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

TO:	UTSC Academic Affairs Committee
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DATE:	March 3, 2026 for March 10, 2026
AGENDA ITEM:	8

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*, section 4)." Under section 5.6 of its *Terms of Reference*, the AAC 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 University of Toronto Quality Assurance Process (UTQAP, Section 3.1 and 3.3).

GOVERNANCE PATH:

1. **UTSC Academic Affairs Committee [For Approval] (March 10, 2026)**

PREVIOUS ACTION TAKEN:

No previous action in governance has been taken on this item.

HIGHLIGHTS:

This package contains minor modifications to the undergraduate curriculum submitted by the UTSC Sciences academic units listed below. These changes require governance approval. Minor modifications

are defined as adjustments that do not substantially alter program or course learning outcomes but may involve modest changes to the structure of a program or course. Upon approval, these changes are in effect as of Fall 2026, for the 2026-27 academic year.

- Department of Biological Sciences (Report: Undergraduate Minor Curriculum Modifications Sciences for Approval)
    - 2 New Courses:
        - BIOC11H3: Microbial Communities in Nature, Health and Industry
        - BIOC36H3: Synthetic Biology for Health and Agriculture

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 2026-27 academic year, as detailed in the respective curriculum report, be approved effective September 1, 2026.

DOCUMENTATION PROVIDED:

1. Report - Undergraduate Minor Curriculum Modifications Sciences for Approval

University of Toronto Scarborough
2026-27 Curriculum Cycle
Undergraduate Minor Curriculum Modifications Science for Approval
March 10, 2026

Biological Sciences (UTSC), Department of

2 New Courses

BIOC11H3: Microbial Communities in Nature, Health and Industry

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

Description:

Populations of microbes are everywhere and impact living and nonliving parts of the world they inhabit. We will explore the structure and composition of microbial communities and their interactions with other organisms and the abiotic environment. Understanding these dynamics is crucial for fields and related careers that range from ecosystem stability to resource management to human health.

Prerequisites:

BIOB50H3 and BIOB51H3

Enrolment Limits:

200

Delivery Method:

In Person

Methods of Assessment:

- Take home assignments – 30%
  Several scaffolded assignments that include in-class discussions, small written assignments on computational analysis that will support the understanding of concepts discussed in this course (LO1-6)
- Spot quizzes – 1%
  In-class topical reinforcement activities via multiple choice questions (LO1-2)
- Mid-term exam – 30%
  Short answer and data analysis (L01-2, 6)
- Final exam- 39%
  Short answer, data analysis and application-based questions (LO1-2, 5-6)

Breadth Requirements:

Natural Sciences

University of Toronto Scarborough

CNC Allowed:

Y

Credit Value:

Fixed: 0.5

Learning Outcomes:

By the end of the course, students will:
1. Understand and describe the characteristics of microbes and microbial populations
2. Understand and apply advanced molecular biology, genomics, evolutionary biology and microbial ecology techniques to understand how microbial populations assemble and inhabit biotic and abiotic environments.
3. Interconnect concepts introduced to students in their first and second-year courses and apply them to the impacts of microbial populations on human health, agriculture, biotechnology and industry.
4. Create hypotheses, identify and describe research strategies to test these hypotheses within the fields of microbiology, ecology, evolution and systems biology.
5. Analyze and interpret experimental data describing biological phenomena.
6. Develop critical thinking skills through communication, analysis, and interpretation of studies of biological phenomena. These learning outcomes support the program learning outcomes that are shared by the programs in Biological Sciences to which this course will be added and importantly support program learning outcomes specific to ecology and evolution concepts

Topics Covered:

Topics will include:

- What are microbes, microbial populations, in contrast to single cells, and where are they found?
- Role of extracellular products and the architecture of microbial populations

- Genomics of microbial populations
- Modeling the dynamics of mono- and multi-species microbial populations
- Molecular and computational tools for characterizing and predicting microbial population dynamics
- Case studies and careers involving the detection and management of microbial populations in nature/non-human environment, health and medicine (e.g. dentistry, surgery and implantations), cosmetics manufacturing, food service, petrochemical industry, and mechanical engineering

Rationale:

This C-level course is being proposed to expand the courses offerings that provide students at a C-level and expansion of enhanced development of knowledge integration from multiple disciplines in an area that is underrepresented in existing C-level courses offered in the department. Importantly this supports the departments development of courses that reflect the concept of One Health, recognizing the interconnectedness of human, animal, plant and microbes optimizing health of communities and ecosystems and supporting the SAMIH initiatives.

