



# CHEM2420 Organic Chemistry II

The University of Toledo  
College of Natural Sciences and Mathematics  
Department of Chemistry and Biochemistry  
CRN: 11109 (section 002)

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<b>Instructor:</b>	Dr. Jianglong Zhu	<b>Course Website:</b>	<a href="#">Blackboard Learn</a> or
<b>Email:</b>	Jianglong.zhu@utoledo.edu		<a href="https://blackboard.utdl.edu/webapps/login/">https://blackboard.utdl.edu/webapps/login/</a>
<b>Office Hours:</b>	MW, 10 am – 12 pm (face-to-face) or by appointment	<b>Class Location:</b>	WO1205
<b>Office Location:</b>	WO3265B	<b>Class Day/Time:</b>	MW, 5:30 – 6:50 pm
<b>Instructor Phone:</b>	419-530-1501	<b>Credit Hours:</b>	3
<b>Offered:</b>	Spring, 2022		

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## CATALOG/COURSE DESCRIPTION

CHEM2420, Organic Chemistry II, covers the second half of Organic Chemistry, which includes the structure and reactivity of organometallic compounds, radicals, aldehydes and ketones, carboxylic acids and their derivatives, enolates and related compounds, aromatic systems, amines and heterocyclic compounds. In addition, modern methods and techniques in organic structure elucidation (IR,  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectroscopy, and mass spectrometry) will be introduced and discussed.

## TEXTS AND ANCILLARY MATERIALS

### Required Materials:

Access to a properly functioning computer with internet access in order to login to Blackboard (<https://blackboard.utdl.edu/>) From the Blackboard course site you will access:

- An electronic copy of the textbook, *Organic Chemistry: Structure and Function* (8<sup>th</sup> Edition) by Vollhardt and Schore. Published by W.H. Freeman/Macmillan, ISBN-10: 1-319-07945-8; ISBN-13: 978-1-319-07945-1;
- Achieve online homework

### Recommended Materials:

- [Preparing for Your ACS Examination in Organic Chemistry: The Official Guide](#) by the Examinations Institute of the American Chemical Society Division of Chemical Education
- Study Guide/Solutions Manual for Organic Chemistry Eighth Edition by Neil E. Schore  
ISBN-13: 978-1319195748/ISBN-10: 1319195741 (this is where you will find the solutions to the end-of-chapter problems)

## PREREQUISITES AND COREQUISITES

The prerequisite for this course is a C- in CHEM2410 (Organic Chemistry I). Students not satisfying the prerequisite will be dropped from the course. While it is not required, students are highly recommended to complete CHEM2460 or 2480 before the beginning of this course and take CHEM2470 or 2490 in the same semester.



## **COURSE STRUCTURE**

**Lecture:** You have 2 options for keeping up with lecture: 1) Attend the lecture in person at our regularly schedule class time, or 2) view the recording of the lecture, at any time, at your convenience. **I highly recommended you attend lecture in person** to help keep you on track with this difficult course. Lecture recordings are best used to review material/hear the lecture a second time.

Take active notes with the provided lecture outline for each lecture.

**Participation points** you will have a set of participation questions to complete on Blackboard for each chapter. You are welcome to use your notes and textbook to complete these questions. You have unlimited attempts and your highest score will be recorded for credit. There will be several extra points available. The deadline for all participation questions is Friday, 4/29, 11:59pm although it is highly recommended to complete them after each chapter is covered.

**Textbook** We urge you to read the text before the lecture so you are familiar with concepts before hearing about them during the limited time of each class session.

**Online Homework** will be assigned each week in the form of an online assignment using the program Achieve.

**Optional homework:** The list of end-of-chapter problems in this syllabus are highly recommended to do for practice. The answers can be found in the solutions manual (under recommended materials)

## **COMMUNICATION GUIDELINES**

As your instructor, I am here to help, and will do my best to respond to email within 24 to 48 hours. Students are expected to check their UT email account and Blackboard frequently for important course information. We want you to be successful in this course, so **let's work together!**

## **COURSE EXPECTATIONS**

1. It is highly recommended to read the textbook before the lecture.
2. Attend face-to-face class, or (not recommended) view the recording of lecture any time. Take active notes with the provided lecture outline.
3. Complete the participation questions after each chapter.
4. Achieve online homework assignments must be completed before the deadlines as posted.

