Sul Ross State University
Syllabus for Organic Chemistry II: CHEM 3408 (Spring 2017)

Class: Organic Chemistry II
Room: WSB 307
Time: MWF 9:00-9:50am
Lab: Wednesday 2:00-4:50pm

Instructor: Dr. David J. Leaver
Office: WSB 318
Office Hours: M-R 3:00-5:00pm
Email: david.leaver@sulross.edu
Office Phone: (432) 837-8115

OBJECTIVES

Student Learning Objectives (SLO):

A student graduating with the ***chemistry major*** is expected to demonstrate that (s)he is able to do the following:

1. Organic Chemistry—Students will be able to draw organic molecular structures and explain organic reactions, stereochemistry, structural analysis and reactions in biological systems.

2. Inorganic Chemistry—The student will be able to demonstrate understanding of coordination chemistry, valence theory, elementary actions and advanced molecular theory.

3. Analytical Chemistry—The student will be able to demonstrate an understanding of theory of analytical chemistry and conduct analytical analysis, including data analysis and calibration, equilibrium chemistry, gravimetric analysis, titrimetric analysis, spectroscopic analysis, and electrochemical analysis.

4. Physical Chemistry—The student will be able to demonstrate an understanding of the application and theory of physical chemistry, including topics such as atomic structure, electrochemistry, surface chemistry, solid-state chemistry, and thermodynamics.

5. Research—The student will collect and analyze published chemical literature and undertake a chemistry research project.

Organic Chemistry II Learning Objectives:

A. The language of aromatic based organic chemistry

B. Reactions and mechanisms of compounds with carbonyl and amino groups

C. In depth retrosynthetic analysis to design complex organic molecules

D. Basic organometallic reactions and catalytic cycles

E. How to write a chemical essay in the language of organic chemistry

F. SciFinder (Chemical Database)

Cell phones **ARE NOT** permitted for use in exams and should be turned off during class time.

Required Text: "Organic Chemistry" by T. W. Solomons, C. B. Fryle and S.A. Snyder (11th ed.), **2014**, John Wiley & Sons (older editions are ok); ***Lab Manual***: "Techniques and Experiments for Organic Chemistry" (6th Edition) by A. Ault, **1998**, University Science Books; (Molecular Model Set optional)

The following chapters will be covered:

Chapter 11: Alcohols and Ethers

Chapter 12: Alcohols from Carbonyl compounds

Chapter 13: Conjugated Unsaturated Systems

Chapter 14: Aromatic Compounds

Chapter 15: Reactions of Aromatic Compounds

Chapter 16: Aldehydes and Ketones: Nucleophilic Addition to the Carbonyl Group

Chapter 17: Carboxylic Acids and their Derivatives

Chapter 18: Reactions at the α Carbon of Carbonyl Compounds: Enols and Enolates

Chapter 19: Condensation and Conjugate Addition Reactions of Carbonyl Compounds

Chapter 20: Amines

Chapter 21: Phenols and Aryl Halides: Nucleophilic Aromatic Substitution

Special Topic G: Carbon-Carbon Bond-Forming and Other Reactions of Transition Metal Organometallic Compound (***if time permits***).

Homework: There will be problems assigned for each chapter. **NO LATE HOMEWORK WILL BE ACCEPTED.** Homework must be completed in **PEN!**

ATTENDANCE PRERESQUITE: BEING ABSENT FROM MORE THAN 9 LECTURES WILL RESULT IN FAILING THE COURSE.

LABORATORY: Attendance to laboratories is required. **NO MAKE-UP LABORATORIES WILL BE GIVEN**. If you **miss 3 labs** or more you will receive an automatic **F** for this course (i.e. this means you will fail the entire Organic I course).

Examinations: There will be ***three midterm*** examinations and ***a final*** examination. The final is mandatory and will be comprehensive. **NO MAKE-UP EXAMS WILL BE GIVEN.**

PERCENTAGE BREAKDOWN OF MARKS:

Homework: 12%
Each Midterm Exam (12.7 %): 38 %
Research Essay 10%
Final Exam: 20%
Laboratory: 20%

Midterm Exam I: Wednesday, February 22nd
Midterm Exam II: Wednesday, March 29th
Research Essay: Monday, April 10th (after class @ 9:50 am)
Midterm Exam III: Wednesday, April 26th
Final Exam: Tuesday, May 9th at 8:00-10:00 am

Course Calendar

Lecture 1 (January 18): Discussion on Syllabus, Activation of an alcohol as a better leaving group, reactions of alcohols and ethers

Lecture 2 (January 20): Formation and reactions of epoxides

Lecture 3 (January 23): Revision on Chapter 11

Lecture 4 (January 25): Preparation of alcohols from carbonyl compounds, oxidation of alcohols **(Homework chapter 11 due)**

