CHEM-760 SPECIAL TOPICS IN ORGANIC CHEMISTRY
Heteroatoms in Organic Synthesis

Course Outline Winter Semester 2019

The course is intended to provide students with an understanding of the utility and mechanism of heteroatom-based functionalities in organic synthesis. The influence of the heteroatom will be emphasized with examples displaying how the heteroatom directs reactivity and where applicable, stereochemistry. Students will be required to deliver two seminars and write two research essays which, when totaled, will comprise a major component of their grade.

Instructor: Professor Adrian L. Schwan, Office: MacN 336, Guelph Campus. 824-4120 X58781; E-mail: schwan@uoguelph.ca FAX: 1-519-766-1499

Method of Presentation: One 2 1/2 hour lecture per week, Thursday nights starting at 7:00 pm in the main link room. First lecture is Mon. Jan. 10, 2019. There will be no lecture on Feb. 7 or during reading week (Feb. 21). The scheduled lectures will be composed of Schwan lecturing for 7 class periods and 4 class periods of student presentations.

Schwan lectures will introduce functional groups and their bonding and electronic charateriztics and also will survey the families of reactions applicable to the functional groups. Presentations by the student will provide a more in-depth assessment of particular reactions or groups of reactions based on the heteratom functional group.

Method of Evaluation: The course grade will be based on two oral seminars, two research essays and a final exam The final examination will be given in April.

The final grade will be calculated as follows:

research seminar 1	15%	on Feb. 14 or 28
research essay 1	20%	due Mar. 7
research seminar 2	20%	on Mar. 28 or Apr. 4
research essay 2	25%	due Apr. 11
final examination	20%	suggested to be Apr. 18 (or Apr. 11)

Presentations and research essays are expected to contain mechanism components, synthetic examples, selectivity features, local (geographic) connections of contributions, and demonstration of heteroatom properties to observed chemistry. Essays are expected to mirror the presentation. See additional documentation for further instructions and guidance.

Main heteroatoms to be addressed:

sulfur, selenium, silicon, phosphorus, boron

Learning Objectives

-to recognize and understand the role of key heteroatom containing functional groups in organic synthesis

-to communicate synthetic and mechanistic chemistry brought about by heteroatom containing functional groups

-to compile and summarize a finite aspect of synethic chemistry

-to increase the student's synthetic chemistry knowledge by unveiling new and valuable functional groups and reactivity modes

-to grow a students mechanistic skills by broadening their exposure to a wider selection of chemistries and reactive intermediates

-to develop an understanding of the role of uncommon bonding effects in organic chemistry

-assist in the development of skills for critical assessment of scientific information

Audits

Please understand that an audit is an official entry on your transcript and there are certain course requirements to achieve this. Audit does not mean "sitting-in". Professor Schwan generally does not recommend the audit or 'sitting in' process, since

1. your graduate career will be assessed primarily by the quality of your thesis and
2. a graduate degree means that you can learn things for yourself. It follows that your time should be spent on your research project.

For University of Waterloo Students

Academic Integrity: *In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility.*

Grievance: *A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy #70, Student Petitions and Grievances, Section 4.* http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm

Discipline: *A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. For information on categories of offenses and types of penalties, students should refer to Policy #71, Student Discipline,* http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm

Appeals: *Concerning a decision made under Policy #70 (Student Petitions and Grievances) (other than petitions) or Policy #71 (Student Discipline) a student may appeal the finding, the penalty, or both. A student who believes he/she has a ground for an appeal should refer to Policy #72 (Student Appeals)* http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm

For University of Guelph Students

Accessibility: The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible.
For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: http://www.csd.uoguelph.ca/csd/

E-mail Communication: As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement: When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course in writing, with your name, id#, and e-mail contact. See the graduate calendar for information on regulations and procedures for Academic Consideration:
http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e1400.shtml

Drop Date: The last date to drop one-semester courses, without academic penalty, is usually the 40th day of classes. Two-semester courses must be dropped by the last day of the add period in the second semester. Refer to the Graduate Calendar for the schedule of dates:
http://www.uoguelph.ca/registrar/calendars/graduate/current/sched/sched-dates-f10.shtml

Academic Misconduct: The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. The Academic Misconduct Policy is detailed in the Graduate Calendar:
http://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/sec_d0e1687.shtml

Recording of Materials: Presentations which are made in relation to course work—including lectures—cannot be recorded in any electronic media without the permission of the presenter, whether the instructor, a classmate or guest lecturer.