## **OVERVIEW OF COURSE GRADE ASSIGNMENT**

**Homework:** There are two types of homework associated with this course: 1) Achieve Homework which will count towards your grade; and 2) problems from the textbook at the end of each chapter which will not be handed in or graded.

**1) Required: Achieve Homework:** There will be an online homework assignment for each chapter. A direct link from Blackboard to Achieve will be available *via* this course's Blackboard site (You will NEED TO REGISTER your information but there is no additional cost). These exercises are not timed, however, you will have unlimited tries with the loss of some credit for each try that is wrong before the due date. **Please do your work well in advance of the due date. Do not wait until the last minute!**

**2) Optional Suggested Homework Problems:** Completion and understanding of the suggested end-of-chapter problems in the textbook (p.8-9 in the syllabus) will be a big step towards achieving a good grade in this course. These questions are not graded but as noted they are HIGHLY RECOMMENDED! The solutions can be found in the recommended solutions manual (see page 1 of syllabus).



**Course Points:** The following is the distribution of possible points in the course:

Achieve Homework Assignments	150 pts
Midterm Exams 3 @ 100 points each	300 pts
Comprehensive Final Exam (Orgo 1 and 2)	200 pts
Participation questions	50 pts
Practice Exam	<u>5 pts</u>

**Total: 705 pts**

Grade Scale: These are the minimum percentages needed to receive the indicated grade:

A	90%	A-	86%	B+	82%	B	78%
B-	74%	C+	70%	C	66%	C-	62%
D+	58%	D	54%	D-	50%		

**Drop, Withdrawal and Incomplete Grades Course drop and withdrawal procedures have been set by the University. Dropped courses do not appear on your transcript. The deadline for dropping is February 1<sup>st</sup>. You may *withdraw* from the course and receive a grade of W. The deadline for withdrawal is March 25<sup>th</sup>. W's do not affect your GPA.**

A course grade of **Incomplete** is given only to those who have completed all but a small percentage of course requirements for an acceptable reason.

#### **Midterm Grading**

A midterm grade should be taken seriously with respect to how well you are doing in the course approximately half-way through the semester. Midterm grades will be calculated based on the score on Exam 1 and up-to-date participation and Sapling points and will use the grade scale as listed above.

#### **Final Grading**

The course points and grade scale as listed above will be used to assign final grades.

### **ACADEMIC POLICIES**

**Examinations** Excused absences will only be given based on conditions outlined below. If an excuse is acceptable, your missed exam score will be replaced with a score equal to the average of the other hour exams. The final exam cannot be excused. For all exams you must show a **photo ID card**. On the final exam you may use a ***non-programmable calculator***.

*Exam Absence Policies:* Students who will not be able to take an exam at the scheduled time due to an irresolvable conflict must provide **written** documentation to verify the conflict. This may occur for students on official university business. The exam will be given at another arranged time before the scheduled test date. *Approval must be obtained in advance.*

Students who unexpectedly miss an exam due to extreme circumstances such as severe illness, death in the family, or car accident should inform their instructor **ASAP**. **Documentation** such as a physician's note, funeral program, an accident report, etc is required. An email to the instructor is expected. In all other cases a missed exam will result in 0 on the exam.

**Academic Dishonesty:** The academic honesty policies, as stated in the UT Catalogue will be **STRICTLY ENFORCED**. Any student found violating the UT academic honesty policies will be penalized in



accordance with these policies. You should read the university's policy on Academic Dishonesty found at [http://www.utoledo.edu/catalog/2000catalog/admissions/academic\\_dishonesty.html](http://www.utoledo.edu/catalog/2000catalog/admissions/academic_dishonesty.html) .

## **UNIVERSITY POLICIES**

Policy Statement on Non-Discrimination on the basis of Disability (ADA). The University is an equal opportunity educational institution. Please read [The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance](#).

