

## Chem 545 Synthetic Organic Chemistry (3 credits)

Pre-requisite: Chem 542

Spring 2018

Instructor: Dr. Ming Xian, Troy 224, 335-6073, [mxian@wsu.edu](mailto:mxian@wsu.edu)

Office Hours: by appointment.

Class location and time: Fulmer 432, 9:10-10:00 MWF

### Course Textbooks:

It is highly encouraged (especially if you want to stay in this field) that you have access to as many of the following books as possible:

1. "Greene's Protective Groups in Organic Synthesis, 4<sup>th</sup> Edition" by Peter G. M. Wuts and Theodora W. Greene
2. "Strategic Applications of Named Reactions in Organic Synthesis" by Laszlo Kurti and Barbara Czako
3. "Advanced Organic Chemistry: Reactions, Mechanisms and Structure, 5<sup>th</sup> Edition" by Michael B. Smith and Jerry March
4. "Transition Metals in the Synthesis of Complex Organic Molecules, 2<sup>nd</sup> Edition" by Louis S. Hegedus

**Course Description:** This course will provide a survey of modern synthetic methods in organic chemistry. Reagents and reaction conditions, reaction mechanisms, and selectivity issues will be discussed.

**Course Objective:** To broaden the understanding of a variety of organic reactions. The students are expected to learn/understand all lectured information and to do additional coursework (handouts) to cultivate their expertise by being exposed to a variety of other related examples in each topic.

### Learning Outcomes:

After completing this course, a student should be able to (1) make informed decisions about HOW to effect organic transformations, (2) analyze chemo-, regio-, and stereoselectivity issues, (3) use their understanding of the reaction mechanism to rationalize/predict outcomes, and (4) interpret and understand the relevant synthetic literature.

### Grading:

Grades will be determined based on your performance on written exams and quizzes. Homework will be voluntary. The scores on these exams will be used to assign letter grades based on the following scale:

A	90-100	B	80-83	C	70-73	D	60-63
A-	87-89	B-	77-79	C-	67-69	F	<60
B+	84-86	C+	74-76	D+	64-66		

### Lecture Topics

Acid/base chemistry, pKa

Protection/Deprotection

-OH Oxidation

C=O Reduction

Enolate chemistry

Alkylation

Aldol reaction

Organocatalysis

Olefination

C=C bond functionalizations

Umpolung Chemistry

Cyclic additions (Diels-Alder, [3+2])

Sigmatropic rearrangements

Transition metal catalyzed reactions

Name reactions review

Total synthesis of natural products

**Students with Disabilities:**

Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor.

All accommodations MUST be approved through the Access Center.

**Academic Integrity:**

Academic integrity will be strongly enforced in this course. Any student caught cheating on any assignment will be given an F grade for the course and will be reported to the Office Student Standards and Accountability. Cheating is defined in the Standards for Student Conduct WAC 504-26-010 (3). It is strongly suggested that you read and understand these definitions:

<http://conduct.wsu.edu/default.asp?PageID=338>

**Safety Statement:**

Washington State University is committed to enhancing the safety of the students, faculty, staff, and visitors. It is highly recommended that you review the Campus Safety Plan (<http://safetyplan.wsu.edu/>) and visit the Office of Emergency Management web site (<http://oem.wsu.edu/>) for a comprehensive listing of university policies, procedures, statistics, and information related to campus safety, emergency management, and the health and welfare of the campus community.

**Class Schedule:**

Week 1	Jan 8 Intro., pKa, acid/base	Jan 10 Protection/Deprotection I	Jan 12 Protection/Deprotection II
Week 2	Jan 15 MLK day (No class)	Jan 17 Protection/deprotection	Jan 19 (Quiz) Oxidation/reduction
Week 3	Jan 22 Oxidation/reduction	Jan 24 Oxidation/reduction	Jan 26 Enolate chemistry
Week 4	Jan 29 Enolate Chemistry	Jan 31 Enolate Chemistry	Feb 2 (Quiz) Enolate Chemistry
Week 5	Feb 5 Cyclizations	Feb 7 Cyclizations	Feb 9 C=O addition, Brown Allylation
Week 6	Feb 12 Allylation/crotylation	Feb 14 Exam 1	Feb 16 Review exam

Week 7	Feb 19 President Day No class	Feb 21 C=C formation	Feb 23 C=C formation
Week 8	Feb 26 C=C formation	Feb 28 Epoxidation	Mar 2 ( <b>Quiz</b> ) Epoxidation
Week 9	Mar 5 Umpolung/dithiane	Mar 7 Umpolung/dithiane	Mar 9 Diels-Alder
Week 10	Mar 12 Spring break	Mar 14 Spring break	Mar 16 Spring break
Week 11	Mar 19 Diels-Alder	Mar 21 Diels-Alder	Mar 23 <b>Exam 2</b>
Week 12	Mar 26 Sigmatropic rearrang.	Mar 28 Sigmatropic rearrang	Mar 30 Sigmatropic rearrange
Week 13	Apr 2 Metal rxn	Apr 4 Metal rxn	Apr 6 ( <b>Quiz</b> ) Metal rxn
Week 14	Apr 9 Metal rxn	Apr 11 Metal rxn	Apr 13 Metal rxn
Week 15	Apr 16 Total synthesis (Discoderm)	Apr 18 Total synthesis	Apr 20 ( <b>Quiz</b> ) Total synthesis
Week 16	Apr 23 Review	Apr 25 Review	Apr 27 Review
Week 17	May 1 <b>Final Exam</b>		