This course will be critical in increasing students' understanding of how microbial populations are integral to health, society and industry, that fulfills a niche that is underrepresented in our curriculum. The key contributions of this course to the curriculum are:
1) Provide a third-year course experience that expands our offerings that highlight the understanding of the role of data collection and data interpretation via use of relevant data on microbiological communities.
2) Address how investigations into the role(s) of microbial populations span diverse biological and scientific disciplines.
3) Demonstrate how the application of the scientific method and evidence are essential for the discovery and validation of scientific knowledge.
4) Highlight the diverse occupations and professionals concerned with microbial populations to encourage students to investigate these as career options.

This proposed course will help students meet University degree level expectations and reinforce declared learning outcomes of both co-op and non-co-op programs:
(i) Conservation and Biodiversity major and Specialist
(ii) Human Biology Major and Specialist
(iii) Molecular Biology and Biotechnology Specialist
(iv) Molecular Biology Immunology and Disease Major
(v) Integrative Biology Specialist
(vi) Major in Biology

Consultation:

Campus Curriculum Committee Meeting September 29, 2025
RO Consultation (Amber Lantsman and Lindsey Taylor) October 14, 2025
DCC October 31, 2025

Resources:

This course will be taught by Zakee Sabree. All resources will be covered by the department’s existing budget.

Overlap with Existing Courses:

There is minor overlap with
•BCH428H1 (Genomics of Microbial communities in Human health); MMG1327H1(Microbiomes in Health and Disease but these courses focus significantly on the tools (i.e. ‘omics) and particularly on human health which is not the focus of this course;
• CSB452H1 (Molecular Interactions Between Plants and Microorganisms) touches on only one aspect of the proposed course plant microbe interactions.
• HMD385H1: (The Human Microbiome in health and disease is restricted to the human microbiome role which is a small aspect of this course).
• EESC30H3 Environmental Microbiology deals with role in the ecosystem and biogeochemical cycles. BIO373H5 deals with the interaction of microorganisms with their environment with specific emphasis on evolution and biogeochemical cycles. Both EESC30H3 and BIO373H5 do not place emphasis on the interrelationships between microorganisms and other organisms.
This course is distinct from all the above courses in that the students will examine holistically the microbial populations associated with other animals, plants and abiotic environments, which makes this course unique to all the above courses.

Programs of Study for Which This Course Might be Suitable:

• Major in Molecular Biology, Immunology and disease (co-op and non-co-op)
• Major and Specialist and human biology co-op and non-co-op.
• Conservation and Biodiversity both major and specialist co-op and non-co-op
• Specialist in Integrative Biology co-op and non-co-op
• Major in Biology (co-op and non-co-op)

Estimated Enrolment:

170

Instructor:

Professor Zakee Sabree

Proposal Status:

Under Review

BIOC36H3: Synthetic Biology for Health and Agriculture

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

Description:

Synthetic biology is an interdisciplinary field that engineers new biological parts, processes, and organisms to perform modified or entirely novel functions. Combining genetic engineering, bioinformatics, and design, it drives innovation across health, agriculture, and biotechnology. This course introduces core theories and techniques through lectures and case studies spanning systems from plants to synthetic yeast. Students will also learn about biomanufacturing, intellectual property, and the biotechnology industry.