## **ACADEMIC POLICIES**

[Undergraduate Academic Policies](#)

[Graduate Academic Policies](#)

## **ACADEMIC ACCOMMODATIONS**

The University of Toledo embraces the inclusion of students with disabilities. We are committed to ensuring equal opportunity and seamless access for full participation in all courses. For students who have an accommodations memo from Student Disability Services, I invite you to correspond with me as soon as possible so that we can communicate confidentially about implementing accommodations in this course. For students who have not established affiliation with Student Disability Services and are experiencing disability access barriers or are interested in a referral to healthcare resources for a potential disability or would like information regarding eligibility for academic accommodations, please contact the [Student Disability Services Office](#) by calling 419.530.4981 or sending an email to [StudentDisability@utoledo.edu](mailto:StudentDisability@utoledo.edu).

### **Policy Statement on Non-Discrimination on the Basis of Disability (ADA)**

The University is an equal opportunity educational institution. Please read [The University's Policy Statement on Nondiscrimination on the Basis of Disability – Americans with Disabilities Act Compliance](#).

## **TECHNOLOGY REQUIREMENTS, SKILLS, AND PRIVACY POLICIES**

Please view the [technology considerations](#) for this course, including technical skills needed, general technology requirements, and technology privacy policies.

## **TECHNOLOGY REQUIREMENTS FOR EXAMS**

### **LockDown Browser\***

This course requires the use of Respondus LockDown Browser for exams. No webcam is required because the exams will be taken in the classroom in a proctored environment.

Watch this brief video to get a basic understanding of LockDown Browser.

<https://www.respondus.com/products/lockdown-browser/student-movie.shtml>

**\*If you do not have a laptop to bring into the classroom to take exams please let your instructor know asap so that alternate testing arrangements can be made.**

### **Download Instructions**

Download and install LockDown Browser from this link:

<https://download.respondus.com/lockdown/download.php?id=213815819>



## **GENERAL TECHNOLOGY REQUIREMENTS**

Students need to have access to a properly functioning computer throughout the semester. The Browser Check Page <http://www.utoledo.edu/dl/helpdesk/browser-check.html> will enable you to perform a systems check on your browser, and to ensure that your browser settings are compatible with Blackboard, the learning management system that hosts this course.

Software Student computers need to be capable of running the latest versions of plug-ins, recent software and have the necessary tools to be kept free of viruses and spyware.

This course does contain streaming audio and video content.

Use of Public Computers: If using a public library or other public access computer, please check to ensure that you will have access for the length of time required to complete tasks and tests. A list and schedule for on-campus computer labs is available on the Open Lab for Students webpage.

UT Virtual Labs: Traditionally, on-campus labs have offered students the use of computer hardware and software they might not otherwise have access to. With UT's Virtual Lab, students can now access virtual machines loaded with all of the software they need to be successful using nothing more than a broadband Internet connection and a web browser. The virtual lab is open 24/7 and 365 days a year at VLAB: The University of Toledo's Virtual Labs.

Learner Technical Support can be found here <http://www.utoledo.edu/dl/students/learnersupport.html>

## **ACCESSIBILITY OF COURSE TECHNOLOGIES**

Please view [Accessibility of Course Technologies](#) for information regarding the accessibility of Blackboard and other technologies used in this course.

## **ACADEMIC AND SUPPORT SERVICES**

Please view the [Learner Support](#) page for links and descriptions of the technical, academic, and student support services available to UT students.

## **SAFETY AND HEALTH SERVICES FOR UT STUDENTS**

Please use the following link to view a comprehensive list [Campus Health and Safety Services](#) available to you as a student.

## **STUDENT SUPPORT SERVICES**

**Course scheduling assistance:** Chemistry Department Secretary, Ms. Samples, is in Room BO 2022, telephone 419-530-2698. She takes care of all scheduling changes.

**Chemistry Help Center**, BO2043, is where the teaching assistants hold their office hours so it is a great place to receive assistance. A schedule will be posted early in the term. No appointment is necessary.

**Tutoring support** for all UT students is available through the **Learning Enhancement Center** located in the Carlson Library.

