

## Organic Synthesis

Chemistry 4321/8321 Fall 2019  
Smith Hall 331  
MWF from 11:15 AM – 12:05 PM

**Instructor:** Professor Joseph J. Topczewski

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**Office Hours:** Wednesday s 3:00-5:00 PM or by appointment in 568B Kolthoff

**Teaching Assistant:** Matt Porter

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**Office Hour:** Tuesday and Thursday from 8:30-9:30 AM in 283 Kolthoff

**Course Description:** This course discusses fundamental concepts, reactions, reagents, structural and stereochemical issues, and mechanistic skills necessary for understanding organic chemistry in a synthetic context.

**Course Objectives:** This course's objective is for students to develop skills in synthetic organic chemistry. Achieving this goal will involve several sub-goals including understanding selectivity principles including stereoselectivity, gaining breadth in recognizing synthetic techniques, and honing skills in scientific communication.

**Prerequisites:** This class requires two prior semesters of organic chemistry lecture and an organic lab. A prior semester of intermediate or advanced organic chemistry is highly suggested. Any student who does not fulfill these prerequisites is strongly encouraged to consult with the instructor to determine if enrollment is appropriate. **This is a challenging class.**

**Pedagogical approach:** Most synthesis classes teach reactions and methods separate from the synthetic context in which the methods should or should not be applied. This class intends to provide the learner with a framework in which to use the power of retrosynthesis in combination with knowledge regarding specific reactions to design approaches to the synthesis of complex targets. Most common methods used to construct molecules will be discussed along with selectivity principles and case studies which use these methods as well as the underlying framework of organic chemistry.

### **Required Materials:**

1. *Strategic Applications of Named Reactions in Organic Chemistry* by L. Kurti & B. Czakoand
2. *Advanced Organic Chemistry* by David E. Lewis.
3. Model Kit (if you don't have one they are available at <http://www.darlingmodels.com/> or <https://duluthlabs.com/>).  
You will probably want a model kit with up to 15-20 carbon atoms.

**Suggested Materials:** These are not required and will not be used. They may be handy for grad students who are interested in the topics:

1. An introductory undergraduate textbook in organic chemistry – if you don't have one get an old one from Amazon for like \$10 – author does not matter and version does not matter. It will be handy to review from.
2. *Stereoelectronic Effects A bridge Between Structure and Reactivity* by Igor V. Alabugin
3. *Classics in Total Synthesis: Targets, strategies, Methods* by Nicolaou K. C. & Sorensen, E. J.

**Expectations:** Students are expected to (1) be prepared for class and arrive promptly to class. (2) attend class on a regular basis and stay for the full duration of the class. (3) recognize gaps in their own fundamental knowledge of prerequisite material and fill those gaps with appropriate material from earlier organic chemistry classes. (4) participate during in-class exercises that will require doing readings and assignments prior to class. (5) operate within an inclusive atmosphere of mutual respect between all class participants. (6) participate appropriately in group projects. (7) conduct themselves with the highest levels of academic integrity.

**Ungraded Problems:** A number of brief but ungraded homework problems will be provided during the semester. These are intended to be self-check exercises and many will be discussed in class. Frequently, the last slide of a class's notes will contain a sample homework problem. Typically, the next class will begin with a discussion of the previous class's problem. Students are *strongly* encouraged to work through these problems in-between class. Other example problems can be obtained at <https://www.organicchemproblems.com/>.

**Graded Problem Sets:** Two problem sets (5-8 in depth questions) will be assigned throughout the semester. These will require a **significant** amount of time to complete. These are **not** group problem sets and students are expected to submit their own work (see policy below). These will be due at the start of class in hard copy two weeks following the date the

assignment was made available (Full dates on Moodle). **Please write your final answers clearly on standard printer paper for submission (DO NOT use spiral paper with torn edges).** It is recommended that you scan or copy your final answer sheet before submission.

**Group Presentations:** There will be a case study section towards the end of the semester. Each student will present as part of a small group. Each case study will focus on a different synthesis, topic, or reaction class. A separate handout will be provided with group assignments, dates, lead references, and specific instructions.