Lecture 5 (January 27): Reaction of organolithium and organomagnesium compounds + revision on Chapter 12

Lecture 6 (January 30): Allylic substitution reactions, 1, 3-butadiene and stability of conjugated dienes **(Homework chapter 12 due)**

Lecture 7 (February 1): 1,4 addition on conjugated dienes, Diels-Alder reaction

Lecture 8 (February 3): Revision on Chapter 13; Review on aromatic compounds. Nomenclature of benzene derivatives

Lecture 9 (February 6): Differences between alkenes and benzenes compounds in terms of general reactions (**Homework chapter 13 due**)

Lecture 10 (February 8): Stability of benzene; Revision on Chapter 14

Lecture 11 (February 10): Electrophilic aromatic substitution reactions (**Homework chapter 14 due**)

Lecture 12 (February 13): Friedel-Crafts alkylation/acylation

Lecture 13 (February 15): Effect of substituents on reactivity and orientation, synthetic applications, revision on Chapter 15

Lecture 14 (February 17): Nomenclature of aldehydes and ketones, synthesis of aldehydes and ketones, nucleophilic addition to the carbon-oxygen double bond (**Homework chapter 15 due**)

Lecture 15 (February 20): Exam revision

Lecture 16 (February 22): Exam I (Chapters 11-14, subject to change)

Lecture 17 (February 24): Synthesis of hemiacetals and acetals, addition of primary and secondary amines to carbonyl groups

Lecture 18 (February 27): Wittig reaction; Revision on Chapter 16

Lecture 19 (March 1): Nomenclature and physical properties of carboxylic acids and acid derivatives, preparation of carboxylic acids (**Homework chapter 16 due**)

Lecture 20 (March 3): Synthesis and reactions of esters and amides

Lecture 21 (March 6): Decarboxylation of carboxylic acids, summary of the reactions of carboxylic acids and their derivatives

Lecture 22 (March 8): Review on Chapter 17 (**Homework chapter 17 due**)

Lecture 23 (March 10): Reactions via enols and enolate anions

March 13-17th is Spring Break (No classes)

Lecture 24 (March 20): Acetoacetic and Malonic Ester syntheses; Enamine chemistry

Lecture 25 (March 22): Review on Chapter 18, Claisen & Dieckmann condensation reactions (**Homework chapter 18 due**)

Lecture 26 (March 24): Aldol condensations continue; addition to unsaturated aldehydes and ketones

Lecture 27 (March 27): Exam revision

Lecture 28 (March 29): Exam II (Chapters 15-18 subject to change)

Lecture 29 (March 31): Synthesis of substituted acetic acids, Michael additions, summary of important reaction of dicarbonyl compounds

Lecture 30 (April 3): Revision on Chapter 19

Lecture 31 (April 5): Nomenclature and physical properties of amines, basicity of amines, amines vs. amides, preparation of amines (**Homework chapter 19 due**)

Lecture 32 (April 7): Reactions of amines

Lecture 33 (April 10): Revision on Chapter 20 (***Research Essay due after class @ 9:50 am***)

Lecture 34 (April 12): Structure and nomenclature of phenols, physical properties and synthesis of phenols (**Homework chapter 20 due**)

April 14: Good Friday (No Class)

Lecture 35 (April 17): Reactions of phenols

Lecture 36 (April 19): Revision on Chapter 21

Lecture 37 (April 21): Special Topic G **(Homework chapter 21 due)**

Lecture 38 (April 24): Exam revision

Lecture 39 (April 26): Exam III: Chapters 19-21 (subject to change)

Lecture 40 (April 28): Revision on Special Topic G

Lecture 41 (May 1): Final Exam Revision (Homework Special Topic G due)

Lecture 42 (May 3): Final Exam Revision

Final Exam (May 9): At 8:00 am-10:00 am (comprehensive)

Students with Special Needs: *Sul Ross State University is committed to equal access in compliance with the Americans With Disabilities Act of 1973. It is the student's responsibility to initiate a request for accessibility services. Students seeking accessibility services must contact Mary Schwartze, M. Ed., L.P.C., in Counseling and Accessibility Services, Ferguson Hall, Room 112. The mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas 79832. Telephone: 432-837-8203. E-mail: mschwartze@sulross.edu .*

Scholastic Dishonesty: *Students who violate the University rules on scholastic dishonesty are subject to penalties, including the possibility of an **F** in the course and/or dismissal from the University. All assignments (including homework) need to be individually completed and not copied from another student's work. Electronic submission of homework is accepted after hours (not recommended), but must be hand written and scanned (either with a scanner or a smart phone) and emailed to Dr. Leaver at:* david.leaver@sulross.edu*. [.pdf is the preferred format for electronically submitted homework.] Homework electronically completed in Microsoft Word or other similar programs will NOT be accepted.*