**Instructor Office Hours** are times when you can meet with your instructor (no appointment needed) with questions about the course material. My office hour times are listed at the top of the syllabus.

## COURSE SCHEDULE

WEEK	DATES	TOPIC	LEARNING OUTCOMES (Listed p.8)	ASSIGNMENTS DUE *Note all participation questions are due before Friday, 4/29, 11:59pm
1	1/19 – 1/21	Intro/Syllabus 15: Benzene and Aromaticity	1-2	<b>Practice Exam Online</b> Due Sunday, 1/23, 11:59pm
2	1/24 – 1/28	15: Benzene and Aromaticity 16: Electrophilic Attack on Derivatives of Benzene	1-3,5,6,12	<b>Participation questions Ch15:</b> Recommended to finish this week  <b>Achieve Homework Ch15:</b> Due Sunday, 1/30, 11:59pm
3	1/31 – 2/4	16: Electrophilic Attack on Derivatives of Benzene 17: Aldehydes and Ketones	1,3-7,9	<b>Participation questions Ch16:</b> Recommended to finish this week  <b>Achieve Homework Ch 16:</b> Due Sunday, 2/6, 11:59pm
4	2/7 – 2/11	17: Aldehydes and Ketones	1,3,5-10,12	<b>Participation questions Ch17:</b> Recommended to finish this week  <b>Achieve Homework Ch 17:</b> Due Sunday, 2/13, 11:59pm
5	2/14 – 2/18	Review 18: Enols, Enolates, and the Aldol Condensation	1,3-7,9	<b>Exam 1</b> , Wednesday, 2/16, in Lecture (Chapters 15, 16, 17)
6	2/21 – 2/25	18: Enols, Enolates, and the Aldol Condensation	1,3-7,9	<b>Participation questions Ch18:</b> Recommended to finish this week  <b>Achieve Homework Ch 18:</b> Due Sunday, 2/27, 11:59pm
7	2/28 – 3/4	19: Carboxylic Acids	1,3-7,9,12	<b>Participation questions Ch19:</b> Recommended to finish this week  <b>Achieve Homework Ch19:</b> Due Sunday, 3/6, 11:59pm
3/7 – 3/11 Spring Break No Classes				
8	3/14 - 3/18	20: Carboxylic Acid Derivatives	1,3-6,9,12	<b>Participation questions Ch20:</b> Recommended to finish this week  <b>Achieve Homework Ch 20:</b> Due Sunday, 3/20, 11:59pm
9	3/21 – 3/25	Review 21: Amines and Their Derivatives	1,3-6,9	<b>Exam 2</b> , Wednesday, 3/23, In Lecture (Ch 18, 19, 20)  <b>Participation questions Ch21:</b> Recommended to finish this week  <b>Achieve Homework Ch 21:</b> Due Sunday, 4/3, 11:59pm

WEEK	DATES	TOPIC	LEARNING OUTCOMES (Listed p.8)	ASSIGNMENTS DUE *Note all participation questions are due before Friday, 4/29, 11:59pm
10	3/28 – 4/1	21: Amines and Their Derivatives 22: Chemistry of Benzene Substituents	1,3-6,9	<b>Participation questions Ch22:</b> Recommended to finish this week  <b>Achieve Homework Ch 22:</b> Due Sunday, 4/10, 11:59pm
11	4/4 – 4/8	22: Chemistry of Benzene Substituents 23: Ester Enolates and the Claisen Condensation	1,3,5,6,9,10	<b>Participation questions Ch23:</b> Recommended to finish this week  <b>Achieve Homework 9 Ch 23:</b> Due Sunday, 4/17, 11:59pm
12	4/11 – 4/15	23: Ester Enolates and the Claisen Condensation 25: Heterocycles	1,3,5,6,9,10	<b>Participation questions Ch25:</b> Recommended to finish this week  <b>Achieve Homework Ch 25:</b> Due Sunday, 4/17, 11:59pm
13	4/18 – 4/22	Review 10: Nuclear Magnetic Resonance (NMR)	1, 3,5,6,9,11	<b>Exam 3</b> , Wednesday, 4/20, In Lecture (Ch 21, 22, 23, 25)  <b>Participation questions Ch10:</b> Recommended to finish this week  <b>Achieve Homework Ch 10:</b> Due Sunday, 5/1, 11:59pm
14	4/25 – 4/29	10: Nuclear Magnetic Resonance (NMR) 11.8 – 11.10: IR Spectroscopy & Mass Spectrometry Review	1,11	<b>Participation questions Ch11:</b> Recommended to finish this week  <b>Achieve Homework Ch 11:</b> Due Sunday, 5/1, 11:59pm  *Note all participation questions are due before Friday, 4/29, 11:59pm
Finals Week 5/2 – 5/6				<b>Final Exam:</b> <b>Monday, 5/2, 5 – 7 pm</b> <b>The Final Exam includes all material from both Orgo 1 and Orgo 2</b>

