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

TO:	UTM Academic Affairs Committee
SPONSOR:	Professor William A. Gough, Vice-Principal Academic & Dean (VPA&D)
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PRESENTER:	Professor Ajay Rao, Vice-Dean Graduate & Postdoctoral Affairs
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DATE:	March 17, 2025, for March 24, 2025
AGENDA ITEM:	6

ITEM IDENTIFICATION:

Minor Modification: Graduate Curriculum Changes, Institute for Management & Innovation (IMI), UTM

JURISDICTIONAL INFORMATION:

Under section 5.6 of its terms of reference, the Academic Affairs Committee is responsible for major and minor modifications to existing degree programs. All major modifications shall be reported annually for information to the Committee on Academic Policy and Programs.

GOVERNANCE PATH:

1. **UTM Academic Affairs Committee [For Approval] (March 24, 2025)**

PREVIOUS ACTION TAKEN:

No previous action.

HIGHLIGHTS:

The Graduate Minor Modification Proposals (enclosed) outline Minor Modifications to new and existing graduate courses. These curricular changes are intended to have significant positive effects on a cumulative basis but are considered to be minor changes in the context of the UTQAP. Proposals for changes brought forward at this meeting were reviewed by the UTM Divisional Graduate Curriculum Committee on November 24, 2024. Proposed changes will come into effect September 1, 2025.

Within the Master of Biotechnology (MBiotech):

- 2 new courses:
  - BTC1730H: Structural Biology in Drug Development
  - BTC2105H: Supervised Study in Biotechnology

- 2 course modifications (updates to description and exclusion/prerequisites)
    - BTC1895H: Python Applications in Digital Health Marketing and Regulatory Compliance
    - BTC2100Y: Thesis Project in Biotechnology
- 3 retired courses
    - BTC1720H: Biomaterials and Protein Chemistry Lab (replaced with BTC1730H)
    - BTC2040H: Change Management (course has not been offered for several years)
    - IFA2901: Investigative Related Matters: Advanced (course has not been offered for several years)
- 2 minor program modifications
    - MBiotech; Field: Biopharmaceutical
        - Adding new courses BTC1730H as required, and BTC2105H as an elective
    - MBiotech; Field: Digital Health Technologies
        - Addition of BTC1889H as required to support deep learning and neural networks; addition of BTC2105H as an elective

RECOMMENDATION:

Be It Resolved,

THAT the proposed graduate curriculum changes in the Institute for Management and Innovation (IMI), as detailed in the proposal dated February 5, 2025, be approved effective September 1, 2025.

DOCUMENTATION PROVIDED:

Minor Modification Proposals: Graduate Curriculum, IMI, UTM

University of Toronto Mississauga

UTM Divisional Graduate Curriculum Proposals Report
February 5, 2025

Table of Contents

Management and Innovation (UTM), Institute for

2 New Courses

BTC1730H: Structural Biology in Drug Development

Description:

Biological, disease, and drug mechanisms are all determined by the three-dimensional arrangement of atoms within biological macromolecules. Therefore, knowledge of molecular structure is fundamental to protein engineering and the development of new therapeutics and vaccines. This course will cover the application of structural biology methods to drug development and biotechnology. Students will be introduced to the modern tools of protein structure determination including Cryo electron microscopy, X-ray crystallography, and NMR through lectures and tutorials. Lectures will focus on theory, techniques, and the advantages and limitations of each method. The applications of these methods to the pharmaceutical and biotechnology industries including protein engineering, target selection and drugability, lead identification and optimization, rational drug design, and drug mechanism of action will be explored through student presentations and discussions. Analytical tools are also a mainstay of drug screening and development. Students will be introduced to some of these tools (PyMol, Autodock), in addition to basic statistical and modelling tools.

Corequisites:

Exclusions:

BTC1720H or BTC2110H

Recommended Preparation:

Notes:

Delivery Method:
In Person

Credit Value:
fixed: 0.5

Rationale:
The Master of Biotechnology (MBiotech) in the Institute for Management & Innovation would like to create a new course: BTC1730H Structural Biology in Drug Development. This course is offered in the Biopharmaceutical stream of the MBiotech program.

