



MASTER OF BIOTECHNOLOGY PROGRAM

Compulsory Course Component

BTC 1720H

BIOMATERIALS
&
PROTEIN CHEMISTRY
LABORATORY

Duncan Jones

Summer Term 2021

MASTER OF BIOTECHNOLOGY

UNIVERSITY OF TORONTO MISSISSAUGA

BTC 1720H – Biomaterials & Protein Chemistry Laboratory

Course Outline (Summer 2021)

Class Location: DV-3065E
Class Times: Mon, Wed & Fri, 12:30-4:30PM; Tue & Thu, 9:30AM-4:30PM
JULY 16TH THROUGH TO AUGUST 13TH (EXCEPT AUGUST 2ND = 20 DAYS)
Professor: **Mr. Duncan Jones, MSc, MBA, PMP**
Office Hours: By appointment
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Course Instructor

Duncan Jones is currently an Associate Professor in the Institute of Management & Innovation (**IMI**), the Director of the ICUBE accelerator, and the Associate Director of the Master of Biotechnology (**MBiotech**) Program at the University of Toronto, Canada.

Duncan holds a Bachelor's of Science (Chemistry and Biochemistry), a Master's of Science (Biochemistry) and a Master's of Business Administration all from the University of Toronto. In addition, he is a Project Management Professional (PMP). For over 30 years, he has primarily worked with inventors in the Life Sciences, especially University professors assisting them in bringing their ideas to market. He has worked in a major pharmaceutical company, as a venture capitalist and with the technology transfer teams at each of Ontario's Universities. He has lectured on and taught business and biotechnology at the high school, college and university levels. Duncan also manages **Hexagon Innovating** (www.hexagon-innovating.com), a consulting firm focused on the fuzzy front end of new product development, sourcing and in-licensing technology, performing technology and intellectual property reviews, doing market research and competitive intelligence, developing business models and strategy, partnering, fundraising, as well as project and portfolio management.

Duncan bringing his commercial and industry experience to the classroom as well as his interest in paedagogy, especially as it relates to critical thinking and experiential learning (<https://duncanjones.weebly.com/education>). Over the last 2+ years, he has taught 11 half-courses at UofT. This represents 7 different courses: 4 in the MBiotech Program, one Master's level elective in Institute of Management of Innovation (UTM), and one undergraduate course in each of the IMI Business Minor (UTM) and Human Biology (St. George) programs.

Course Description

This course is a companion course to **BTC1710H, Biomaterials & Protein Chemistry Theory**, providing a suite of four week-long laboratory modules 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	3 x 12%
PPMs	3 x 10%
Bioinformatics	12%
Individual Assessment	10%
Team Efficiency	10%
Best Bottom Line	2%*

* One team only.

Standard Operating Procedures (SOPs)

In addition to the bioinformatics report (see below), each full team must submit a single document electronically to Quercus in PDF format comprising the 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**. The submission is due by **NOON** of the **Monday** following completion of the course. Marking will be based on the following critical aspects—

- The provision of a generic description of each module, including thorough and relevant background information and context, chemical drawings (created using ChemDraw software, and **not** downloaded images), photographs, diagrams, and figures, as well as a carefully written procedural section that spells out how the experiment should be conducted. (Historically 10-20 pages/protocol)
- The depth and 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.

Project Performance Metrics (PPMs)

PPMs measure each team's success performing each of the **three** laboratory modules. 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. In effect, each team performs each laboratory module twice (i.e., two half-teams), and are marked based on demonstrated improvement according to these PPMs. All modules must be completed in seven half-day sessions or less. For nanoparticle and PEGylation modules, this runs weekly from Monday to Friday, whereas biodiesel begins on Fridays and concludes on Thursdays. The scoring of PPMs is as follows:

7	No demonstrable improvement;
7.5	Modest improvement;
8	Substantial improvement;
8.5	Strong improvement;
9-10	Very strong improvement, excellent

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 a dedicated TA, who will grade this assignment and serve in a consulting capacity to teams (2 x 30-minute, online sessions at a mutually agreed date and time).

Individual Assessment

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

- Regular attendance of the laboratory sessions (does not apply to bioinformatics which can be performed off-site).
- Each of the 7 teams are to form two "half-teams" of 2-3 members for **Weeks 1 & 3** (**a** and **b**) and different "half-teams" for **Weeks 2 & 4** (**c** and **d**). Each half-team is to complete one of the four modules in the 7 half-day sessions each week (see Table). By the end of the course each full team will have, in effect, completed each module twice and each student will have participated in their fair share of the onsite tasks (individually as a result of COVID restrictions: 7 to 9 onsite visits for each member).

	Nanoparticles	Biodiesel	PEGylation	Bioinformatics
Weeks 0 & 1 (6 days)	Team 1a	Team 5a	Team 1b	Team 5b
	Team 2a	Team 6a	Team 2b	Team 6b
	Team 3a	Team 7a	Team 3b	Team 7b
	Team 4a	–	Team 4b	–
Week 2 (5 days)	Team 5d	Team 1c	Team 5c	Team 1d
	Team 6d	Team 2c	Team 6c	Team 2d
	Team 7d	Team 3c	Team 7c	Team 3d
	–	Team 4c	–	Team 4d
Week 3 (4 days)	Team 1b	Team 5b	Team 1a	Team 5a
	Team 2b	Team 6b	Team 2a	Team 6a
	Team 3b	Team 7b	Team 3a	Team 7a
	Team 4b	–	Team 4a	–
Week 4 (5 days)	Team 5c	Team 1d	Team 5d	Team 1c
	Team 6c	Team 2d	Team 6d	Team 2c
	Team 7c	Team 3d	Team 7d	Team 3c
	–	Team 4d	–	Team 4c

- 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 penalized.

Team Efficiency & Best Bottom Line

Revenues from final product sales (based on quality and yields) as well as earnings from the weekly social events minus lab expenses and any assessed lab penalties are to be tracked and reported in a financial statement posted on Quercus by **NOON** of the **Monday** following completion of the course.

The weekly social events include:

- **SingStar Fridays:** Brought to you by the exclusive franchisees, every Friday afternoon, exact timing may vary.
- **Game of Thrones Jigsaw Challenge:** Every day in DV-3065; win **\$1,000** for each completed kingdom (the Seven Kingdom and King's Landing), and **\$500** for completed oceans or realms north of the Wall.

These financial components are calculated on a comparative sliding scale based on a comparison each team's net profit. The team with the greatest loss will score **7**. The team with the largest profit will score **10 + 2* = 12**.