Chemistry
UNIVERSITY OF TORONTO

CHM 479H/1008: Biological Chemistry

2024 Winter Course Syllabus

I TEACHING TEAM

INSTRUCTOR

Professor Mark Nitz
Mark.nitz@utoronto.ca
Lash Miller Laboratories Room 439
Student hours – After class on Thursdays or by appointment

II COURSE OVERVIEW

COURSE DESCRIPTION:
This course covers in-depth examination of bacterial peptidoglycan biosynthesis, how the mechanisms of the enzymes involved were determined and how these enzymes have been targeted for antibiotic discovery.

STUDENT LEARNING OUTCOMES:
At the end of the course, you will be able to apply chemical knowledge to understand, evaluate and speculate on how small molecules may interact with and affect biochemical pathways and enzyme systems. Using your interpretation of biochemical assay results you will be able to propose hypothesis concerning the mechanisms of the enzymes involved and how they relate to the overall biochemical pathway.

PREREQUISITE COURSE(S):
This course assumes you have a basic understanding of chemical reactivity and functional groups at the level of CHM347, biochemistry at the level of BCH210, and the fundamentals of reaction and enzyme kinetics.

Prerequisites: BCH210H, CHM347

READINGS:
Reference text: D. Voet and J. G. Voet, "Biochemistry".

Journal articles will also be cited in lecture notes and you may find these useful to understand the course content.

III COURSE ORGANIZATION

This course will proceed in person classes.

Class Location and Time:
Thursdays 10-12
Room SS1069

COURSE SCHEDULE & RELEVANT SESSIONAL DATES:

DATES	Discussion number	TOPICS
Jan 11	Intro	Course intro and the Penicillin story, Discovery and isolation
Jan 18	Discussion 1	MurA + MurB
Jan 25	Discussion 2	MurC-F (Part I -III)
Feb 1	Discussion 3	MraY Part I and Mur G part 1 (Assignment Due)
Feb 8	Discussion 4	MurG part 2 and Flippase
Feb 15	Discussion 5	Polymerizing the glycan and crosslinking
Feb 22	-	Reading week
Feb 29 (leap year!)	-	Midterm
March 7	Discussion 6	Crosslinking the peptide/ Mechanism of Penicillin (Assignment Due)
March 14 (π)	Discussion 7	Penicillin resistance lactamases and metallolactamases/clavulanic acid and related compounds
March 21	Discussion 8	Metallolactamase inhibitors/Vancomycin
March 28	Discussion 9	Vancomycin Resistance and other supramolecules (Assignment Due)
April 4	Discussion 10	Non-ribosomal Peptide synthesis

IV EVALUATION/GRADING SCHEME

OVERVIEW:

CHM479
Discussion Participation 10%
Assignments (x3): 35%
Midterm exam: 20%*
Final Assessment: 35%*

CHM1008
Discussion Participation 10%
Assignments (x3): 25%
Midterm exam: 20%
Proposal: 15%
Final Assessment: 30%

*If the final assessment grade is better than the midterm grade the weighting of the midterm will be reduced to 15% and the final assessment increased to 40%

Discussion Participation

A written question about the discussion material is submitted via Quercus, (Due Tuesday midnight before the class). A few of these questions will be taken up in the first part of the following lecture and discussed. The grading of the questions will be explained in the course introduction discussion. The first questions are due on Jan 16th. Late discussion questions will not be accepted. The best 7 discussion question grades out of the 10 possible submissions will count towards your final grade. The 7 out of 10 approach is done to provide adequate accommodation for absences

Assignments
These assignments will be based on literature related to the enzymes and topics we cover in the course. Assignments are to be completed individually. Assignments are to be submitted via Quercus.

Assignment 1 Due Feb 1th
Assignment 2 Due March 7th
Assignment 3 Due March 28th

Exams
Midterm Exam (Feb 29th). This will cover material up to Discussion 5. The exam will take place during class time. Practice midterm questions will be available on Quercus. A synchronous debrief after the exam will occur after Discussion 6 in the student hour.

Final Exam: This will occur during the exam period. The final exam is cumulative.

For students missing the midterm test for a valid reason, the missed grade will be calculated based on performance on the final exam.

V COURSE POLICIES

- Each member of this course is expected to maintain a:

(i) professional and respectful attitude during all course activities, including discussions and all online activity.
(ii) personal calendar/schedule/organizer to ensure that all course activities are completed, and due dates are met.
(iii) familiarity with the university policy on Academic Integrity (overleaf)

- The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. As a Course Instructor, I will neither condone nor tolerate behaviour that undermines the dignity or self-esteem of

any individual in this course and wish to be alerted to any attempt to create an intimidating or hostile environment. It is our collective responsibility to create a space that is inclusive and welcomes discussion. Discrimination, harassment and hate speech will not be tolerated. If you have any questions, comments, or concerns, we encourage you to reach out to the staff in our Equity Offices.