Biotechnology is trending towards more statistical analysis, use of software, and AI-based analysis. Familiarity with statistics and software will help MBiotech students. BTC1730H will cover the theoretical components of biomaterials and protein chemistry (which are covered in BTC1720H – a course that we are deactivating). Students will also be introduced to a basic biostatistics package in the first offering of the course. In future offerings, the instructor will morph the course to reflect increasing software/analytical demands.

We have offered this course for several years through the following code: BTC2110H Topics in Biotechnology. This proposal makes this course a required component, re-names the course, and formalizes its role as part of MBiotech's core curriculum.

Consultation:
Many Biotech students do not find employment in a lab. Several program alumni have commented that BTC1720H, a practical lab course, is not useful. Therefore, we are recommending deactivating BTC1720H. BTC1730H will focus on the theoretical components of biomaterials and protein chemistry that are currently covered in BTC1720H.

Resources:
We have offered this course for several years through the following code: BTC2110H Topics in Biotechnology. This proposal makes this course a required component, re-names the course, and formalizes its role as part of MBiotech's core curriculum.

There is a faculty member assigned to teach BTC1730H on load. This course has already been developed. We have classroom space for this course.

BTC2105H: Supervised Study in Biotechnology

Description:

This course is intended for students who wish to pursue a supervised study involving a specific topic area covered by the program. The student will achieve mastery of this narrow topic area during this project. The intention of the project is that the work is at a level where the student could be a co-author on a paper submitted to a peer reviewed journal. The project can be team based, but each student must have a defined area of responsibility. The topic can be in the digital health technologies or biopharmaceutical stream in the Master of Biotechnology program.

As a supervised project, it is expected that the student supports data collection, data analysis, and paper writing, typically on a team. The project will culminate with a paper that is submitted to the instructor. In addition, there will be a final presentation to the program which must include at least one additional faculty member other than the supervisor for this project.

Corequisites:

Exclusions:

BTC2100Y or BTC2110H

Recommended Preparation:

Notes:

Delivery Method:
In Person

Credit Value:
fixed: 0.5

Rationale:
The Master of Biotechnology (MBiotech) in the Institute for Management & Innovation would like to create a new course: BTC2105H Supervised Study in Biotechnology. This course is offered in the Biopharmaceutical and Digital Health Technologies stream of the MBiotech program.

Biotechnology continues to be driven by scientific findings and publications. Data analysis from clinical and preclinical trials is a key area that closely connects with biotechnology decision making and a deep understanding of the publication process in these areas is useful to MBiotech students. This course formally recognizes this pedagogic outcome by providing a course credit for such efforts.

We have offered this course for several years through the following special topics courses: BTC2110H Topics in Biotechnology. This proposal re-names the course and formalizes its role as part of MBiotech's curriculum.

Unlike BTC2100Y, the student does not play a lead role in BTC2105H. There is no expectation the student will write scholarly works. There is no expectation that the student will achieve a significant synthesis of the data or peer reviewed literature. They are, however, part of a team that collectively will eventually submit a paper for publication.

Consultation:

Resources:
While BTC2105H is a new course, we have offered a similar learning opportunity for several years through the following special topics courses: BTC2110H Topics in Biotechnology.

There are no formal classes for this course. Students typically meet weekly with their supervisor. All professors that supervise a student will not be compensated.

We aim to provide students with up to $500 in funding for research materials in BTC2105H. The funds would cover statistical or AI-based software, wearable technology (e.g. Oura ring for sleep tracking), or a one-day internship for a student to observe an open heart surgery for cardiac projects.

When we have offered BTC2105H as a special topics course, we have usually enrolled 5 students. As such, we expect to spend $2500 on research material per course.

The funding needed for research materials is expected to be offset by budget savings from the retirement of BTC1720H.

Overlap with Existing Courses:
BTC2105H is specific to the MBiotech program and not offered externally. While there are certainly course codes that allow students to conduct research on campus, this course by virtue of its title readily conveys the specialization of the research in question.

