

# Chemistry 610: Organic Reactions

Fall 2020

Classes will be held MWF from 1:35–2:25 PM in Chemistry 2121  
(Simulcast)

Instructor: Prof. Andy A. Thomas  
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## Course Description

Chemistry 610 is designed to introduce upper-level undergraduates and beginning graduate students to advanced topics in organic chemistry. Lectures will begin by introducing bonding concepts, FMO theory and conformational analysis in both cyclic and acyclic systems. Following this section, a discussion of the most important classes of organic transformations will be presented. The course will also cover strategies in (retro)synthetic analysis of complex molecules.

## Office Hours

Tuesday 8:30–10 AM, or by appointment, Chemistry 328x.

## Lectures

Lectures will be performed in person with streaming *via* zoom. Students may elect to attend in person or login remotely. A link will be provided to those enrolled prior to the first day of instruction. This is an evolving process and is subject to change during the semester.

## Required Textbooks:

Title: Organic Chemistry (2<sup>nd</sup> Edition)  
by: Jonathan Clayden, Nick Greeves, Stuart Warren  
ISBN: 9780199270293

Title: Strategic Applications of Named Reactions in Organic Synthesis (1<sup>st</sup> Edition)  
by: László Kürti and Barbara Czakó  
ISBN-10: 0-12-369483-3

## Supplemental Textbooks:

Title: Advanced Organic Chemistry Part A: Structure and Mechanisms (5<sup>th</sup> Edition)  
by: Francis A. Carey and Richard J. Sundberg  
ISBN-13: 978-0387683461

Title: Advanced Organic Chemistry Part B: Reaction and Synthesis (5<sup>th</sup> Edition)  
by: Francis A. Carey and Richard J. Sundberg  
ISBN-13: 978-0387683508

Title: Classics in Stereoselective Synthesis (1<sup>st</sup> Edition)  
by: Erick M. Carreira and Lisbet Kvaerno  
ISBN: 978-3-527-29966-9

## Contacting Me

There are a few reliable ways to get the help you need:

- Office hours: Tuesday mornings, 8:30–10:00 AM, Chem 328x
- Email: For all emails regarding class, include “**Chem610**” in the subject line. I will do my best to respond within 24 hours.
- For quick questions, before or after class are good times.

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## Course Grades

|                   |                           |
|-------------------|---------------------------|
| Problem sets      | 250 points (50 pts/pset)  |
| Mini-review       | 150 points                |
| Two examinations  | 300 points (150 pts/exam) |
| Final examination | 300 points                |
| <b>Total</b>      | <b>1000 points</b>        |

## Problem Sets and Exams

Problem sets will be distributed at the beginning of class one week prior to each assigned due date. Collaboration on these homework assignments is recommended, but each student must hand in their own problem set. Answers to problem sets must be typed in 12 pt Ariel font along with all chemical structures drawn in chemdraw. *No hand-written problem sets will be accepted.* Your grade will be based on your cumulative performance towards the total number of points possible in the course. Exam locations / times are to be determined. The final exam is cumulative. If your final exam score exceeds any of your exams, your lowest exam score will be replaced by that of the final exam.

## Academic Integrity Statement and Policy

“An Aggie does not lie, cheat or steal, or tolerate those who do.”

“Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one’s work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case” ([Section 20.1.2.3, Student Rule 20](#)).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at [aggiehonor.tamu.edu](http://aggiehonor.tamu.edu).

## Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources in the Student Services Building or at (979) 845-1637 or visit [disability.tamu.edu](http://disability.tamu.edu). Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

## Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions (see [University Rule 08.01.01.M1](#)):

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- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, you will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with [Counseling and Psychological Services \(CAPS\)](#).

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's [Title IX webpage](#).

## Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student's academic success and overall wellbeing. Students are encouraged to engage in proper self-care by utilizing the resources and services available from Counseling & Psychological Services (CAPS). Students who need someone to talk to can call the TAMU Helpline (979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org).

## Campus Safety Measures

To promote public safety and protect students, faculty, and staff during the coronavirus pandemic, Texas A&M University has adopted policies and practices for the Fall 2020 academic term to limit virus transmission. Students must observe the following practices while participating in face-to-face courses and course-related activities (office hours, help sessions, transitioning to and between classes, study spaces, academic services, etc.):

- Self-monitoring—Students should follow CDC recommendations for self-monitoring. **Students who have a fever or exhibit symptoms of COVID-19 should participate in class remotely and should not participate in face-to-face instruction.**
- Face Coverings—[Face coverings](#) (cloth face covering, surgical mask, etc.) must be properly worn in all non-private spaces including classrooms, teaching laboratories, common spaces such as lobbies and hallways, public study spaces, libraries, academic resource and support offices, and outdoor spaces where 6 feet of physical distancing is difficult to reliably maintain. Description of face coverings and additional guidance are provided in the [Face Covering policy](#) and [Frequently Asked Questions \(FAQ\)](#) available on the [Provost website](#).
- Physical Distancing—Physical distancing must be maintained between students, instructors, and others in course and course-related activities.
- Classroom Ingress/Egress—Students must follow marked pathways for entering and exiting classrooms and other teaching spaces. Leave classrooms promptly after course

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activities have concluded. Do not congregate in hallways and maintain 6-foot physical distancing when waiting to enter classrooms and other instructional spaces.

