DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Chemistry
Chemistry of Living Systems
CHEM3601
Winter Term 2019

Instructor(s): **Professor Frances Cozens** (e-mail frances.cozens@dal.ca, room 410 Chemistry, fourth floor). *Office hours:* Mondays, Wednesdays and Fridays 12:30 pm – 1:30 pm. You are also welcome to e-mail Dr. Cozens if you would like to make an appointment for a specific time. Please put CHEM3601 in the subject line.

Professor Norman Schepp (e-mail norman.schepp@dal.ca, room 411 Chemistry, fourth floor). You are also welcome to e-mail Dr. Schepp if you would like to make an appointment for a specific time. Please put CHEM3601 in the subject line.

Lectures: Chemistry Building, Room 223: M/W/F 11:35-12:25 am; three hours per week

---

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 Format: Lecture 3 hours weekly
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,
- enzyme catalysis,
- coenzymes,
- prochirality
- simple enzyme kinetics.

Structure, including stereochemistry, and mechanism (*i.e.*, arrow-pushing) are emphasized in discussions of the behavior 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**).

DALHOUSIE UNIVERSITY

Key Knowledge or Skills Expected
Key concepts presented in Introductory Organic Chemistry, especially reaction mechanisms and use of arrow-pushing. 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.

Key knowledge or skills expected of students coming into the course
All aspects of the material contained in CHEM 2401 and 2402, CHEM 1011 and CHEM 1012 (or equivalents).

Required Course Materials
Lectures: Class notes will normally be available on the Brightspace class website shortly before the lecture.
NOTE: Lectures notes are subject to change. The most up-to-date set of lecture notes will be available on Brightspace. Annotated lecture notes will not be posted to Brightspace and are not available. Students are encouraged to write their own notes during the lectures.

Textbook: The official textbook is: "Organic Chemistry" **8th Edition**, by Paula Y. Bruice. This book is available at the University Bookstore as a hard copy or ebook and is the same book used in CHEM2402. In CHEM 3601, "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 midterm tests and the final examination will be covered in the PowerPoint slides that will be available on Brightspace.

Other textbooks Biochemistry such as “Principles of Biochemistry” 5th edition, H.R. Horton, L.A is a useful resource 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.

Course Content
Lectures The following topics are expected to be covered in CHEM 3601 and are listed below. (Class lecture notes 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
- 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)
- Bioenergetics
- Oxidative Phosphorylation
- Any Other Topics

How to do well in CHEM 3601
Attend class. There is a clear and direct correlation between skipped lectures and poor results in this course. This cannot be stressed enough! Even though the class will follow the textbook closely, the more classes you attend the better you will do!
Take good notes. Taking your own notes will help you to learn. Even though class notes are provided the more you write your own notes the better you will do.
Study. Keep up with the material. It is critical to stay up with the material. The material in CHEM 3601 cannot be learned the day before the final examination.
Practice. Do the problem sets as soon as possible after they appear on the Brightspace and do NOT look at the answers until the problem set is complete. Attend the scheduled tutorials in the concept room!

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
Midterm tests and the final examination are "closed book," i.e., no cheat-sheets. There will be two, 50-minute midterm tests during regular class time.
The mid-term tests will take place during class-time on **Friday, February 15th**, and on **Monday, March 25th**. There will be **no make-up midterm tests.**

In CHEM 3601 you are required to write BOTH midterm tests and the final examination. If you are absent from a midterm due to illness or a significant personal issue please complete the Dalhousie Student Declaration of Absence and send an email to fcozens@dal.ca with the appropriate midterm subject header: Missed CHEM 3601 Midterm 1/Midterm 2. Only students who submit a completed Dalhousie Student Declaration of Absence will receive an exemption for the midterm test. If no Dalhousie Student Declaration of Absence is completed and submitted to fcozens@dal.ca prior to the midterm test or 48 hours after the date of the midterm test the student will receive a mark of 0 on the missing midterm test. Midterm tests or the final examination should NOT be written in red ink.

The three-hour final examination (time and place to be scheduled by the Registrar) will cover the entire course. A student may write a make-up final examination if the final examination was missed with a justifiable, documented

medical reason. The date and time of the make-up examination will be decided a few days after the CHEM 3601 final examination has been written and will be at the end of the regular examination period. The student is responsible to contact the instructor at fcozens@dal.ca to arrange the make up final examination in CHEM 3601. The instructor will not contact the student. Failure to contact the instructor prior to the final examination date or within 24 hours after the final examination and to provide appropriate documentation for the missed final examination will result in a grade of 'INC' for CHEM 3601. CHEM 3601 has no supplementary examination. The University policy is that final examinations are not returned to students.

Marking Schemes

Midterm-Test 1: 20%
Midterm-Test 2: 20%
Final examination: 60%

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)	

Course Policies

Email

It is your responsibility to read your Dalhousie email, as class notifications may be sent by email.

Cancelled Classes

In the case of a weather-related closure of the University, a DalAlert email will be sent to all students, faculty and staff. Other information can be found at www.dal.ca/storm.html. In the event that CHEM 3601 needs to be cancelled, notification will be sent by email and a notice will be placed on the classroom door.

DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus (Sectiion B)

CHEM3601

University Policies and Statements

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

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

Missed or Late Academic Requirements due to Student Absence (policy)
https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html

Student Resources and Support

DALHOUSIE UNIVERSITY

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

Safety

Biosafety: https://www.dal.ca/dept/safety/programs-services/biosafety.html

Chemical Safety: https://www.dal.ca/dept/safety/programs-services/chemical-safety.html

Radiation Safety: https://www.dal.ca/dept/safety/programs-services/radiation-safety.html

Scent-Free Program: https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html