COURSE COLOUR CODE: STRAWBERRY

MBIOTECH

MASTER OF BIOTECHNOLOGY PROGRAM

Compulsory Course Component

BTC1720H

BIOMATERIALS & PROTEIN CHEMISTRY LABORATORY

Leigh Revers

Summer Term, 2022

MASTER OF BIOTECHNOLOGY

UNIVERSITY OF TORONTO MISSISSAUGA

BTC1720H – Biomaterials & Protein Chemistry Laboratory

Course Outline (Summer, 2022)

Class Location:	DV-3065E
Class Times:	Mon, Wed & Fri, 12:30-4:30PM; Tue & Thu, 9:30AM-4:30PM
Professor:	**Dr. Leigh Revers, M.A., D.Phil.**
Office Hours:	By appointment.
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Leigh Revers is currently Associate Professor in Chemical & Physical Sciences and Director of the Master of Biotechnology (MBiotech) Program at the University of Toronto, Canada. He came to the program with an extensive background in biotechnology entrepreneurship, and he has over 3 decades' experience working in the life sciences sector, both in world-class academic institutions and in industry. Trained as an organic chemist and molecular biologist in the Dyson Perrins Laboratory, he first came to Canada in 1996 as the recipient of a Leverhulme Scholarship to work with Professor Harry Schachter on developmental enzymes involved in human diseases at Toronto's Hospital for Sick Children. His research interests in complex carbohydrates as mediators of events at the cell-surface led to his interest in cancer. He joined Professor Jean Gariépy's research team in 1999 to work on novel biologic toxins capable of exploiting cancer-related carbohydrate signals. A long-held interest in entrepreneurship led in 2000 to his becoming a co-founder of **Molecular Templates Inc.** (MTI), a private biotechnology company focused on the development of novel toxin-based cancer therapeutics. In May 2006, he was appointed Assistant Director with the **MBiotech Program** at the University of Toronto. In 2007, Dr Revers co-founded a consulting practice, which provides specialist scientific and financial services to small and medium-sized enterprises in the life sciences. In 2009, he participated in a USD$2M Series A financing of MTI led by Santé Ventures, which saw the company relocate to Austin, Texas. Shortly afterwards, he co-founded a new Canadian company, **D5Pharma Inc.**, based out of the Sunnybrook Research Institute, which is presently focused on developing aptamer and other biomacromolecular technologies for diagnostic and therapeutic applications. Over the past 10 years, he has spoken widely to healthcare professionals across Canada, and around the world, on the subject of biologics and biosimilars in the context of haematology, rheumatology and oncology. In September of 2017, his company MTI was listed on the NASDAQ (**MTEM**). Dr Revers holds Bachelor's, Master's, and Doctoral degrees in Physical Sciences from the University of Oxford in the United Kingdom.

Course Description

This course is a companion course to **BTC1710H, Biomaterials & Protein Chemistry Theory**, providing a suite of FOUR week-long laboratory modules, each one designed to illustrate some of the common chemical, analytical and informatics techniques used in

biotechnological research that are relevant not only to therapeutics and the pharmaceutical sector, but also more broadly, for example in so-called 'white' industrial biotechnology.

The broad goals of the course are to—

1. Expose students to some of the chemical techniques associated with drug **enhancement** and **delivery**, and the **extraction** of biofuels;
2. Familiarize students with modern open-source bioinformatics platforms for sequence analysis and structure prediction;
3. Provide an opportunity for iterative technical improvement as a function of specific project performance metrics;
4. Enhance technical writing skills and nurture students' awareness of, and compliance with, the strict regulatory frameworks for standard operating procedures that are an essential part of Good Laboratory Practice.

Evaluation and Grades

Grading breakdown for the course is listed below.

