Microbiology

Prerequisites:
BIOB10H3 and BIOB11H3

Rationale:
We are adding BIOB10H3 - Cell Biology back as a prerequisite as the prerequisite for BIOB11H3 - Molecular Aspects of Cellular and Genetic Processes is changing and will no longer be BIOB10H3.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

BIOC19H3: Animal Developmental Biology

Prerequisites:
BIOB10H3 and BIOB11H3

Rationale:
We are adding BIOB10H3 - Cell Biology back as a prerequisite as the prerequisite for BIOB11H3 - Molecular Aspects of Cellular and Genetic Processes is changing and will no longer be BIOB10H3.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

BIOC20H3: Principles of Virology

Prerequisites:
BIOB10H3 and BIOB11H3

Rationale:
We are adding BIOB10H3 - Cell Biology back as a prerequisite as the prerequisite for BIOB11H3 - Molecular Aspects of Cellular and Genetic Processes is changing and will no longer be BIOB10H3.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

BIOC31H3: Plant Development and Biotechnology

Prerequisites:
BIOB10H3 and BIOB11H3

Rationale:
We are adding BIOB10H3 - Cell Biology back as a prerequisite as the prerequisite for BIOB11H3 - Molecular Aspects of Cellular and Genetic Processes is changing and will no longer be BIOB10H3.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

BIOC35H3: Principles in Parasitology

Prerequisites:
BIOB10H3 and BIOB11H3

Rationale:
We are adding BIOB10H3 - Cell Biology back as a prerequisite as the prerequisite for BIOB11H3 - Molecular Aspects of Cellular and Genetic Processes is changing and will no longer be BIOB10H3.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

BIOC40H3: Plant Physiology

Prerequisites:
BIOB10H3 and BIOB11H3

Rationale:
We are adding BIOB10H3 - Cell Biology back as a prerequisite as the prerequisite for BIOB11H3 - Molecular Aspects of Cellular and Genetic Processes is changing and will no longer be BIOB10H3.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

BIOD65H3: Pathologies of the Nervous System

Prerequisites:
BIOB10H3 and BIOB11H3 and [0.5 credits from the following: BIOC32H3, NROC61H3, NROC64H3 or NROC69H3]

Rationale:

We are adding BIOB10H3 - Cell Biology back as a prerequisite as the prerequisite for BIOB11H3 - Molecular Aspects of Cellular and Genetic Processes is changing and will no longer be BIOB10H3.

Consultation:
DCC September 28, 2023

Version Start Session: Fall 2024

UNIVERSITY OF TORONTO SCARBOROUGH

2024-25 Curriculum Cycle
Undergraduate Minor Curriculum Modifications for Approval
Report: Physical and Environmental Sciences
February 8, 2024

Report: Physical and Environmental Sciences

4 Program Modifications

SCMAJ1076: MAJOR PROGRAM IN ENVIRONMENTAL SCIENCE (SCIENCE)

Completion Requirements:

Program Requirements
This program requires 8.5 credits as follows:

First Year
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions
CHMA10H3 Introductory Chemistry I: Structure and Bonding
CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms
[~~(MATA20H3) Calculus A~~ MATA29H3 Calculus I for the Life Sciences *or* MATA30H3 Calculus I for the Physical Sciences]
[~~(MATA21H3) Calculus B~~ MATA35H3 Calculus II for the Biological Sciences *or* MATA36H3 Calculus II for the Physical Sciences]*
[PHYA10H3 Physics I for the Physical Sciences *or* PHYA11H3 Physics I for the Life Sciences]
EESA06H3 Planet Earth

Second Year
STAB22H3 Statistics I
and
1.5 credits from the following:
EESB03H3 Principles of Climatology
EESB04H3 Principles of Hydrology
EESB05H3 Principles of Soil Science
EESB15H3 Earth History
EESB16H3 Feeding Humans - The Cost to the Planet
and
0.5 credit from the following:
BIOB50H3 Ecology
EESB02H3 Principles of Geomorphology
EESB22H3 Environmental Geophysics
EESB17H3 Hydro Politics and Transboundary Water Resource Management
[CSCA08H3 Introduction to Computer Science I *or* CSCA20H3 Introduction to Programming]
CHMB55H3 Environmental Chemistry

Third & Fourth Years
[2.0 credits at the C- or D-level in EES courses with at least 0.5 credit at the D-level] *or* [1.5 credits at the C- or D-level in EES courses and PSCD11H3 Communicating Science: Film, Media, Journalism, and Society]

Description of Proposed Changes:

1. Adding MATA29H3 to the first-year course selection of Math courses, fixing a hidden prerequisite for MATA35H3.
2. Added missing title to MATA35H3
3. Removing retired MATA20/A21 options.
4. EESB22H3 Environmental Geophysics is to be added as a second-year elective course in the Major of Environmental Science.

Rationale:

1. Adding MATA29H3 to the math course selection to fix a hidden prerequisite was discussed on April 11, 2023 in a Env. Sci. Group meeting and the change was approved.
2. The course code was listed without the course title. It has now been added.
3. MATA20 and MATA21 are retired courses that were last offered in 2009 Fall and 2010 Fall respectively. They can be removed as program options.