**Exams:** There will be three **comprehensive** exams during class throughout the semester. They are all comprehensive and even include Organic I/II. You don't need to ask – if we covered it, then it is fair game. If it is in 90%+ Organic I/II courses, then it is fair game.

**Chem 8321 Assignment:** The students enrolled as 8321 students will be responsible for an additional assignment. This assignment is valued tentatively at 5% of the overall grade.

<b>Tentative Grading Schedule:</b>	<b>4321</b>	<b>8321</b>
	25% exam 1	25% exam 1
	25% exam 2	25% exam 2
	25% homework (12.5% each)	20% homework (10% each)
	25% group presentations	25% group presentations
		5% 8321 Assignment

**Make up Policy:** Homework will not be accepted late. Homework is assigned sufficiently far in advance where being late is unacceptable. If you are sick, then please email it to me. If you will be out of town, then email it to me in advance. There will be no scheduled make up exams. Any legitimate conflict must be discussed in advance with the professor. Participation in the presentation is a core component of the group project. Being absent during your group presentation will result in a 0 for that portion of the grade. Other absences will be assessed on a one-on-one basis per the University guidelines at the sole discretion of the professor. The instructor does not need to be informed of other absences – attendance is not required.

**Collaboration:** Collaboration is a principle component of the scientific enterprise. Students are encouraged to work together through the course – especially during group projects. However, students are solely responsible for all submitted works bearing their name and “copying” is Academic Dishonesty. For instance, synthesis is a highly creative enterprise and it is unlikely that students would propose identical synthetic sequences independently.

**Academic Dishonesty:** As defined in the Student Code of Conduct by the Regents of the University of Minnesota - Twin Cities at the following URL: [http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf) **Students are strictly responsible** for following the code of conduct. Instances of academic dishonesty in my class will be referred to the appropriate university offices. Other violations of the Student Code of Conduct will also be referred. Consequences may include probation, suspension, or expulsion.

**Disability Resource Center:** The University of Minnesota is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations. If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact the DRC at 612-626-1333 to arrange a confidential discussion regarding equitable access and reasonable accommodations. If you are registered with the DRC and have a current letter requesting reasonable accommodations, we encourage you to contact your instructor early in the semester to review how the accommodations will be applied in the course.

**Student Mental Health:** As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via <http://www.mentalhealth.umn.edu/>.

### **Student Conduct Code**

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community. As a student at the University you are expected adhere to Board of Regents Policy: Student Conduct Code. To

review the Student Conduct Code, please see:  
[http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf).

### **Appropriate Student Use of Class Notes and Course Materials**

Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Such actions violate shared norms and standards of the academic community. For additional information, please see:  
<http://policy.umn.edu/education/studentresp>.

### **Sexual Harassment**

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy:  
[https://regents.umn.edu/sites/regents.umn.edu/files/policies/Sexual\\_Harassment\\_Sexual\\_Assault\\_Stalking\\_Relationship\\_Violence.pdf](https://regents.umn.edu/sites/regents.umn.edu/files/policies/Sexual_Harassment_Sexual_Assault_Stalking_Relationship_Violence.pdf)

### **Title IX**

I want to let you know that, in my role as a University employee, I am required to share information that I learn about possible sexual misconduct with the campus Title IX office that addresses these concerns. This allows a Title IX staff member to reach out to those who have experienced sexual misconduct to provide information about the personal support resources and options for investigation that they can choose to access. You are welcome to talk with me about concerns related to sexual misconduct. You can also or alternately choose to talk with a confidential resource; the University offers victim-advocacy support professionals, health services professionals and counselors that will not share information that they learn about sexual misconduct. <http://aurora.umn.edu/>

### **Equity, Diversity, Equal Opportunity, and Affirmative Action**

The University provides equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy:  
[http://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity\\_Diversity\\_EO\\_AA.pdf](http://regents.umn.edu/sites/regents.umn.edu/files/policies/Equity_Diversity_EO_AA.pdf).

### **Academic Freedom and Responsibility: for courses that do not involve students in research**

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.