2 Course Modifications

BTC1895H: Python Applications in Digital Health Marketing and Regulatory Compliance

Title:

Track Changes: Python Applications in Digital Health Marketing and Regulatory Compliance

Description:

Track Changes:

This course ~~gives students~~builds on the foundation ~~to engage with healthcare-related information disseminated from websites related to digital health. Product information in healthcare not only has to follow some basic concepts of website design and data collection, but must also be regulatory compliant with respect to such organizations as the Pharmaceutical Advertising Advisory Board (PAB). Students will explore key elements of website design for this purpose. Lastly, students will be exposed to~~al programming skills acquired in the introductory course ("Coding in the R Language"; BTC1855H), focusing on advanced techniques for data handling and analysis in the context of digital health using Python-based programming tools. Students will learn how to create interactive dashboards, handle missing data, perform advanced data censoring techniques, and work with real-world biometric and clinical datasets. There will be an emphasis on making sure the data sets used are "dirty" (i.e., contain errors, inaccuracies, or inconsistencies that can negatively affect the quality and reliability of analysis, processing, or decision-making) to reflect common clinical trial situations. Applications will focus on healthcare related information disseminated from a website related to digital health, product information in healthcare, website design and data collection, regulatory compliance, and social listening in health as a data gathering tool from web traffic.

Prerequisites:

Track Changes:

BTC1855H

Rationale:

Students will engage with healthcare-related information disseminated from websites related to digital health but now using the programming language of Python, rather than R. We have found that Python is the most common language used by our employer-partners and is commonly sought in the field of digital health technologies. Python is also commonly requested by our current students and is easier to employ with advanced problems in AI (i.e., “Deep learning” in Python rather than R). Lastly, our students have requested more experience in coding. To keep the curriculum relevant, we are proposing to take the original course (BTC1895H Digital Health Marketing and Regulatory Compliance) and visit the same topics, while focusing on Python-based programming analysis and solutions.

Resources:

No change to existing resources.

BTC2100Y: Thesis Project in Biotechnology

Description:

Track Changes:

This course ~~allows students to conduct research with one of the program instructors.~~is intended for students who wish to pursue a research thesis study involving a specific topic area covered by the program. The student will achieve mastery of a focused topic area during this project. The intention of the project is to conduct research in a field germane to MBiotech with the goal of the student being a lead author on a paper submitted to a peer reviewed journal. The project can be team based, but each student must have a defined area of responsibility. The topic can be in the digital health technologies or biopharmaceutical stream in the Master of Biotechnology program. As a thesis project, it is expected that the student will take a lead role in the data collection, data analysis, and paper writing. The project will culminate with a paper that is submitted to the instructor and a paper that meets the standards of a peer reviewed publication. In addition, there will be a final presentation to the program which must include at least one additional faculty member other than the supervisor for this project.

Corequisites:

Exclusions:

Track Changes:

BTC2105H

Recommended Preparation:

Notes:

Learning Outcomes:

Course Experience:

Rationale:

The Master of Biotechnology (MBiotech) in the Institute for Management & Innovation would like to make changes to BTC2100Y Thesis Project in Biotechnology. This course is offered in the Biopharmaceutical and Digital Health Technologies streams of the MBiotech program. The changes are:

1) Update the course description to better define a pedagogic outcome, and
2) Make BTC2105H Supervised Study in Biotechnology an exclusion.

Biotechnology continues to be driven by scientific findings and publications. Data analysis from clinical and preclinical trials is a key area that closely connects with biotechnology decision making and a deep understanding of the publication process in these areas is useful to MBiotech students. This course formally recognizes this pedagogic outcome by providing a course credit for such efforts.

In addition to the proposal for BTC2100Y, we are submitting a proposal for a new course, BTC2105H Supervised Study in Biotechnology. BTC2100Y and BTC2105H are companion courses where students learn to engage in the research process.

Consultation:

BTC2100Y is specific to the MBiotech program and not offered externally. While there are certainly course codes that allow students to conduct research on campus, this course by virtue of its title readily conveys the specialization of the research in question.

Resources:

BTC2100Y is an existing course. The professor who currently teaches this course will continue to do so and there will be no change in teaching and space resources.

We aim to provide students with up to $500 in funding for research materials in BTC2100Y. The research funds would cover statistical or AI-based software, wearable technology (e.g. Oura ring for sleep tracking), or a one-day internship for a student to observe an open heart surgey for cardiac projects.

In 2024-2025, we enrolled five students in BTC2100Y. As such, we expect to spend $2500 on research material per course.

