CHEM 212 Organic Chemistry II (with Lab)
Spring 2025

Instructor: Dr. Adharsh Raghavan *(pronounced Ah-the-ersh Rah-guv-un)*
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If you have an emergency, text me at 765-637-3026
Lecture: Tues & Thurs 9:30 AM – 10:45 AM, JEPS 451
Lab: Tuesdays 12:30–3:15 pm, JEPS 213
Office Hours: M 12:00 – 1:00 pm (Zoom; click here for link), 3:00 – 5:00 pm (Zoom; click here for link)
T 4:00 – 5:00 pm
W 10:00 am – 12:00 pm

Textbooks and Supplies:
Required:

- Organic Chemistry 4th Ed. by David Klein (ISBN 978-1-119-65959-4)
  - Please purchase the loose-leaf version, NO WILEY PLUS this semester.
- Laboratory Techniques in Organic Chemistry 4th edition. Jerry R. Mohrig et.al. ISBN 1-4641-3422-7. Paper copy required for use in the lab. Older editions are fine, you'll just need to use the index a lot to find the correct pages / sections.
- Lab coat and Lab goggles
- Lab notebook with duplicating pages
- $20 on your Eagle One card for printing or a working printer
- Ability to convert paper documents to .pdf

Recommended:

- Molecular model kit
- Pushing Electrons by Daniel Weeks (any edition)
- Klein, D.K; Organic Chemistry I,II as a Second Language: Translating the Basic Concepts. Wiley, New York. 2007 – Both of these books have been placed on reserve in the Simpson Library

Prerequisite: C or better in CHEM 211.

Continuation to CHEM 317: A grade of C or better is required to take CHEM 317 (Biochemistry I).

Course website: I will make use Canvas to communicate with you regularly. Make sure that you know how to use Canvas and set up the needed alerts. Please keep your UMW mailboxes empty enough that you can receive any e-mails and keep this line of communication open. You are responsible for all communication from me in this class, whether it is in lecture, lab, or via e-mail.

Course Description: CHEM 212 is more of a synthesis class than CHEM 211, which focused on the key principles of studying reaction mechanisms and basic lab skills. You will be assessed both on your ability to construct synthetic schemes and your understanding of *how* and *why* certain reactions take place. The reactions discussed in this semester will primarily focus on the reactions of the major functional

groups of organic chemistry: alkenes, alkynes, alcohols, ethers, amines, and the carbonyl groups. Special topics such as carbohydrates and polymers may be discussed, depending on the pace of the course.

Course Objectives: After completing the course, you should

- Know the molecular structure, including the stereochemistry, and nomenclature of several classes of organic compounds, especially carbonyl-containing and aromatic molecules
- Understand how these functional groups can be interconverted through synthetic sequences
- Have developed laboratory techniques for the preparation and analysis of organic compounds, including spectroscopic methods (NMR and IR)

Class format: Lectures are the lifeblood of this course, and as such, I expect you to attend every lecture, and follow up with the corresponding course material outside of class (textbook, textbook problems, HW, quizzes, discussions, etc.). I will post supplemental videos to Canvas, but these CANNOT be used as a substitute for lectures.

Grades and Assignments:

Homework (10 problem sets @ 5 pts each)	50 points
Quizzes (10 quizzes @ 10 points each)	100 points
Exams (4 exams @ 100 points each)	400 points
Laboratory assignments	250 points
Final exam	200 points

Letter grades will be assigned based on the following scale. Grades are rounded to the nearest integer. No exceptions will be made!

A : ≥ 925 points	A− : 895 – 924 points	
B+ : 865 – 894 points	B : 825 – 864 points	B− : 795 – 824 points
C+ : 765 – 794 points	C : 725 – 764 points	C− : 695 – 724 points
D+ : 665 – 694 points	D : 595 – 664 points	
F : ≤ 595 points		

Students with a course grade of 75% or less will receive a mid-semester unsatisfactory report.

Homework

Book problems will be assigned as Homework; 10 chapters/units, 5 pts each = 50 pts.

Quizzes

There are ten chapter/unit quizzes. 10 chapters/units, 1 quiz per chapter/unit = 100 pts. These will either be administered as timed Canvas quizzes, or as take-home, or in-person quizzes. The format is at the discretion of the instructor.

Exams

There are four in-class 75-minute exams (100 pts each) throughout the course of the semester. Each will cover the material covered in the classes prior to the exam. Exams may be rescheduled, but only after notification prior to the week of the exam.

Laboratory Assignments:
Missing more than two labs and/or failure to turn in two or more lab reports will result in an automatic **F** for the class. If you must miss lab, notify the instructor prior to the week of the lab. Making up labs may be done at the instructor's discretion.