- To attend a face-to-face class, students must wear a face covering (or a face shield if they have an exemption letter). If a student refuses to wear a face covering, the instructor should ask the student to leave and join the class remotely. If the student does not leave the class, the faculty member should report that student to the [Student Conduct office](#) for sanctions. Additionally, the faculty member may choose to teach that day's class remotely for all students.

## Personal Illness and Quarantine

Students required to quarantine must participate in courses and course-related activities remotely and **must not attend face-to-face course activities**. Students should notify their instructors of the quarantine requirement. Students under quarantine are expected to participate in courses and complete graded work unless they have symptoms that are too severe to participate in course activities.

Students experiencing personal injury or illness that is too severe for the student to attend class qualify for an excused absence (See [Student Rule 7, Section 7.2.2.](#)) To receive an excused absence, students must comply with the documentation and notification guidelines outlined in Student Rule 7. While Student Rule 7, Section 7.3.2.1, indicates a medical confirmation note from the student's medical provider is preferred, **for Fall 2020 only, students may use the Explanatory Statement for Absence from Class form in lieu of a medical confirmation. Students must submit the Explanatory Statement for Absence from Class within two business days after the last date of absence.**

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## Schedule of Lectures and Tentative Exam Dates

Listed below is a schedule of approximate lecture coverage and approximate exam dates.

| Lecture | Date        | Topics                                            | Reading Assignment                                                                               |
|---------|-------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1       | Aug 19      | Steric, Electronic, Stereoelectronic Effects      | Clayden: chapters 1, 2, 4                                                                        |
| 2       | Aug 21      | The Anomeric Effect                               | Clayden: chapter 16                                                                              |
| 3 / 4   | Aug 24 & 26 | Conformational Analysis and Effects on Reactivity | Clayden: chapter 16                                                                              |
| 5       | Aug 28      | Dihydroxylation                                   | Clayden: chapter 19                                                                              |
| 6       | Aug 31      | Oxidative Cleavage                                | Clayden: chapter 19                                                                              |
| 7       | Sep 2       | Epoxidation                                       | Clayden: chapter 19                                                                              |
| 8       | Sep 4       | Hydrogenation<br><b>(PSET 1 Due)</b>              | Clayden: chapter 23                                                                              |
| 9       | Sep 7       | Hydride Reduction                                 | Clayden: chapter 23                                                                              |
| 10      | Sep 9       | Dissolving Metal Reduction                        | Clayden: chapter 23 p 541; Ch 25 p 602                                                           |
| 11      | Sep 11      | Activation of Hydroxyl and Carboxyl Groups        | Clayden: chapter 10 p 244; Ch 15 p 349                                                           |
| 12      | Sep 14      | Protecting Groups<br><b>(PSET 2 Due)</b>          | Clayden: chapter 23                                                                              |
| 13      | Sep 16      | <b>Exam I (In class Review)</b>                   |                                                                                                  |
| 14      | Sep 18      | Generation of Enolates                            | Clayden: chapter 20                                                                              |
| 15 / 16 | Sep 21 & 23 | Alkylation of Enolates                            | Clayden: chapter 25                                                                              |
| 17 / 18 | Sep 25 & 28 | Aldol Reactions                                   | Clayden: chapter 26                                                                              |
| 19      | Sep 30      | Acylation of Enolates                             | Clayden: chapter 26 p 640                                                                        |
| 20      | Oct 2       | Michael Addition                                  | Clayden: chapter 22                                                                              |
| 21      | Oct 5       | Annulation                                        | Clayden: chapter 26 p 638                                                                        |
| 22 / 23 | Oct 7 & 9   | Alkene Formation                                  | Clayden: chapter 27                                                                              |
| 24 / 25 | Oct 12 & 14 | Additions to Alkenes                              | Clayden: chapter 19                                                                              |
| 26      | Oct 16      | Alkynes                                           | Clayden: chapter 23                                                                              |
| 27      | Oct 19      | Alkyne Metathesis<br><b>(PSET 3 Due)</b>          | Lee, D.; Volchkov, I.; Yun, S. Y. Alkyne Metathesis <i>Org Reac</i> <b>2020</b> , <i>102</i> , 1 |

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|         |             |                                                                |                                                                      |
|---------|-------------|----------------------------------------------------------------|----------------------------------------------------------------------|
| 28      | Oct 21      | <b>Exam II</b> (In class Review)                               |                                                                      |
| 29      | Oct 23      | Pericyclic Reactions                                           | Clayden: chapter 25                                                  |
| 30–32   | Oct 26 - 30 | Diels Alder                                                    | Clayden: chapter 34                                                  |
| 33 / 34 | Nov 2 & 4   | Cycloadditions                                                 | Clayden: chapter 34                                                  |
| 35 / 36 | Nov 6 & 9   | Sigmatropic Rearrangements                                     | Clayden: chapter 19                                                  |
| 37/38   | Nov 11 & 13 | Organoboron and Organosilicon chemistry<br><b>(PSET 4 Due)</b> | Organic Synthesis : The Roles of Boron and Silicon. Gibson, Susan E. |
| 39      | Nov 16      | Organotin chemistry                                            | Chem. Rev. <b>1996</b> , <i>96</i> , 31.                             |
| 40      | Nov 18      | Holiday                                                        |                                                                      |
| 41 / 42 | Nov 20 & 23 | Organometallic Reactions<br><b>(PSET 5 Due)</b>                | Clayden: chapter 40                                                  |
|         | TBD         | <b>Final Exam</b>                                              |                                                                      |