(iv) Communication with instructor (e.g., I will respond to email within 24 hrs. on weekdays).

(v) This course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session.

(vi) Course videos and materials belong to your instructor, the University, and/or other sources depending on the specific facts of each situation, and are protected by copyright. Do not download, copy, or share any course or student materials or videos without the explicit permission of the instructor.

(vii) Policy for late assignment submissions - 5% will be deducted daily.

(viii) All assignments and discussion questions should be submitted via Quercus.

(ix) If you are absent from your studies due to illness or other reasons and unable to complete course work (e.g., a term test or an assignment) then a piece of written documentation is required. The following four items are the recognized forms of documentation:

1. Absence Declaration via ACORN (please note the circumstances under which an absence declaration can and cannot be submitted)
2. U of T Verification of Illness or Injury Form
3. College Registrar's letter
4. Letter of Academic Accommodation from Accessibility Services

Students who complete the ACORN Absence Declaration form must additionally contact me/ to discuss their situation within five business days of the missed piece of work. This is essential action for any consideration to be granted.

For extended absences and for absences due to non-medical reasons, make sure to contact your College Registrar's Office. They can help you decide between a request for an extension or other types of academic consideration.

(x) If you suspect or know that you have a disability that is affecting your studies, learn about the services and supports available through Accessibility Services. A disability can be physical disability, sensory disability, a learning disability, mental health disorder or a short-term disability like an injury. If you are not sure whether you have a disability, you can confidentially contact Accessibility Services with your questions.

VI TECHNOLOGY REQUIREMENTS

- Specific guidance from the U of T Vice-Provost, Students regarding student technology requirements is available here: https://www.viceprovoststudents.utoronto.ca/covid-19/tech-requirements-online-learning/
- Advice for students more broadly regarding online learning is available here: https://onlinelearning.utoronto.ca/getting-ready-for-online/
- This course requires the use of computers, and technical issues are possible. When working on a piece of academic work, students are responsible for scheduling enough time to allow for reasonable delays due to technical difficulties to be overcome, so such issues will not be acceptable grounds for deadline extension. Particularly, maintaining an up-to-date independent backup copy of your work is strongly recommended to guard against hard-drive failures, corrupted files, lost computers, etc.
- Students may use artificial intelligence tools, including generative AI, in this course as learning aids or to help produce assignments. However, students are ultimately accountable for the work and should be warned that chatGPT has repeatedly failed the course.

VII INSTITUTIONAL POLICIES & SUPPORT

ACADEMIC INTEGRITY

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

On quizzes and term tests:

1. Using or possessing unauthorized aids. **Please note that the use of websites (such as Chegg.com or the course discussion board) to post quiz/term test questions or to post/access answers to questions is an academic offence under the University of Toronto's Code of Behaviour on Academic Matters. Alleged instances of this nature are forwarded to the Faculty of Arts & Science Student Academic Integrity office.**
2. Looking at someone else's answers or collaborating/discussing answers during a quiz or term test.
3. Misrepresenting your identity.

In general academic work:

1. Falsifying institutional documents or grades.
2. Falsifying or altering any documentation required by the University.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see www.academicintegrity.utoronto.ca/).

COPYRIGHT

If a student wishes to copy or reproduce class presentations, course notes or other similar materials provided by instructors, he or she must obtain the instructor's written consent beforehand. Otherwise, all such reproduction is an infringement of copyright and is absolutely prohibited. More information regarding this is available here: https://teaching.utoronto.ca/ed-tech/audio-video/copyright-considerations/

ACCESSIBILITY NEEDS
Students with diverse learning styles and needs are welcome in this course. The University of Toronto is committed to accessibility: if you require accommodations for a disability, or have any other accessibility concerns about the course, please contact Accessibility Services as soon as possible.

ACCOMMODATIONS FOR RELIGIOUS OBSERVANCES
Following the University's policies, reasonable accommodations will be made for students who observe religious holy days that coincide with the due date/time of an assignment, tutorial, class or laboratory session. Students must inform the instructor **before** the session/assignment date to arrange accommodations.

ADDITIONAL SERVICES & SUPPORT
The following are some important links to help you with academic and/or technical service and support:

- General student services and resources at Student Life
- Full library service through University of Toronto Libraries
- Resources on conducting online research through University Libraries Research
- Resources on academic support from the Academic Success Centre
- Learner support at the Writing Centre
- Information for Technical Support/Quercus Support

ACKNOWLEDGEMENT OF TRADITIONAL LANDS
We wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca and, most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.