The funding needed for research materials is expected to be offset by budget savings from the retirement of BTC1720H

3 Retired Courses

BTC1720H: Biomaterials and Protein Chemistry Lab

Rationale:

The Master of Biotechnology (MBiotech) program at the Institute for Management & Innovation would like to deactivate BTC1720H Biomaterials and Protein Chemistry Lab. This course is part of the biopharmaceutical stream.

Biotechnology is trending towards more statistical analysis, use of software, and AI-based analysis. Familiarity with statistics and software will help MBiotech students. As such, a lab-based course is not a priority.

We will create a new course, BTC1730H, that focuses on the theoretical components of biomaterials and protein chemistry covered in BTC1720H.

This proposal is an amendment to the 2024-2025 Academic Calendar.

Consultation:

Many of our students do not find employment in a lab. Several program alumni have commented that BTC1720H, a practical lab course, is not useful. We will create a new course, BTC1730H, that focuses on the theoretical components of biomaterials and protein chemistry covered in BTC1720H.

Resource Implications:

By deactivating this course, we will free up financial resources from the operating budget of up to $30,162, due to reduced lab costs. We hope to access these savings to provide students with up to $500 in funding for research materials in BTC2100Y and BTC2105H.

BTC2040H: Change Management

Rationale:

BTC2040H Change Management is being deactivated. It has not been offered for several years. In 2022, this course was replaced by IMI3002H Change Management to make it accessible to all students at the Institute for Management & Innovation (IMI)..

This course is not a requirement of the MBiotech program. This change does not affect the program requirements.

BTC2040H was last offered in Winter 2022. As MBiotech is a two-year program, students that took BTC2040H are no longer in the program. BTC2040H does not need to be listed as an exclusion to IMI3002H.

Consultation:

In 2022, all IMI Vice Directors were consulted when IMI3002H was proposed. In October 2024, all IMI Vice Directors were consulted on deactivating BTC2040H.

Resource Implications:

None.

IFA2901H: Investigative Related Matters: Advanced

Rationale:

This course has not been offered for more than 5 years and is not required for any program.

Resource Implications:

None.

2 Minor Program Modifications

IMI-B-MBIOTECH-FLD-B: Biotechnology MBiotech; Field: Biopharmaceutical

Completion Requirements
Students must complete **9.5 graduate full-course equivalents (FCEs)** over a 24-month period:

- 4.5 FCEs in MBiotech courses (includes credits for Seminar and Work Term Placement):
  - BTC1600H *Biopartnering I*
  - BTC1610H *Biopartnering II*
  - BTC1900Y *Work Term I (Internship)*
  - BTC1910Y *Work Term II (Internship)*
  - BTC2000H *Effective Management Practices*
  - BTC2010H *Fundamentals of Managerial Concepts*
  - BTC2030H *Management of Technological Innovation*
- 3.5 FCEs in Biopharmaceutical courses:
  - BTC1700H *Molecular Biology Laboratory*
  - BTC1710H *Biomaterials and Protein Chemistry Theory*
  - ~~BTC1720H *Biomaterials and Protein Chemistry Lab*~~
  - BTC1730H *Structural Biology in Drug Development*
  - BTC1800H *Biotechnology in Medicine*
  - BTC1810H *Biotechnology and Drug Manufacturing*
  - BTC1820H *Biotechnology in Agriculture and Natural Products*
  - BTC2020H *Society, Organizations, and Technology*
- 1.5 FCEs in elective courses chosen from:
  - BTC1860H *Generations of Advanced Medicine: Biologics in Therapy (GAMBiT)*
  - BTC1920Y *Work Term III (Internship)*
  - BTC2100Y *Thesis Project in Biotechnology*
  - BTC2105H *Supervised Study in Biotechnology*
  - BTC2110H *Topics in Biotechnology*
  - BTC2120H *Topics in Biotechnology*
  - IMI elective courses
  - Other graduate courses approved by Program Directors.

An ongoing **seminar series** led by university, industry, and government specialists links all the participants with the academic, practical, and applied aspects of the program.

Description of Proposed Changes:
The Master of Biotechnology (MBiotech) program in the Institute for Management & Innovation would like to replace BTC1720H with BTC1730H. This course is offered in the Biopharmaceuticals stream of the MBiotech program. We would also like to add BTC2105H as an elective course.