4. EESB22H3 as an elective course will serve 2nd year students who have gained an interest in geoscience from first year courses (EESA06) and first year physics courses (PHYA10 and PHYA11) but want to see the applicability to real-world issues on environmental matters (e.g., monitoring climate change and natural hazards, etc.). The course bridges the gap between Environmental Science and Geophysics. As a result, we are looking to give a wider access of geoscience to the larger student body.

Impact:
None

Consultations:
Proposal discussed and approved by the Environmental Science group in the Department of Physical and Environmental Science (April 2022).
Proposal approved by the Department of Physical and Environmental Science Teaching and Curriculum Committee on Sept 18, 2023.

Resource Implications:
None

Version Start Session: Fall 2024

SCSPE0351A: SPECIALIST PROGRAM IN ENVIRONMENTAL GEOSCIENCE (SCIENCE)

Completion Requirements:

Program Requirements
Total requirements: 16.0 credits of which 1.0 credit must be at the D-level as follows:

First Year:
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions
CHMA10H3 Introductory Chemistry I: Structure and Bonding
CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms
EESA01H3 Introduction to Environmental Science
EESA06H3 Introduction to Planet Earth
[MATA30H3 Calculus I for Physical Sciences *or* MATA31H3 Calculus I for Mathematical Sciences]
[MATA36H3 Calculus II for Physical Sciences *or* MATA37H3 Calculus II for Mathematical Sciences]
PHYA10H3 Physics I for the Physical Sciences
PHYA21H3 Physics II for the Physical Sciences

Second Year:
CHMB55H3 Environmental Chemistry
EESB02H3 Principles of Geomorphology
EESB03H3 Principles of Climatology
EESB04H3 Principles of Hydrology
EESB05H3 Principles of Soil Science
EESB15H3 Earth History
EESB18H3 Natural Hazards
EESB19H3 Mineralogy
CSCA20H3 Introduction to Programming
STAB22H3 Statistics I

Third Year:
EESB20H3 Sedimentology and Stratigraphy
EESC03H3 Geographic Information Systems and Remote Sensing
EESC07H3 Groundwater
EESC13H3 Environmental Impact Assessment and Auditing
EESC20H3 Geochemistry
~~EESC31H3 Glacial Geology~~
EESC22H3 Exploration Geophysics
EESC36H3 Petrology
and
0.5 credit from the following:
BIOB50H3 Ecology
~~EESB21H3 Exploration Geophysics~~
EESB22H3 Environmental Geophysics
EESB26H3 Introduction to Global Geophysics
EESC18H3 Limnology
EESC19H3 Oceanography
EESC31H3 Glacial Geology

Fourth Year:
EESC37H3 Structural Geology
and
0.5 credit from the following:
EESC26H3 Seismology and Seismic Methods
EESD02H3 Contaminant Hydrogeology
EESD06H3 Climate Change Impact Assessment
EESD09H3 Research Project in Environmental Science
EESD10Y3 Research Project in Environmental Science
EESD11H3 Advanced Watershed Hydrology
EESD13H3 Environmental Law, Policy and Ethics
EESD15H3 Fundamentals of Site Remediation

EESD19H3 Professional Development Seminars in Geoscience
EESD20H3 Geological Evolution and Environmental History of North America
EESD21H3 Geophysical and Climate Data Analysis
and
[1.0 credit at the C- or D-level in EES courses] or [0.5 credit at the C- or D-level in EES courses and PSCD11H3 Communicating Science: Film, Media, Journalism, and Society]
Strongly recommended: EESC16H3 Field Camp I *or* EESD07H3 Field Camp II *or* EESD33H3 Field Techniques

Description of Proposed Changes:

1. Moved EESC31H3 (Glacial Sedimentology and Stratigraphy) from a required course to an optional course in Third Year.
2. Moved EESC22H3 (Exploration Geophysics, renumbered from EESB21) from an option to a required course in Third Year.
3. Add MATA31H3 (Calculus I for Mathematical Sciences) as an option to the first year Calculus I courses.

Rationale:

1/2. EESC31H3 is being replaced by EESC22H3 as a required course, in order to fulfill a goal of the academic unit, which is to expand the foundational geophysics content in Specialist Environmental Geoscience program. This course replacement also is designed to provide students with increased access to experiential learning opportunities and specialized apparatus, which are a part of EESC22H3 (EESC22 was formerly the EESB21 course – course number change submitted separately) but not EESC31H3. Our department has already made a significant investment (~$72,000) to secure equipment and materials for the experiential learning component, primarily in EESC22H3.
Additionally, the faculty member who taught EESC31H3 biennially has recently retired. This change means that EESC22H3 will now be offered annually, providing less complications under which students can fulfil their Specialist Environmental Geoscience program requirements.
Finally, since the Specialist Environmental Geoscience program has been designed to meet the expectations of the Professional Geoscientists of Ontario (PGO) accreditation, the new course option (EESC22H3) fulfills the same 'Additional Foundation Geoscience' certification requirement as the previous offering (EESC31H3), but delivered at a greater frequency (i.e., annually vs. biennially).
3. MATA31H3 is added as a first year Calculus I option as without it the issue of a hidden prerequisite for the MATA37H3 (already part of the optional Calculus II courses) may arise.

