

Faculty of Science Course Syllabus
Department of Chemistry
Chemistry of Living Systems
CHEM3601
Winter Term 2021

Instructor(s): Professor Frances Cozens, Virtual Office frances.cozens@dal.ca. Principal Instructor, day-to-day class inquiries and all administrative matters for the CHEM3601 lectures.
Office Hours Via Teams –by appointment. You are welcome to e-mail Professor Cozens if you would like to make an appointment for a specific time. Please put CHEM3601 in the subject line.

Dr. Michael Beh, Virtual Office michael.beh@dal.ca. CHEM3601 synchronous lecture help sessions, tutorial and student support.
Office Hours Via Teams –to be scheduled or by appointment. You are welcome to e-mail Dr. Beh if you would like to make an appointment for a specific time. Please put CHEM3601 in the subject line.

Lectures: Weekly lecture material will be uploaded to Brightspace in an asynchronous format. The class will be formatted with weekly uploads to Brightspace. The weekly asynchronous material will be uploaded usually on the Thursday of each week. The material may include, lecture PowerPoint notes, lecture videos of the PowerPoint notes, and practice problems.

Lectures tutorials: Synchronous Teams meetings will be scheduled throughout the term in the Monday, Wednesday or Friday, 12:30 - 1:30 pm timeslots.

The following pages constitute the syllabus for this course, CHEM3601. You can consider the syllabus to be a contract, which delineates responsibilities and expectations for both the students and the teaching team. You should review the syllabus at your earliest convenience, refer to it as necessary throughout the term, and contact the Instructor with any questions and/or concerns you may have.

Course Description Credit hours: 3

The chemical principles governing a wide variety of biological processes will be discussed. Structure and mechanism will be emphasized in explanations and predictions of the behaviour of organic compounds in nature. Specific topics include:

- amino acids
- hydrogen bonding
- stereochemistry
- proteins
- activation of carbonyl groups
- peptide synthesis
- enzymes
- enzyme catalysis
- coenzymes

- prochirality
- simple enzyme kinetics
- biomolecules

Structure, including stereochemistry, and mechanism (*i.e.*, arrow-pushing) are emphasized in discussions of the behaviour of organic compounds in nature (living systems). The structures of small and large molecules will be described along with the reactivity of small molecules in living systems. The catalytic role of enzymes and coenzymes as catalysts will be examined from a mechanistic perspective. Overall, the material presented will illustrate the fundamental relationship between chemistry and the existence of all living organisms.

Course Prerequisites

PREREQUISITES: CHEM 2402.03 (grade of C- or better).

Key Knowledge or Skills Expected

CHEM3601, a bioorganic chemistry class, combines the components of both organic chemistry and biochemistry to investigate the chemistry of living things. While biochemistry aims at understanding biological processes using chemistry, bioorganic chemistry attempts to expand organic-chemical reactions toward biology. In this class we will apply organic chemistry to biological reactions to develop a greater understanding of the processes involved in living systems. Key concepts presented in Introductory Organic Chemistry, especially reaction mechanisms and use of curved arrows. A working knowledge of the chemical principles related to acid-base and nucleophilic-electrophilic reactions is assumed.

Course Goals or Outcomes

- To be familiar with the structure and stereochemistry of molecules found in living systems.
- To be familiar with reactions used by or used to study living systems.
- To be familiar with the action of enzymes active sites.
- To appreciate that chemistry is fundamental to biological processes supporting all living systems.
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Key knowledge or skills expected of students coming into the course

All aspects of the material contained in CHEM1011 and CHEM1012, CHEM2401 and CHEM2402 (or equivalents).

Required Course Materials

Lectures: Class material will be available from Brightspace in weekly uploads. NOTE: Lectures notes are subject to change. The most up-to-date set of lecture notes will be available on Brightspace. A class Calendar posted to Brightspace will provide the running dates for the lectures, quizzes and assignments.

Textbook: Resource Textbook: "Organic Chemistry" **8th Edition**, by Paula Y. Bruice. This book is available at the University Bookstore as an ebook and is the same book used in CHEM2402. In CHEM3601, "Organic Chemistry" by Bruice will be followed loosely and lecture notes will be somewhat based on the material from this book. The material that will be on the quizzes, assignment 1 and the final examination will be covered in the PowerPoint slides that will be available on Brightspace.

Other Biochemistry textbooks, such as "Principles of Biochemistry" 5th edition, H.R. Horton, are useful resources for CHEM3601.

Problem sets: (and answers) and other aids will be provided on the Brightspace class website. Please visit the Brightspace platform often to keep up-to-date on the class material.

Brightspace: All class material including, class communication via announcements, lecture notes and videos, practice problems, etc will be posted to Brightspace, <https://dal.brightspace.com>

Teams: Dalhousie-supported Microsoft Teams for synchronous lecture tutorials and drop-in sessions, help along with class appointments: accessible via the “waffle” on MyDal, login via your Dalhousie email address

Lectures: The following topics are expected to be covered in CHEM 3601 and are listed below. (Class lecture notes and video lectures will be available on Brightspace).