Component	Weighting
SOPs (see below)	3 x 12%
PPMs (see below)	3 x 10%
Bioinformatics	12%
Individual Assessment	10%
Team Efficiency	10%
Best Bottom Line	2%*

** One team only.*

Standard Operating Procedures (SOPs)

Teams must submit a **single document** electronically to Quercus in PDF format comprising three SOPs. The document **MUST** *precisely* follow the template provided, including font usage, heading styles, and headers and footers. The font choices must adhere to the template, and teams will need to install the specialist typeface provided (NewsGoth BT). A table of contents **must** be provided, but the sample SOP already provided need not be included. These SOPs should reflect what students have seen previously in **BTC1700H, Molecular Biology Laboratory,** and aim to provide a generic description of each module, including relevant background and context, chemical drawings (created using **ChemDraw** software, and ***not*** downloaded images), photo-graphs, diagrams, and figures, as well as a carefully written procedural section that spells out how the experiment should be conducted by someone 'trained in the art' (i.e., another scientist). The submission is due on the last day of the course, and will be combined with other teams' SOPs to create a **physical, bound, publication-grade volume** that will then be marked by the instructor and SIAs. Marking will be based on the following critical aspects—

- The clarity of the technical writing; a high degree of proficiency in English

language usage, coupled with a concise, direct and clear style that is easy to follow for a newcomer to the protocols being described;

- The quality and professionalism of the document's appearance, such as correct and appropriate pagination, paragraph spacing, headings, headers and footers, correct citation styles, consistent figure and table legends, all observing compliance with the SOP template; and
- The accuracy of grammar, spelling, punctuation, and scientific notation. Appropriate and correct use of special scientific, mathematical and typographic characters (°, µ, ÷, ± , *etc.*) and of **bold** and *italic* typefaces will be a part of this expectation.

Project Performance Metrics (PPMs)

PPMs measure the team's success performing each of the **three** practical laboratory modules (*i.e.*, not bioinformatics, see below). Worksheets are provided for each module that must be completed and submitted by **NOON** of the **Monday** following completion of the module. Teams are encouraged to elaborate on these worksheet templates by adding further salient data or calculations, and appending images, spectra, *etc.* All submissions MUST be through Quercus. Each team performs each laboratory module twice, and are then marked based on **demonstrable improvement** according to these PPMs. All modules must be completed in seven half-day sessions or less. Timelines for the laboratory modules are 5 consecutive working days over the 20 days of the course (15-Jul to 12-Aug; 1-Aug is a national holiday; change-overs occur on Fridays and the final Monday). The scoring of PPMs is as follows, as judged by the instructor and/or SIAs—

7	No clear improvement demonstrated
7.5	Modest improvement
8	Significant improvement
8.5	Very significant improvement
9-10	Exceptional improvement

Bioinformatics

This module runs **independently** outside of the laboratory and involves computer-aided protein structural analyses. Details of this component are made available separately through our dedicated SIA, who will grade this assignment and serve in a consulting capacity to teams. The specifics of the deliverables, and the concomitant deadlines, will be communicated to teams by your SIA.

Individual Assessment

As with BTC1700H, students' contributions to the course are individually assessed based on the following:

1) Regular attendance of the laboratory sessions (does not apply to bioinformatics);
2) Demonstrable familiarity with the module currently being undertaken, for example through proper preparation before class. Students who display a lack of knowledge of the practical and analytical chemistry they will be performing will be penalised; and

3) Active participation in weekly social events, which include:

   a. **Coffee & Treats Tuesdays and/or Thursdays:** Outside DV-3065 (consult the online course calendar for exact timing);

   b. **Barbecue Thursdays:** In the CCT courtyard at noon (consult the online course calendar);

   c. **SingStar Fridays:** Brought to you by the exclusive franchisees, every Friday afternoon, exact timing may vary.

   d. **Game of Thrones Jigsaw Challenge:** Every day in DV-3065; win **$1,000** for each completed kingdom (the Seven Kingdoms and King's Landing), and **$500** for completed oceans (marked on the map) or realms north of the Wall.

   e. **PHAGE Hunt:** Every day in DV-3065; win $1,000-5,000 for identifying the reappearance of PHAGE in any of the materials provided to teams during the course.

Team Efficiency & Best Bottom Line

Teams must abide by the laboratory monetary system, akin to their experiences in BTC1700H. A bank will be in operation and teams will receive cash payments for the completion of modules, as well as from other entrepreneurial activities. Ultimately, these financial components of the mark scheme are calculated on a **comparative sliding scale** based on the delta between each team's bottom line and the average and variance of the **bottom line** achieved by all teams at the end of the course. The team with the median cash balance will score **7** and the marks for the remaining teams will be calculated accordingly.