Impact:

None

Consultations:

Proposal discussed and approved by the Environmental Science group in the Department of Physical and Environmental Science April 18, 2023
Proposal approved by the Department of Physical and Environmental Science Teaching and Curriculum Committee on Sept 18, 2023.

Resource Implications:

None

Version Start Session: Fall 2024

SCSPE1076B: SPECIALIST PROGRAM IN ENVIRONMENTAL PHYSICS (SCIENCE)

Completion Requirements:

Program Requirements
Total Requirements: 16.0 credits

First Year (4.0 credits):
CHMA10H3 Introductory Chemistry I: Structure and Bonding
CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms
EESA06H3 Introduction to Planet Earth
MATA23H3 Linear Algebra I
MATA30H3 Calculus I for Physical Sciences
MATA36H3 Calculus II for Physical Sciences
PHYA10H3 Physics I for the Physical Sciences
PHYA21H3 Physics II for the Physical Sciences

Second Year (4.5 credits):
EESB15H3 Earth History
EESB19H3 Mineralogy
MATB41H3 Techniques of Calculus of Several Variables I
MATB42H3 Techniques of Calculus of Several Variables II
MATB44H3 Differential Equations I
PHYB10H3 Intermediate Physics Laboratory I
PHYB21H3 Electricity and Magnetism
PHYB54H3 Mechanics: From Oscillations to Chaos
and
~~*1.0*~~ *0.5 credit from the following:*
EESB02H3 Principles of Geomorphology
EESB03H3 Principles of Climatology
EESB04H3 Principles of Hydrology
EESB05H3 Principles of Soil Science
~~EESB15H3 Earth History~~
EESB22H3 Environmental Geophysics

Third Year (4.0 credits):
EESB20H3 Sedimentology and Stratigraphy

MATC46H3 Differential Equations II
PHYB57H3 Introduction to Scientific Computing
STAB22H3 Statistics I
and
1.5 credits from the following:
~~EESB21H3 Exploration Geophysics~~
EESB26H3 Introduction to Global Geophysics
EESC22H3 Exploration Geophysics
EESC26H3 Seismology and Seismic Methods
PHYB52H3 Thermal Physics
PHYC11H3 Intermediate Physics Laboratory II
PHYC50H3 Electromagnetic Theory
PHYC54H3 Classical Mechanics
and
0.5 credit from the following:
CHMB55H3 Environmental Chemistry
EESC07H3 Groundwater
EESC18H3 Limnology
EESC19H3 Oceanography
EESC20H3 Geochemistry
EESC31H3 Glacial Geology

Fourth Year (3.5 credits):
EESC36H3 Petrology
EESC37H3 Structural Geology
EESD21H3 Geophysical and Climate Data Analysis
PHYD37H3 Introduction to Fluid Mechanics
and
1.5 credits from the following:
ASTC25H3 Astrophysics of Planetary Systems
EESC03H3 Geographic Information Systems and Remote Sensing
EESD02H3 Contaminant Hydrogeology
*EESD09H3 Research Project in Environmental Science
*EESD10Y3 Research Project in Environmental Science
EESD13H3 Environmental Law, Policy and Ethics
EESD33H3 Field Techniques
PHYC14H3 Introduction to Atmospheric Physics
PHYC50H3 Electromagnetic Theory
PHYC54H3 Classical Mechanics
*PHYD01H3 Research Project in Physics and Astrophysics]
*PHYD02Y3 Extended Research Project in Physics and Astrophysics
PHYD26H3 Planetary Geophysics
PHYD38H3 Nonlinear Systems and Chaos
*PHYD72H3 Supervised Reading in Physics and Astrophysics

*no more than 1.0 credit from EESD09H3, EESD10Y3, PHYD01H3, PHYD02Y3 and PHYD72H3 may be counted as fulfilling the program requirements.

Notes:
Where any course appears on more than one option list, it may only be counted as fulfilling the requirements for one of those lists of options.

Strongly recommended: EESC16H3 Field Camp I or EESD07H3 Field Camp II or EESD33H3 Field Techniques.

The optional courses EESB19H3 Mineralogy and EESC36H3 Petrology and EESC37 Structural Geology are strongly recommended for students focusing on training as a geophysicist.

Description of Proposed Changes:
1. EESB15H3 Earth History moved from an option to a requirement in Second Year to fix a hidden prerequisite for EESB19 and EESB20); adjusted weights of Second Year requirements to account for this.
2. EESB22H3 Environmental Geophysics added as a second0year elective course.
3. EESB21H3 renumbered to EESC22H3.

Rationale:
1. EESB15 Earth History was already a course in the 2nd year of the Specialist in Environmental Physics program, however only as an elective course. As EESB15 is a prerequisite for EEC37 (a required course) and EESB19 and EESB20 (optional courses), the elective character of B15 in the 2nd year created a lot of issues with registration. Students enroll without having completed EESB15, and must be removed through the prerequisite check process. Moving EESB15 from the selection section of the 2nd year to the required courses in the 2nd year fixes the hidden prerequisite and will lessen confusion for students. The weights of the Second Year requirements have been adjusted in line with this change.