Prerequisites:

BIOB12H3

Enrolment Limits:

50

Delivery Method:

In Person

Methods of Assessment:

1. Quizzes – Biweekly online assessments designed to reinforce and review material covered in class. (LO 1-2)
2. Assignments – Structured exercises that scaffold key learning outcomes and develop analytical and (in silico) practical skills leading up to the midterm and final reports. Activities may include gene mining, identifying enzyme families for specific reactions, curating and analyzing amino acid sequences, conducting phylogenetic and protein structure analyses, performing in silico cloning, and reviewing relevant patents and preprints. (LO 2-5)
3. Midterm Report – A literature-based review focusing on a specific biological process, platform, or challenge, culminating in the identification of a target gene, enzyme, or biological part for modification. (LO 2-7)
4. Final Report – A research-style paper in the format of a biotechnology publication, demonstrating the ability to identify a knowledge gap, design an in-silico methodology, and perform bioinformatic experimentation to address a defined problem. (LO 2-7)

Breadth Requirements:

Natural Sciences

University of Toronto Scarborough

CNC Allowed:

Y

Credit Value:

Fixed: 0.5

Learning Outcomes:

1. Recall and explain core concepts in synthetic biology, including genetic circuit design, enzyme function, and biological part engineering. (Knowledge, Comprehension)
2. Apply gene-mining approaches to identify and classify enzyme families, orthologs, and genetic elements associated with specific biochemical reactions or bioprocesses using sequence databases and bioinformatic tools. (Application, Analysis)
3. Curate and analyze amino acid and nucleotide sequences to infer evolutionary relationships and predict structure–function associations through phylogenetic and structural analyses. (Analysis)
4. Design in silico cloning strategies and computational models to modify or optimize target genes, enzymes, or biosynthetic pathways. (Application, Synthesis)
5. Critically evaluate scientific literature, patents, and preprints to assess the current state of knowledge and innovation in synthetic biology. (Evaluation)
6. Synthesize information from diverse sources to develop a focused research question and propose a rational design or experimental approach addressing a biotechnological problem. (Synthesis, Evaluation)
7. Communicate synthetic biology concepts and research findings in professional scientific formats, including literature reviews and biotechnology-style reports. (Application, Communication) These learning outcomes support the program learning outcomes incorporated into the major department Program learning outcomes that are shared by programs in Biological Sciences

Topics Covered:

- What is synthetic biology?
- Plasmids and cloning
- DNA cloning strategies
- Workshops: in silico cloning
- Protein expression and purification
- Enzyme structure and function
- Genetic circuits
- Metabolic engineering
- Industrial scale
- Intellectual property
- Biotechnology startups

Rationale:

This C-level course is being proposed to fill a curricular gap on Synthetic Biology, which is an emerging interdisciplinary field that involves engineering biological systems, processes, and platforms, with applications to One Health and Food Security. There are currently no courses dedicated to Synthetic Biology on the tri-campus at the undergraduate level.

A course in Synthetic Biology would be a valuable addition to the “Molecular Biology and Biotechnology” Specialist program at UTSC by integrating and extending existing strengths in molecular biology, genetics, and bioinformatics toward the design and engineering of biological systems. It would expose students to modern, interdisciplinary tools such as gene mining, enzyme engineering, and in silico design—skills increasingly demanded in research and biotechnology industries. It will build on strengths established in BIOB10, BIOB11, and BIOB12, and has positive synergies with courses, including BIOC31H3 (Plant Development and Biotechnology) and BIOD30H3 (Plant Research and Biotechnology). The latter will build on topics developed in this course, with a narrower application, namely plant/agricultural research and innovation.

The course will also be a valuable asset for the course set in the Major program in “Molecular Biology, Immunology, and Disease.” It will build upon concepts learned in BIOB51H3 Evolutionary Biology and will provide positive synergies with course, including core course: BIOC17H3 Microbiology and additional C-level courses: BIOC12H3 Biochemistry I: Proteins & Enzymes; BIOC13H3 Biochemistry II: Bioenergetics and Metabolism; BIOC14H3 Genes, Environment and Behaviour; and BIOC15H3 Genetics.

By bridging theory with design-based practice and addressing current topics in biomanufacturing, ethics, and intellectual property, the course will also fill a curricular gap in preparing students for the practical aspects of careers in the rapidly growing field of biotechnology.

Consultation:

Campus Curriculum Committee Meeting September 29, 2025
RO Consultation (Amber Lantsman and Lindsey Taylor) October 14, 2025
DCC October 17, 2025

Resources:

This course will be taught by Mehran Dastmalchi. All resources will be covered by the department’s existing budget.

Estimated Enrolment:

50

Instructor:

Professor Mehran Dastmalchi
Proposal Status: Under Review