Rationale:
BTC1720H Biomaterials and Protein Chemistry Lab is being retired, and BTC1730H will replace BTC1720H. There will be no change in the number of FCEs required for program completion. Biotechnology is trending towards more statistical analysis, use of software, and AI-based analysis. Familiarity with statistics and software will better serve MBiotech students. This change will not affect the program learning outcomes.

BTC2105H is also being added as an elective course. More information on BTC2105H can be found in the minor modification proposal.

Impact:
This change will not impact current students. This change will impact students that begin the program in May 2025.

Consultations:
Many of our program students are seeking employment opportunities in fields other than lab environments. Several program alumni have commented that BTC1720H, a practical lab course, is not useful. After review and discussion, it was decided to retire BTC1720H, and create a new course BTC1730H which will focus on theoretical components of biomaterials and protein chemistry.

Resource Implications:
There is an existing faculty member assigned to teach BTC1730H on load. This course curriculum has already been developed. We have classroom space for this course.

IMI-B-MBIOTECH-FLD-DHT: Biotechnology MBiotech; Field: Digital Health Technologies

Completion Requirements

Students must complete **9.5 graduate full-course equivalents (FCEs)** over a 24-month period:

- 4.5 FCEs in MBiotech courses (includes credits for Seminar and Work Term Placement):
  - BTC1600H *Biopartnering I*
  - BTC1610H *Biopartnering II*
  - BTC1900Y *Work Term I* (internship)
  - BTC1910Y *Work Term II* (internship)
  - BTC2000H *Effective Management Practices*
  - BTC2010H *Fundamentals of Managerial Concepts*
  - BTC2030H *Management of Technological Innovation*
- 4.~~0~~5 FCEs in Digital Health Technologies courses:
  - BTC1842H *Medical Device Reimbursement*
  - BTC1855H *Coding in R Language*
  - BTC1859H *Data Science in Health I*
  - BTC1877H *Data Science in Health II*
  - BTC1878H *Health Data Visualization with Tableau*
  - BTC1882H *Digital Ethnography in Health*
  - BTC1889H *Deep Learningin Health*
  - BTC1895H *Python Applications in Digital Health Marketing and Regulatory Compliance* ~~*Digital Health Marketing and Regulatory Compliance*~~
  - BTC1899H *Digital Health Technology*
- ~~1.~~0.5 FCE in elective courses chosen from:
  - BTC1860H *Generations of Advanced Medicine: Biologics in Therapy* (GAMBiT)
  - ~~BTC1889H *Deep Learning in Health*~~
  - BTC1896H *Technology and Cognitive Performance*
  - BTC1920Y *Work Term III* (internship)
  - BTC2100Y *Thesis Project in Biotechnology*
  - BTC2105H *Supervised Study in Biotechnology*
  - BTC2110H *Topics in Biotechnology*
  - BTC2120H *Topics in Biotechnology*
  - IMI elective courses
  - Other graduate courses approved by Program Directors.

An ongoing **seminar series** led by university, industry, and government specialists links all the participants with the academic, practical, and applied aspects of the program.

Description of Proposed Changes:

The Master of Biotechnology (MBiotech) program in the Institute for Management & Innovation proposes to change BTC1889H Deep Learning in Health from an elective to a required course. This course is offered in the Digital Health Technologies stream of the MBiotech program. It is also proposed to add BTC2105H as an elective course.

Rationale:

Currently, training on deep learning is offered as an elective. Too few students are getting exposure to this curriculum. In order to adequately achieve the learning outcomes for the MBiotech Digital Health Technologies stream and degree learning outcomes, training in neural networks (BTC1889H Deep Learning in Health) is necessary. In the original program layout, this content was included in the data science courses. However, it has been determined there is too much material to cover in only one course. Therefore, BTC1889H is being made into a required course for all students in the Digital Health Technologies stream.

BTC2105H is also being added as a course option in the list of elective credits.

Impact:

This change will not impact current students. This change will impact students that begin the program in May 2025. There is no net increase to the number of credits required to complete the program, because the number of elective courses required is being reduced from 1.0 FCEs to 0.5 FCEs.

Consultations:

There has been some discussion with students. This was originally part of the Digital Health Technologies proposal. This change ensures that we fulfil the degree learning outcomes as originally proposed.

Resource Implications:

There are no new resources required for this change. BTC1889H is an existing course and there are no anticipated changes in teaching resources.