2. EESB22 will serve 2nd year students who have gained an interest in geoscience from first year courses (EESA06) and first year physics courses (PHYA10 and PHYA21) but want to see the applicability to real-world issues on environmental matters (e.g., monitoring climate change and natural hazards, etc.). Given this Specialty in Environmental Physics, the course bridges the gap between Environmental Science and Geophysics. As a result, we are looking to build a larger geoscience student community focused on environment and sustainability. In the Environmental Physics specialty, EESB22H3 will be the first potential access to those wishing to take a geoscience course, acting as a feeder into more technical courses currently offered (EESB26H3 / EESC22H3 / EESC26H3).

3. A proposal has been submitted for EESB21 to be renumbered to EESC22, so this course code has been updated in the Third Year requirements

Impact:
None

Consultations:
Proposal discussed and approved by the Environmental Science group in the Department of Physical and Environmental Science (April 2023).
Proposal approved by Environmental Physics Supervisor of Study in August 2023.
Proposal approved by the Department of Physical and Environmental Science Teaching and Curriculum Committee on Sept 18, 2023.

Resource Implications:
None

Version Start Session: Fall 2024

SCSPE0371: SPECIALIST PROGRAM IN GLOBAL ENVIRONMENTAL CHANGE (SCIENCE)

Completion Requirements:

Program Requirements
Total requirements: 14.5 credits

First Year (4.5 credits):
BIOA01H3 Life on Earth: Unifying Principles
BIOA02H3 Life on Earth: Form, Function and Interactions
CHMA10H3 Introductory Chemistry I: Structure and Bonding
CHMA11H3 Introductory Chemistry II: Reactions and Mechanisms
EESA01H3 Introduction to Environmental Science
EESA06H3 Introduction to Planet Earth
[MATA29H3 Calculus I for Life Sciences *or* MATA30H3 Calculus I for Physical Sciences]
[MATA35H3 Calculus II for Biological Sciences *or* MATA36H3 Calculus II for Physical Sciences ~~or MATA37H3 Calculus II for Mathematical Sciences]*~~]
[PHYA10H3 Physics I for the Physical Sciences *or* PHYA11H3 Physics I for the Life Sciences]
~~*Note: MATA35H3 cannot be used to fulfill the prerequisites for PHYB57H3~~

Second Year (5.0 credits):
[CSCA08H3 Introduction to Computer Science I *or* CSCA20H3 Introduction to Programming]
BIOB50H3 Ecology
BIOB51H3 Evolutionary Biology
CHMB55H3 Environmental Chemistry
EESB03H3 Principles of Climatology
EESB04H3 Principles of Hydrology
EESB05H3 Principles of Soil Science
ESTB01H3 Introduction to Environmental Studies
STAB22H3 Statistics I
and
0.5 credit from the following:
BIOB52H3 Ecology and Evolutionary Biology Laboratory
EESB15H3 Earth History
EESB16H3 Feeding Humans - The Cost to the Planet
PSCB90H3 Physical Sciences Research Experience

Third and Fourth Years (5.0 credits):
3.5 credits as follows:
BIOC58H3 Biological Consequences of Global Change
BIOC63H3 Conservation Biology
EESC02H3 Invaded Environments
EESC03H3 Geographic Information Systems and Remote Sensing
EESC04H3 Biodiversity and Biogeography
EESC30H3 Environmental Microbiology
~~EES/ESTC38H3 The Anthropocene~~
EESD06H3 Climate Change Impact Assessment
and
1.5 credits from the following, of which 0.5 credit must be at the D-level:
BIOC37H3 Plants: Life on the Edge
BIOC51H3 Tropical Biodiversity Field Course
BIOC52H3 Ecology Field Course
BIOD52H3 Biodiversity and Conservation
BIOD54H3 Applied Conservation Biology
EESC13H3 Environmental Impact Assessment and Auditing
EESC16H3 Field Camp I
EESC18H3 Limnology
EESC19H3 Oceanography
EESC20H3 Geochemistry
EESC24H3 Advanced Readings in Environmental Science
EESC38H3H3/ESTC38H3 The Anthropocene
EESD02H3 Contaminant Hydrogeology
EESD09H3 Research Project in Environmental Science
EESD07H3 Field Camp II

EESD10Y3 Research Project in Environmental Sciences
EESD11H3 Advanced Watershed Hydrology

Description of Proposed Changes:

1. Addition of MATA29H3 Calculus I for Life Sciences as options for the first year Calculus I courses.
2. Removal of MATA37H3 Calculus II for Mathematical Sciences] as a MAT option in year 1.
3. Removal of the note related to PHYB57H3 prerequisites.
4. Addition of EESC02 Invaded Environments (new course) as a required course in the third and fourth year of the program.
5. Moving EESC38/ ESTC38 The Anthropocene from a required course to an optional course in the third and fourth year.
6. Addition of EESD07 Field Camp II as an optional course in the third and fourth year

Rationale:

1. MATA29H3 is added as first-year Calculus I option as without these, the issue of a hidden prerequisite for the MATA35H3 (already part of the optional Calculus II courses) may arise.
2. MATA37H3 is removed as a first-year Calculus option, as this course only was included as a prerequisite for PHYB57H3 (a computer science course that was included in an earlier version of the program).
3. A note on MATA37H3 in relation to PHYB57H3 is, therefore also removed, as it no longer applies.
4. EESC02 (Invaded Environments) is a new course in the Department of Physical and Environmental Sciences (Fall 2024) taught by a new teaching stream hire (S. Livingstone) as part of their regular teaching load. This change, therefore places that course as a requirement within one of the Department of Physical and Environmental Sciences' core environmental science programs.
5. EESC38/ ESTC38 (The Anthropocene) is a course that is taught on an irregular basis and is not part of any single regular teaching requirement. Therefore, to ensure students in the Specialist Global Environmental Change are able to complete all program requirements, this is moved to an optional course (in lieu of EESC02 as described/ motivated above).
6. EESD07 (Field Camp 2) is added as an optional course in the third and fourth year. This is to remain consistent with the previous inclusion of EESC16H3 (Field Camp 1) in the program and to afford more experiential learning opportunities within the program.

Impact:

None

Consultations:

1. Proposal discussed and approved by the Environmental Science group in the Department of Physical and Environmental Science (April 18, 2023), and through email (May 31, 2023).
2. Inclusion of EESC02 as a required course discussed with S. Livingstone (July 30, 2023).
3. Proposal approved by the Department of Physical and Environmental Science Teaching and Curriculum Committee (September 20, 2023).

Resource Implications:

None

Version Start Session: Fall 2024

1 New Course

EESC02H3: Invaded Environments

Impact on Programs: This Proposal triggers modifications in the unit's programs(s)

Description:

This course applies a multi-disciplinary lens to the subject of biological invasions and is intended to build upon foundational understandings of global environmental change. The course explores the foundational ecological theories of biological invasions, ecological conditions and mechanisms driving invasions, multi-scale perspectives on the environmental impact of biological invasions (community, ecosystem), past and current approaches to the management of invaded environments, social and economic impacts of species invasions, and invasion risk assessment and biological invasion policy.

Prerequisites: BIOB50H3 and [1.5 additional credits from EES or BIO courses]

Corequisites:

Exclusions:

Enrolment Limits: 80

Recommended Preparation: EESA01H3 and ESTB01H3 and BIOB51H3

Notes: Priority will be given to students enrolled in the Specialist Program in Global Environmental Change.

Breadth Requirements: Natural Sciences

CNC Allowed: Y

Credit Value: fixed: 0.5

Learning Outcomes:

Students who take EESC02H3 should be able to:

1. Have knowledge of prominent historical and current examples of biological invasions
2. Describe the ecological theories of the mechanisms behind biological invasions and biological control
3. Describe how and why biological invasions represent a significant aspect of global environmental change
4. Describe the various social perspectives on biological invasions and biological control of invasive species
5. Describe the key aspects of the stage-based management of biological invasions
6. Describe the key international and Canadian policies addressing biological invasions
7. Contrast past biological control to present day biological control
8. Describe how biological invasions are impacting protected areas
9. Construct and execute risk assessment models for invasive species

10. Describe the key aspects of management plans for biological invasions
11. Describe how invasive species distribution models work and their limitations

Topics Covered:

Several foundational aspects of invasive species ecology and management, including:
• Ecological theory of biological invasions
• History of invasion biology
• Multi-scale (community, ecosystem, landscape) analyses of the impact and spread of biological invasions
• Current approaches to the management of invaded environments
• Social and economic considerations
• Risk assessment and policy response

The course also covers key technical skills, including mathematical and conceptual modelling approaches for the management of biological invasions, namely:
• Population response to different management intervention
• Invasion scenarios and projections

Finally, the course covers topics related to present impacts of biological invasions and management options, including:
• Impacts on threatened and endangered species
• Management of invasions in protected areas
• Management of invasions in urban centres
• Chemical and biological control of invasive species
• Strategic planning and policy

Methods of Assessment:

Assessments for EESC02H3 will include:
1. A mid-term written exam (**20%,** related to Learning Outcomes 1-6)
2. A final written exam (**30%**, related to Learning Outcomes 1-11, with an emphasis on 7-11).
3. A written assignment **(30%,** wherein students research and describe a current invasive species case study (related to a minimum of 3 Learning outcomes to be selected by the student).
4. A group presentation/debate, wherein students develop arguments supporting or opposing biological control of specific invasive species (**10%**, related to Learning Outcomes 2, 4, & 7).
5. Bi-weekly tutorial assessments (**10%** total), wherein students will engage with course content via discussion groups.

Rationale:

The spread and impact of biological invasions is a significant global environmental challenge. With the release of each new report from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Servies (IPBES), the increasing impact of biological invasions is further evidenced. The ecological and human-environment interactions that cause biological invasions are well studied, but mitigation and containment remain an ongoing challenge for environmental managers and policy makers. In addition, the varied perspectives on their true impact and the ethics underpinning the management of invasive species often creates contestation. Currently there are no courses across UTSC that provide significant breadth, depth and historical context on the subject of biological invasions.

