Queen's University

CHEM-314 – Strategies in Organic Synthesis

2022 Fall Semester Syllabus

Instructor: Professor P. Andrew Evans, CHE508
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Telephone N°: (613) 533-6286

Office Hours: Monday 1:30 to 3:00 pm and Wednesday 1:30 to 3:00 pm
If the office hours are not sufficient or inconvenient, additional appointments can be scheduled *via* e-mail.

Textbook: *Organic Chemistry*, Second Edition, Clayden, J.; Greeves, N.; Warren, S. Oxford University Press, New York, 2012.
Classics in Stereoselective Synthesis, Carreira, E. M.; Kvaerno, Wiley VCH, Weinheim, 2009 (*Recommended*).

Lectures: All lectures will take place in Botterell Hall B148
Monday – 10:30 am to 11:30 am
Wednesday – 9:30 am to 10:30 am
Friday – 8:30 am to 9:30 am

The lecture material will be made available on the course website as PDF files. It is recommended that students read the assigned sections **after** the lectures. The instructor will also provide additional handouts and notes during the lectures as deemed necessary.

onQ: Grades and relevant information will be posted on the onQ site for this course.

Assignments: There will be a series of assignments that should be submitted *via* onQ as a single PDF file for grading by the instructor.

Examinations: Two open-book examinations are scheduled for the following dates:
Exam 1 – Friday, October 7, 2022 at 8:30 am.
Exam 2 – Friday, November 18, 2022 at 8:30 am.

Presentation: The final assignment will be a class presentation in groups during the week of November 28, 2022.

Grade: The grade will be determined in the following manner:

Assignments	25%
Examinations	25%
Participation	10%
Presentations	40%

NB: A final exam is **not** scheduled for this course *in lieu* of the final class presentation.

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There are NO MAKE-UP EXAMS in CHEM-314. Please report any conflicts well in advance to the instructor; your final exam will be worth more to compensate. NO EXCEPTIONS and NO RE-WRITES.

General Comments:

This course allows students to learn the principles relevant for planning and to understand the stereoselective synthesis of chiral organic molecules. It will illustrate the main approaches t employed to facilitate the construction of new carbon-carbon bonds in a stereoselective manner. The students will become familiar with cyclic and acyclic stereocontrol, including the planning of synthetic routes. The course requires a good understanding of stereochemical principles, and reading the *assigned sections* in the textbook and learning to use molecular models is critical to understanding specific details in designing new synthetic schemes.

CHEM/ENCH-314 - Learning Outcomes:

Students should garner the following skills upon successfully completing the course:

1. Identify the type of chirality transfer in a transformation and thereby predict the outcome of a particular reaction.
2. Draw transition states for specific reactions to predict the outcome of a specific process.
3. Identify potential problems with specific stereochemical outcomes.
4. Rationalize the stereochemical outcome for a range of reactions using well-established models for stereoselective reactions.
5. Learn how to plan and implement synthetic sequences for the stereoselective synthesis of organic molecules.

CHEM/ENCH-314 Course Material:

The following is a *tentative* list of the course topics that forms the basis of this course. The material will be supplemented with other sources as deemed necessary.

1. Introduction and Historical Development
2. Diastereoselective Reactions – Cyclic *vs*. Acyclic Stereochemistry
   (a) Addition Reactions – Allylation, 1,2-Additions, Aldol, Alkylations, Wittig, *etc*.
   (b) Oxidation and Reductions
   (c) Cycloadditions – Diels-Alder
   (d) Rearrangements – Claisen, Cope, *etc*.
   (e) Free Radical – Cyclization, Allylation, *etc*.
   (f) Metal-Mediated Reactions – Cyclopropanation, *etc*.
3. Retrosynthetic Analysis and Synthesis

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Grading:

All components of this course will receive numerical percentage marks, which will include adjustments based on the average grade. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to Queen's Official Grade Conversion Scale below:

Queen's Official Grade Conversion Scale

Grade	Numerical Course Average (Range)	Grade	Numerical Course Average (Range)
A+	90-100	C	63-66
A	85-89	C–	60-62
A–	80-84	D+	57-59
B+	77-79	D	53-56
B	73-76	D–	50-52
B–	70-72	F	49 and below
C+	67-69	I	Incomplete

Academic Integrity:

Academic integrity is constituted by the five core fundamental values of honesty, trust, fairness, respect and responsibility (see: www.academicintegrity.org). These values are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University (see the Senate Report on Principles and Priorities http://www.queensu.ca/secretariat/policies/senate/report-principles-and-priorities).

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments conform to the principles of academic integrity. Information on academic integrity is available in the Arts and Science Calendar (see Academic Regulation 1 http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations/regulation-1), on the Arts and Science website (see https://www.queensu.ca/artsci/students-at-queens/academic-integrity), and from the instructor of this course. Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions, which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

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Copyright on Course Material:

This material is copyrighted and is for the sole use of students registered in CHEM314. This material includes class videos, handouts, emailed information and all documents and information provided on the course onQ site. This material shall not be distributed or disseminated to anyone other than students registered in this course. Failure to abide by these conditions is a breach of copyright and may also constitute a breach of academic integrity under the University Senate's Academic Integrity Policy Statement.

Accessibility Statement:

Queen's is committed to an inclusive campus community with accessible goods, services, and facilities that respect the dignity and independence of persons with disabilities. Course materials are available in an accessible format or with appropriate communication supports upon request.

Please contact **Meredith Richards** in the Department of Chemistry in one of the following ways:

Email: **ugadm@chem.queensu.ca**
Phone: **613-533-6000 extension 75518**

Accommodations Statement:

Queen's University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability and think you may need accommodations you are strongly encouraged to contact Student Wellness Services (SWS) and register as early as possible. For more information, including important deadlines, please visit the Student Wellness website at: http://www.queensu.ca/studentwellness/.

Location and Timing of Final Examinations:

As noted in Academic Regulation 8.2.1, "the final examination in any class offered in a term or session (including Summer Term) must be written on the campus on which it was taken, at the end of the appropriate term or session at the time scheduled by the Examinations Office." The exam period is listed in the key dates prior to the start of the academic year in the Faculty of Arts and Science Academic Calendar and on the Office of the University Registrar's webpage. A detailed exam schedule for the Fall Term is posted before the Thanksgiving holiday; for the Winter Term it is posted the Friday before Reading Week and for the Summer Term the window of dates is noted on the Arts and Science Online syllabus prior to the start of the course. Students should delay finalizing any travel plans until after the examination schedule has been posted. Exams will **NOT** be moved or deferred to accommodate employment, travel /holiday plans or flight reservations.

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Academic Considerations for Students in Extenuating Circumstances:

The Senate Policy on Academic Consideration for Students in Extenuating Circumstances (http://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslcwww/files/files/policies/senateandtrustees/Academic%20Considerations%20for%20Extenuating%20Circumstances%20Policy%20Final.pdf) was approved in April, 2017. Queen's University is committed to providing academic consideration to students experiencing extenuating circumstances that are beyond their control and which have a direct and substantial impact on their ability to meet essential academic requirements. The Faculty of Arts and Science has developed a protocol to provide a consistent and equitable approach in dealing with requests for academic consideration for students facing extenuating circumstances, which can be found at: http://www.queensu.ca/artsci/accommodations.