Part 1 Introduction and Review Material

- Overview
- Hydrogen Bonding
- Stereochemistry

Part 2 Proteins

- Amino Acids & Peptides
- Carboxyl Group
- Peptide Synthesis
- Protein Structure
- Prochirality

Part 3 Enzymes

- Enzymes as Catalysts
- Enzyme Kinetics
- Coenzymes: Decarboxylation
- Coenzymes: Amino Acids
- Coenzymes: Redox

Part 4 Other Biomolecules

- Nucleic Acids
- Lipids
- Carbohydrates

Part 5 Other Processes (Time Permitted)

- Any Other Topics

How to do well in CHEM 3601

Participate in the class material. Keep up with the class material that is posted to Brightspace.

Take good notes. Taking your own notes from the lecture slides will help you to learn.

Study. Keep up with the material.

Quizzes. Study and utilize the class notes when answering the quiz questions.

Useful Websites:

- Web of Science Citation Databases (Chemistry search; Dalhousie library)
- Scifinder Scholar (chemistry search; Dalhousie library)
- Chemical Institute of Canada (www.cheminst.ca/)

- Royal Society of Chemistry (www.rsc.org)
- American Chemical Society (www.acs.org & pubs.acs.org)
- Chemistry Societies' Network (www.chemsoc.org)

Course Assessment

Evaluations: Quizzes will be available for each lecture topic and scheduled during the term. There will be five (5) lecture quizzes. In addition to the online quizzes the class will have two hand-written assignments, a group project and a three-hour synchronous final examination.

All work must be completed in the class. If you are experiencing illness, please submit a student declaration of absence and the due date will be adjusted accordingly.

The three-hour final examination will cover the entire course and will be delivered in a synchronous format. A student may write a make-up final examination if the final examination was missed with a justifiable reason. The date and time of the make-up examination will be decided a few days after the CHEM3601 final examination has been written and will be at the end of the regular examination period. The University policy is that final examinations are not returned to students. All material in CHEM3601 is strictly copyright and not for distribution, this includes all components of the class including the final examination.

Independent work. All graded work in CHEM3601 must be done independently by each student enrolled in the class. Online resources can be used for all graded work, except 'cheating' websites such as CHEGG.COM.

Copyright @. All material posted online for CHEM3601 is strictly copyrighted. No class material can be distributed in any way to a third party. Upon investigation via University protocols if a student is found to have participated in the **uploading of any material to a third party such as CHEGG.COM** or sharing with anyone not enrolled in the class this will lead to a **mark of 'F' for CHEM3601**. Please do not upload any portion of CHEM3601 to CHEGG.COM or any other online class distribution website.

All work must be the student's independent and individually prepared work (except for the group project). Student work that is not independently done will receive a **mark of 0 on the submitted material**. Utilizing online resources is allowed.

Email. It is your responsibility to read your Dalhousie email, as class notifications may be sent by email. For any correspondence in CHEM3601 please use email to contact Dr. Cozens.

Delayed postings. In the case of a weather-related closure, internet or power interruptions, online content may be delayed.

Marking Scheme

All quizzes and assignments will count towards the final grade in CHEM 3601. A minimum mark of 40% must be obtained on the final examination in CHEM 3601 to pass the class. Any less than 40% on the final examination in CHEM 3601 will automatically result in a grade of "F" in CHEM3601.

Online quizzes will be assigned throughout the term. Each topic will have an associated quiz that must be done within the time allowed for the quiz. Each quiz will be independently graded, and the total quiz mark will be 25% of the class. The class Calendar will have the quiz release and due dates and is subject to change.

Course Assessment:

Five Online Quizzes (5% each)	25% total
Two online assignments (15% each)	30% total
Class group project	10%
Final examination	35%
Total	100%

Dates of online assignments:

Assignment 1 released on February 9, 2021 and due on February 10, 2021

Assignment 2 released on March 9, 2021 and due on March 10, 2021

Group project will be conducted the week of March 15, 2021 with completion date of March 23, 2021

Final Examination (date to be scheduled by the Registrar) will be a three-hour exam and will cover the entire course.

This class will rely in Brightspace for the upload of the assignment and final examination. Please note that only the uploaded document to Brightspace will be graded. Errors in the uploads to Brightspace are the responsibility of the student and therefore students must check their uploaded documents to ensure the upload is the correct version and completed document for grading.

A minimum grade of 40/100 marks on the final examination is required in CHEM 3601 to pass the class.
A minimum total grade of 50/100 marks is required in CHEM 3601 to pass the class.

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (<50)
A- (80-84)	B- (70-72)	C- (55-59)	

Chemistry courses, unless stated otherwise, have a minimum grade requirement of C- for their prerequisite chemistry courses. Students with grades below C- in the prerequisite chemistry courses can only register with the permission of the instructor for the course.

Faculty of Science Course Syllabus (Section B)**CHEM3601 Winter 2021
Chemistry of Living Systems****University Policies and Statements**

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Missed or Late Academic Requirements due to Student Absence

As per Senate decision instructors may not require medical notes of students who must miss an academic requirement, **including the final exam**, for courses offered during fall or winter 2020-21 (until April 30, 2021).

Information on regular policy, including the use of the Student Declaration of Absence can be found here: https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html.

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: <http://www.dal.ca/cultureofrespect.html>



Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

https://www.dal.ca/academics/important_dates.html

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: <https://www.dal.ca/faculty/science/current-students/academic-advising.html>

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: <https://libraries.dal.ca/>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Fair Dealing Guidelines <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: <https://dsu.ca/dsas>

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html