The proposed course aims to equip students across a wide range of disciplines and career trajectories with, 1) a foundational understanding of the science and management of biological invasions, 2) the ability to navigate interdisciplinary conversations connected to biological invasions, and 3) the ability to critically engage with academic discourse on the subject of biological invasions. For students enrolled in the Specialist Global Environmental Change program, who in many cases will be seeking careers in the environmental sector, a depth of knowledge on the topic of biological invasions will be invaluable.

EESC02H3 has specifically been designed as:
1. A 3rd-year required course in the Specialist Program in Global Environmental Change (Science)
2. A natural sciences breadth course for the larger UTSC student community.

Consultation:

April, 2022: Initial meetings regarding the addition of a new course in DPES EES Undergraduate specialist program in Global Environmental Change with program supervisor, Adam Martin and DPES Chair, George Arhonditsis.

Oct, 2022: Follow-up conversation regarding the development and addition of new course focused on Biological Invasions in EES Undergraduate Specialist program in Global Environmental Change. The need to include a climate change science course in the EST program was discussed. Thoughts about whether to create a new course or make use of an existing EES course was discussed.

April, 2023: Another follow-up meeting regarding DPES EES Specialist Program in Global Environmental Change with Adam Martin. The decision to create a new EES science course called “Invaded Environments” was made.

May, 2023: Consultation with Biology’s Dr. Nick Mandrak (Program Director for Conservation and Biodiversity in the MEnvSc Program) regarding course content. Dr. Mandrak was fully supportive and recommended consulting with Drs. Rachel Sturge and Ivana Stehlik.

May, 2023: Course code approval by Amber Lantsman in Registrar’s Office

June, 2023: Conversation with UTSC Biology undergraduate program supervisors Drs .Rachel Sturge and Ivana Stehlik regarding support for the course proposal and possible cross-listing with undergraduate programs in Integrative Biology and Conservation and Biodiversity.

Sept 18, 2023: Feedback solicited and received from DPES Teaching and Curriculum Committee. Proposal approved by DPES Teaching and Curriculum Committee.

Sept, 2023: Course code corrected due to conflict.

Sept, 2023: Follow up conversation with Drs. Sturge and Stehlik from Biology regarding possible cross-listing. Decision made to not pursue cross listing, but to increase enrolment limit to 80 students in order accommodate interested students in BIO programs.

Resources:

1. EESC02H3 will be taught by **regular faculty** (Stuart Livingstone)
2. EESC02H3 will require TA support at an estimated rate of two 70-hour appointments (subject to enrollment numbers), which is **covered by the unit’s existing budget.**
3. EESC02H3 does not require any additional infrastructure and/or equipment.
4. EESC02H3 will not require ancillary and/or laboratory fees.

Overlap with Existing Courses:

UTSC:

- **Limited overlap with BIOC63, “Conservation Biology”.**
  BIOC63 provides an introduction to the subject of biological invasions and covers topics such the interaction between

climate change and invasive species, but does not provide the breadth, depth, or historical context to the subject of biological invasions that EESC02H3 aims to provide.

- **Limited overlap with BIOD59, "Models in Ecology, Epidemiology, and Conservation".**
  BIOD59 is focused on the mathematical modelling of populations and disease, and provides a case study on the modelling of biological invasions. While there will be some overlap with EESC02H3 on this topic, different software will be used (Free software "Vortex" to be downloaded to students laptops) and a different example will be used. The degree of overlap between BIOC63 and BIOD59 does not warrant EEC02H3 being listed as an exclusion for either course.

UTSG:

- **Limited overlap with EES255, "Essentials of Biodiversity Science and Conservation Biology"**
  EESB255H1 provides an introduction to the subject of biological invasions and covers topics such the impact of invasive species on biodiversity, but does not provide the breadth, depth, or historical context to the subject of biological invasions that EESC02H3 aims to provide.

UTM:

- **Limited overlap with ENV495, "Restoration Ecology I"**
  ENV49H provides an introduction to the subject of biological invasions and covers topics such the restoration of environments after the removal of invasive species, but does not provide the breadth, depth, or historical context to the subject of biological invasions that EESC02H3 aims to provide.

Part of a program proposal?
SCSPE0371: SPECIALIST PROGRAM IN GLOBAL ENVIRONMENTAL CHANGE (SCIENCE) – added to third year requirements

Programs of Study for Which This Course Might be Suitable:
Biology programs (consulted June, 2023)

Estimated Enrolment: 80

Instructor: Stuart Livingston

Version Start Session: Fall 2024

4 Course Modifications

EESC16H3: Field Camp I

Description:

~~Many environmental problems can only be assessed by collecting geological and other environmental data in the field. This course will provide students with the necessary skills for fieldwork investigations in a range of environments. The camp is held annually either in May or late August. Locations for the camp include Costa Rica, Rockies, Arizona, and Appalachians.~~

Experiential learning in environmental science is critical for better understanding the world around us, solving pressing environmental issues, and gaining hands-on skills for careers in the environmental sector. This course provides exciting and inspiring experiential learning opportunities, across disciplines with themes ranging from geoscience, ecology, climate change, environmental physics, and sustainability, across Canada and internationally. The course entails a 7-10-day field camp with destinations potentially changing yearly, that prioritizes environmental skills including environmental data collection, in-field interpretation of environmental patterns and processes, and science communication.