Final Exam:
The final exam for this course is the comprehensive Organic Exam from the American Chemical Society. It is a 70 question, 120-minute multiple course exam, including spectroscopy. The final exam for this course will be held in accordance with the schedule posted by UMW Academic Services. It is University policy that missing a final exam will result in a grade of F for the course. A review sheet and further information will be provided. A study guide for the ACS exams is available at the ACS exams website for $25.00. http://shopping.na1.netsuite.com/examsinstitute. Practice exams are also available at the same website.
Please bring **only** pencils and erasers. No calculators, cellphones, or anything else will be permitted.

Classroom Policies:
Attendance:
Attendance is not taken daily. However, there may be group or individual assignments (quizzes or other worksheets) which will be collected and graded. These assignments cannot be made up, as they are designed to be done during class.

Tardiness
Entering class late is a distraction to your classmates, and I discuss "class business" during the first 5 minutes of the class, therefore it is important that you arrive on time. If you are late, enter and get organized quietly. If you need to leave the room during class, please go and return quietly. Attendance policies in the lab are outlined in the laboratory syllabus. Importantly, if you are late to the lab (more than 5 min late), you will not be allowed to enter.

Electronic devices: Cell phones or other electronic devices are not to be used in class or in lab. They must be turned off during class sessions. Laptops and tablets are only permitted in class for note-taking purposes. These devices won't be needed in lab; furthermore, the lab is not a safe place for them. Please make sure they are stored away from your work area, so they are not damaged by reagents or solvents. It is a policy of the chemistry department that headphones are not to be worn in the laboratory at any time.

Academic Dishonesty: The honor system, as outlined on the UMW Fredericksburg Honor Council Website will be strictly enforced in this course. Students are reminded of their obligation to abide by the code, including reporting observed violations to the Honor Council. The honor pledge will be written on all graded work. Books, notes, cell phones, PDAs and other electronic devices are not allowed during exams. A calculator may be used, but it must not contain any chemical information that could be used during an exam. All written work is to be prepared "in your own words". Guidelines for source use must be followed.
http://www.umw.edu/honor/fredericksburg/default.php

ADA: The Office of Disability Resources has been designated by the college as the primary office to guide, counsel, and assist students with disabilities. If you receive services through the Office of Disability

Resources, and require accommodations for this class, make an appointment with me as soon as possible to discuss your approved accommodation needs. Bring your accommodation letter, along with a copy of our class syllabus with you to the appointment. I will hold any information you share with me in strictest confidence unless you give me permission to do otherwise.

If you have not contacted the Office of Disability Resources and have reasonable accommodation needs, (note taking assistance, extended time for tests, etc.), I will be happy to refer you. The office will require appropriate documentation of disability.

Title IX

University of Mary Washington faculty are committed to supporting students and upholding the University's *Policy on Sexual and Gender Based Harassment and Other Forms of Interpersonal Violence*. Under Title IX and this Policy, discrimination based upon sex or gender is prohibited. If you experience an incident of sex or gender-based discrimination, we encourage you to report it. ***While you may talk to me, understand that as a "Responsible Employee" of the University, I MUST report to UMW's Title IX Coordinator what you share***. If you wish to speak to someone confidentially, please contact the below confidential resources. They can connect you with support services and help you explore your options. You may also seek assistance from UMW's Title IX Coordinator. Please visit http://diversity.umw.edu/title-ix/ to view UMW's *Policy on Sexual and Gender Based Harassment and Other Forms of Interpersonal Violence* and to find further information on support and resources.

Policy on Recording of Class

In this class, students may not make audio or video recordings of any course activity unless the student has an approved accommodation from the Office of Disability Resources permitting the recording class meetings. In such cases, the accommodation letter must be presented to the instructor in advance of any recording being done and all students in the course will be notified whenever recording will be taking place. Students who are permitted to record classes are not permitted to redistribute audio or video recordings of statements or comments from the course to individuals who are not students in the course without the express permission of the faculty member and of any students who are recorded. Distribution without permission is a violation of educational privacy law. This policy is consistent with UMW's Policy on Recording Class and Distribution of Course Materials.

Recommended problems: In addition to assigned problems, I recommend practicing problems from your textbook. Complete as many as you can, choosing different types of problems from different sections. Once you have completed those problems, you are welcome to seek out additional problems in other organic textbooks in the library, or my office. Repetition is the key to success in organic chemistry, especially to move beyond simple memorization.