\*Note Achieve Homework Deadlines subject to change based on when material is covered in lecture

**STUDENT LEARNING OUTCOMES** Upon completion of this course, students will be able to:



1. Recognize chemical terminology specific to organic chemistry and describe and compare bonding in different types of organic substances.
2. Identify aromaticity by the criteria of structure, thermodynamics, molecular orbitals, and properties.
3. Predict the influence of functional groups on reactivity and the structure of products formed.
4. Identify acids and bases, predict  $pK_a$ , and apply  $pK_a$  to organic reactivity.
5. Explain fundamental chemical mechanisms, including reactions of ketones, aldehydes, carboxylic acids, carboxylic acid derivatives, benzene, benzene derivatives, and conjugated molecules.
6. Use curved arrow convention to convey organic reaction mechanisms.
7. Choose reaction products by comparing relative energies in the context of conformation and reaction coordinate diagrams.
8. Apply protecting groups in organic synthesis.
9. Develop multi-step synthesis to create complex molecules.
10. Predict product distributions of reactions based on kinetic and thermodynamic factors.
11. Predict the structure of organic molecules with use of proton NMR spectroscopy, carbon NMR spectroscopy, IR spectroscopy and mass spectrometry.
12. Identify and describe societal applications of organic chemistry.

The following problems listed below are **suggested** end-of-chapter problems (Independent Homework) to attempt. You should be able to do these problems and they might appear on an in-class examination. These problems will be covered in the recitation course (CHEM2440).

Chapter 15 – Benzene and Aromaticity

36(a-h), 38, 42(a-c), 47 – 49, 55, 56, 69-70

Chapter 16 – Electrophilic Attack on Derivatives of Benzene

30, 32 – 37, 40, 41, 43, 45, 57, 61, 64

Chapter 17 – Aldehydes and Ketones

27-28(a-e), 32-34, 36-37, 39, 48, 51, 55 and 56 (a-f,h,i), 57, 60, 68-69

Chapter 18 – Enols, Enolates, and the Aldol Condensation

32-33, 35, 37, 42-45, 47-52, 55(a-g)

Chapter 19 – Carboxylic Acids

27, 30, 33, 35-37, 40, 41, 45, 59-61

Chapter 20 – Carboxylic Acid Derivatives

30, 34, 36-37, 39-40, 42, 44, 45, 46(a-c), 49, 53, 68, 70, 71

Chapter 21 – Amines and their Derivatives





28, 35, 38(a-e), 39(a-b, d,g,h), 41, 43a, 44, 45, 63, 65, 66

Chapter 22 – Chemistry of Benzene Substituents

37-40, 42, 43(a,b), 46, 47, 53, 56, 57, 62, 68, 69(a-c), 76, 77

Chapter 23 – Ester Enolates and the Claisen Condensation

27, 28(a-g), 29, 30, 33, 37, 44, 53, 54

Chapter 25 – Heterocycles

31, 32(a,b), 35, 36a, 39(a-d), 40(a-c), 47, 53, 62, 63

Chapter 10 – Using NMR Spectroscopy to Deduce Structure

35, 37-39, 41-49, 58(a-c), 65-67

Chapter 11.8 – 11.10 – IR Spectroscopy and Mass Spectrometry

57, 59, 61-63,78