Recommended Preparation:

EESB15H3 and [an additional 0.5 B-level credit in EES courses]

Learning Outcomes:

1. apply fundamental concepts and practical skills to the identification and discussion of environmental issues in field settings.
2. use field data, along with personal observations and experiences, to formulate and test hypotheses surrounding environmental phenomena, patterns, and processes.
3. collect, manage, and analyze environmental field data.
4. use field data and related analyses to generate answers to research questions and hypotheses related to, and inform solutions on, basic and applied environmental themes.
5. communicate environmental data to specialized and general audiences, in both oral and written formats.
6. acquire and apply best practices regarding field safety and logistics.

Rationale:

The course description and recommended preparation has been changed to better inform students on which sites may be visited during the field camp (domestic versus international sites).

The new Recommended Preparation (1.0 credit of EES courses) is meant to create a common knowledge and skill base for all participating students which enhances the understanding of environmental and geo-sciences topics and processes seen and discussed during the respective field trips.

Consultation:

The proposal was discussed and approved by the Environmental Science group in the Department of Physical and Environmental Science by email on June 21, 2023.
Proposal approved by the Department of Physical and Environmental Science Teaching and Curriculum Committee on Sept 18, 2023.

Resources: None

Version Start Session: Fall 2024

EESC22H3: Exploration Geophysics

Impact on Programs: This Proposal triggers modifications in the unit's programs(s)

New Course Code:
~~EESB21H3~~ EESC22H3

Prerequisites:
~~EESA06H3~~ EESB15H3 and PHYA21H3

Exclusions:

EESB21H3, JGA305

Recommended Preparation:

~~EESB15H3~~ EESB20H3

Learning Outcomes:

~~- Understanding geophysical methods, including seismic, gravity, magnetic, electrical resistivity and electromagnetic radar. - Detection and delineation of local features/subsurface resources using geophysical methods - Application of appropriate geophysical surveying methods for the exploration of fossil fuels (oil, gas, coal); metalliferous mineral deposits; bulk mineral deposits (sand and gravel); groundwater supplies; archaeological investigations~~

Students should leave this course with the ability to:
1.) Understand the underlying physical and mathematical principles, as well as strengths and weaknesses, of various geophysical techniques.
2.) Recognize which geophysical technique(s) are appropriate for specific problem.
3.) Develop and implement a basic field survey to acquire data with the geophysical equipment used during practical.
4.) Perform basic processing of geophysical data using software and interpret them to address applied problems.

Methods of Assessment:
Lab assignments (4 x 5%) 20%
GPR report 25%
GPR group presentation 10%
Participation (graded as field notebook) 15%
Final Exam 30%

Rationale:
The level of the course has been revised to better reflect the content covered and methods of assessment. This course has a significant field component during which students are expected to work semi-independently and operate expensive equipment. Based on the instructor's experience with this course, the maturity and competency required to perform these tasks adequately are more likely to be found in a senior (3rd or 4th year) student. Additionally, the learning objectives this course fits well into the program learning objectives of the C-level courses for example for the Environmental Science - Geoscience Specialist and Environmental Physics Programs.
The course prerequisites have been revised to ensure that students have the necessary background knowledge in introductory geology. To that end, EESB15 (Earth History) has been moved from recommended preparation to a prerequisite.
The prerequisites for this course where selected due to its focus on blending fundamental concepts from two distinct fields, namely physics and geology, in order to facilitate comprehension of near-surface geophysical methods, their principles and environmental applications.
The previous course code has been added as an exclusion.

Consultation:
Course code approved on April 19, 2023. The proposal was discussed and approved by the Environmental Science group in the Department of Physical and Environmental Science on May 28, 2023. The Teaching and Curriculum Committee approved the proposal on Sept 18, 2023.

Resources:
None

Version Start Session: Fall 2024

EESC26H3: Seismology and Seismic Methods

Description:

~~A course describing how seismology is used to probe both shallow layers near the surface as well as Earth's deep interior. Topics covered will include refraction and reflection methods, surface waves, tomography, magnitude and the Richter scale. Concepts including travel times and anisotropy will be discussed.~~

Seismology is the study of earthquakes and how seismic waves move through the Earth. Through application of geological and mathematical techniques, seismology can reveal the inner workings of the Earth and provide hazard analysis for tectonic events such as earthquakes, volcanic eruptions, and tsunamis. This course will outline the practical applications of seismology to real-world scenarios of academic research and human exploration, while highlighting cutting-edge technological advances. Topics covered include subsurface imaging and surveying, catastrophe modelling, Martian seismology, stress and strain principles, wave theory, data inversion, and data science applications on seismic data analysis.