Resources: The Graduate Calendar is the source of information about the University of Guelph's procedures, policies and regulations which apply to graduate programs:
http://www.uoguelph.ca/registrar/calendars/graduate/current/

CHEM 760 Winter 2019

Seminar and Essay Guidelines

General Content Components

Brief history (longer if there is an important evolution of the reaction)
Chemical methods to incorporate the heteroatom, if applicable.
Requirement of bonding features unique to the heteroatom ("This reaction works because...." or "The stereochemical outcome is due to.....")
Mechanism with modern references; any mechanism reinterpretations or contentious points?
Value in synthesis with examples: important methodology; natural products or drugs or industrial application, if possible
Any selectivity features of the reaction?
Any local contributions? (GWC^2?, Ontario? Canada? Michigan or Upstate NY?)
Any sustainable aspects or conditions? (green achievements, atom economy, circumvent protecting groups?)
What other reactions effect similar chemistry, if any?
Have the reagents or conditions evolved over time?

Seminar:

Components as above plus :

Effective screen layout: Consistent appearance (all molecules the same size), <u>your</u> original graphics with no mistakes, effective atom size/bond length ratio; innocuous reaction arrows; balance of text and atom size to molecule size; 4 to 8 molecules per slide
Good speech
10-12 minutes in length
Questions from others: At least 1 question for every two presentations

Written report:

Components as above plus :

Good flow; good, mature English; proper use of articles; self consistent reference structure and syntax; proper journal abbreviations – use JOC format
Absolutely no plagiarism. Text will be compared to www using "Turnitin".
No tables of R groups/conditions/yields. Use a reference manager. Get copyright permission for inclusion of someone else's graphics (append the email to your report).

15-20 double spaced pages including diagrams but not including references. Submitted as Word file (easier to provide feedback) or as pdf.

The slides you employ for your presentation are to be distributed to the class (via Schwan) before evening presentation.

Also, presenters are expected to provide a 1 page mechanistic and synthetic summary to other classmates as a study summary for the final exam.

Timing Advice and due dates:

Week 1: claim a topic (Day 1 for this), find too many references and start learning the material
Week 2: Choose references for inclusion; start drawing molecules; start planning structure of seminar and essay.
Week 3: Bring the seminar to a point of near completion, while adding fragmented points and thoughts to your essay;
Week 4: do substantial writing of essay
Week 5; no lecture, complete seminar and send tentative presentation to Schwan for feedback
Week 6 Feb. 14 present Seminar 1: UG students and 1 or 2 UW volunteers
Reading week: 2nd topic decided
Week 7 Feb. 28: present Seminar 1; remaining UW students
Week 8 (March 7) Essay 1 due (option to send for Turnitin assessment prior)
Week 11 Mar. 28 present Seminar 2: UW students
Week 12 Apr. 4 present Seminar 2: UG students and prior UW volunteers
April 11: Essay 2 due (option to send for Turnitin assessment prior)
April 18, final exam?

Anticipated Marking Scheme (with consideration to guidelines and expectations noted above):

SEMINAR

Slides	6	
Oral Presentation and Clarity	6	
Quality and Frequency of Questions Asked	3	
Scientific Content	15	/30

ESSAY

English	5	
Typos/Syntax	5	
Reference Compilation	5	
Scientific Content	15	/30

Conventional sources of references:

Library including online books
SciFinder
Google Scholar
Wikipedia
Web of Knowledge

Unconventional sources of references:
http://www.organic-chemistry.org/
Science of Synthesis is available on Guelph campus (at least):
http://thieme-chemistry.com/thieme-chemistry/sos/trials/?WT.mc_id=IS_SOS_OrgChem_14-10_Product-of-the-month
www.synarchive.com