Suggestions for success:

Conceptual understanding is the bedrock upon which this course is built; so make sure you are comfortable with CHEM 211 fundamentals before you even begin to approach this course. I hope that you have realized, after taking CHEM 211, that organic chemistry is one of the most challenging but rewarding branches of chemistry. This course, by necessity, moves quickly to cover all the material necessary for success in future classes (especially biochemistry and other biology classes). To not fall behind, I recommend reading through the strategies presented below. If you are not approaching this

class as a part-time, if not a full-time job, you are not spending enough time with the material. This equates to about 12 hours per week outside of class.

But time and effort alone are not enough; your effort must be productive, in the right direction. There are things you need to memorize, and things you need to conceptually understand. The more concepts you internalize and rationalize using basic chemistry arguments, the fewer things you will end up needing to memorize.

Recommended strategies

1. Read (or at least scan) the chapter before class.
2. Be attentive and participate in class. Ask questions to clarify your conceptual understanding, and give me answers to questions I pose in class; the class is a judgement-free zone where you are free to explore all sorts of ideas and learn the reasons behind why certain organic reactions proceed the way they do. Volunteering information, whether correct or not, is one of the best ways to engage with the class and absorb course material.
3. Re-read your notes within 24 hours of lecture. Re-work all reactions and examples covered in class. Use your book to fill in any gaps. Discuss the material with your classmates.
4. Bring any questions to me during office hours. I love talking about chemistry. I can't give you the answers to homework, but I will work with you until the material "clicks".
5. Work the in-chapter problems as you work on each section. Work the end of chapter problems. Work 2 or 3, then check them using the solutions manual. If you don't get it, write and rework the problem so that you are actively writing down the correct answer.
6. Study both individually and in groups. Working in groups forces you to explain your thinking to others, which is one of the best methods of learning.
7. As the exam comes closer, re-work problems that gave you difficulty.
8. Come to office hours as soon as you realize that you are not understanding, falling behind, or getting confused.

Tentative course schedule, Spring 2025

** The schedule is subject to change based on the pace of the lectures **

Week	Tuesday	Lecture activity	Thursday	Lecture activity
1	Jan 14	Orgo 1. Review / Alcohols	Jan 16	Alcohols
2	Jan 21	Alcohols / Quiz 1	Jan 23	Ethers and epoxides
3	Jan 28	Ethers and epoxides / Quiz 2	Jan 30	Exam 1
4	Feb 4	Aldehydes & Ketones	Feb 6	Aldehydes & Ketones
5	Feb 11	Aldehydes & Ketones / Quiz 3	Feb 13	Carboxylic acid derivatives
6	Feb 18	Carboxylic acid derivatives	Feb 20	Carboxylic acid derivatives / Quiz 4
7	Feb 25	Exam 2	Feb 27	Enolates
	Mar 4	SPRING BREAK	Mar 6	SPRING BREAK
8	Mar 11	Enolates	Mar 13	Enolates / Quiz 5
9	Mar 18	Dienes	Mar 20	Dienes / Quiz 6 / Aromaticity
10	Mar 25	Aromaticity / Quiz 7	Mar 27	Aromatic substitution
11	Apr 1	Aromatic substitution	Apr 3	Aromatic substitution / Quiz 8
12	Apr 8	Exam 3	Apr 10	Amines
13	Apr 15	Amines / Quiz 9 / Bioorganic	Apr 17	Bioorganic
14	Apr 22	Bioorganic / Quiz 10	Apr 24	Exam 4

Final exam: Thursday, May 1st, 8:30 am

Tentative Chem 212 Lab Schedule

The order of labs may change at instructor's discretion

Week	Day	Lab activity	Lab reports due
Week 1	Jan 14	Lab review	
Week 2	Jan 21	Grignard synthesis	
Week 3	Jan 28	Grignard synthesis or computational chemistry	
Week 4	Feb 4	Carvone epoxidation	Grignard synthesis
Week 5	Feb 11	Horner-Wadsorth-Emmons synthesis	Carvone epoxidation
Week 6	Feb 18	Unknown identification	Wittig synthesis
Week 7	Feb 25	Unknown identification	
	Mar 4	SPRING BREAK	
Week 8	Mar 11	Unknown identification	
Week 9	Mar 18	Aldol condensation	Unknown identification
Week 10	Mar 25	Diels-Alder reaction	Aldol condensation
Week 11	Apr 1	Polystyrene synthesis	Diels-Alder
Week 12	Apr 8	Acetylferrocene synthesis	Polystyrene synthesis
Week 13	Apr 15	Column chromatography	Acetylferrocene
Week 14	Apr 22	Lab final	Column chromatography

Important dates:

Drop deadline: Jan 31

Mid-semester grades due: Mar 14

Withdraw deadline: Mar 21

Final grades due: May 6