Prerequisites:

~~EESB26H3~~

[MATA36H3 or MATA37H3] and PHYA10H3

Exclusions:

JPE493H1

Enrolment Limits:

40

Recommended Preparation:

EESB15H3, EESB26H3

Learning Outcomes:

~~- Understanding the terms used by seismologists, e.g., Richter scale, magnitude, travel time - Understanding the advantages and disadvantages of reflection and refraction methods - Mathematical methods applied to determine epicentre locations and interpretation of data stacking and seismographs - Identification of diffraction and interference and damping, seismic signatures of resources~~

Students should leave this course with:
1. an understanding of different seismic topics covered (see below);
2. understanding seismic theory;
3. analyze and interpret different forms of seismic data, focusing on reflection and tomography data;
4. communicate seismic data and related interpretations to specialist and general audiences.

Topics:

~~- Wave types in elastic media, pressure and transverse waves, surface waves~~
~~- Detection of seismic waves, magnitude, the Richter scale, tomography, free oscillations~~
~~- Reflection and refraction seismology, exploration methods, arrays~~
~~- Travel times, sources and attenuation, anisotropy and dispersion~~
- Understanding the terms used by seismologists, e.g., Richter scale, magnitude, travel time
- Understanding the advantages and disadvantages of reflection and refraction methods
- Mathematical methods applied to determine epicentre locations and interpretation of data stacking and seismographs
- Identification of diffraction and interference and damping, seismic signatures of resources

Rationale:

The previous prerequisite for this course was selected before the course was developed and delivered. As the course has now been delivered after several years of not being offered, proper consideration of the relevant prerequisite can be made. The previous prerequisite has been moved to a recommended course. As a result, the course only requires fundamental mathematical and physical knowledge ([MATA36H3 or MATA37H3] and PHYA10H3), with recommended courses related to Earth processes (EESB15H3, EESB26H3). Furthermore, given the former prerequisite was not a required course for any program and only offered every few years, keeping this prerequisite could limit the potential course enrolment for EESC26H3.
The course description, learning outcomes, and topics have been fully updated to better reflect the course content.

Consultation:

Proposal discussed and approved by the Environmental Science group in the Department of Physical and Environmental Science by email on June 7th to June 19th, 2023.
Consultation on course description has been conducted via email with geophysicists Russ Pysklywec, Erkan Gün, and Qinya Liu, as well as Alan Yu (a former EESC26H3 student).
Consultation with several current undergraduate students was also undertaken, as well as with Adam Martin and Tom Meulendyk.
Proposal approved by the Department of Physical and Environmental Science Teaching and Curriculum Committee on Sept 18th, 2023.

Resources:

None

Version Start Session: Fall 2024

EESD07H3: Field Camp II

Description:

~~This field camp will familiarize students with several geological settings and modern environments.~~
~~The camp is held annually either in May or late August. Locations for the camp include Costa Rica, Rockies, Arizona, and Appalachians.~~

Experiential learning is a critical element of applied environmental science. Hands-on experience in observing, documenting, and quantifying environmental phenomenon, patterns, and processes unlocks a deeper understanding and curiosity of the natural world, and prepares students for careers in the environment. This advanced field camp course explores applied scientific themes across geoscience, climate science, ecology, hydrology, environmental physics, and sustainability, while emphasizing student-led scientific enquiry and projects. Over a 7-10-day field camp in locations in Canada and abroad, students will develop a deep inquiry-based understanding and appreciation of the natural world, by immersing themselves in some of Earth's most captivating environments.

Learning Outcomes:

1. apply fundamental concepts and practical skills to the identification and discussion of environmental issues in field settings.
2. use field data, along with personal observations and experiences, to formulate and test hypotheses surrounding environmental phenomena, patterns, and processes.
3. collect, manage, and analyze environmental field data.
4. use field data and related analyses to generate answers to research questions and hypotheses related to, and inform solutions on, basic and applied environmental themes.
5. communicate environmental data to specialized and general audiences, in both oral and written formats.
6. acquire and apply best practices regarding field safety and logistics.

Rationale:

The course description change is done to better inform students on aspects of experiential learning in environmental science as well as which sites may be visited during the field camp (domestic versus international sites). Learning outcomes have been added.

Consultation:

Proposal discussed and approved by the Environmental Science group in the Department of Physical and Environmental Science by email on June 21, 2023.
Proposal approved by the Department of Physical and Environmental Science Teaching and Curriculum Committee on Sept 18, 2023

Resources:

None

Version Start Session: Fall 2024

UNIVERSITY OF TORONTO SCARBOROUGH

2024-25 Curriculum Cycle
Undergraduate Minor Curriculum Modifications for Approval
Report: Arts & Science Co-op
February 8, 2024

Report: Arts & Science Co-op

2 Retired Courses

COPB36H3: Work Term in Biodiversity and its Field Assessment

Rationale:
Change to the Spec Co-op in Conservation and Biodiversity means that the course is no longer part of the program. Students will take the standard coop prep course (COPB50) instead.

Consultation:
Biology and Co-op consulted on Oct 18, 2023.

Resources:
None

COPC36H3: Co-op Work Term for Conservation and Biodiversity

Rationale:
Course is being retired, as it has never been used. Students in the Specialist Co-op Conservation and Biodiversity program complete COPC30 instead.

Consultation:
Co-op office & PCC team, November 14, 2023

Resources:
None