

**Sul Ross State University**  
**Syllabus for Organic Chemistry II: (CRN: 21346)**  
**CHEM 3408 (Spring 2023)**

**Class:** Organic Chemistry II  
**Room:** WSB 307  
**Time:** MWF 9:00-9:50am  
**Date:** Jan. 18 to May 17

**Instructor:** Dr. Hong Young Chang  
**Office:** WSB 219  
**Email:** hxc19tv@sulross.edu  
**Office Phone:** (432) 837-8113  
**Office Hour:** M-R 2:00-6:30pm  
(In person or zoom)  
(Appointments only)

**Food & Drinks:** There will be no eating or drinking in the classroom. If you need to take a sip of your drink during class time, you may leave the room to do so.

**SRSU Disability Services: ADA (Americans with Disabilities Act):**

*Sul Ross State University (SRSU) is committed to equal access in compliance with Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the student's responsibility to initiate a request each semester for each class. Students seeking accessibility/accommodations services must contact Rebecca Greathouse Wren, LPC-S, SRSU's Accessibility Services Coordinator at 432-837-8203 (please leave a message and we'll get back to you as soon as we can during working hours), or email [rebecca.wren@sulross.edu](mailto:rebecca.wren@sulross.edu). Their office is located on the first floor of Ferguson Hall (Room 112), and our mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas, 79832.*

**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.*

***1. All assignments and homework (including the multiple-choice homework (MCH)) need to be individually completed and not copied from another student's work.***

***2. The multiple-choice homework (MCH) will disappear after each due time in the Blackboard of SRSU. Therefore, you need to keep the due day and time.***

***3. The handy homework must be hand written and submitted to Dr. Chang directly. This handy homework will not be accepted by my email [Pdf format has to be used to submit]***

## **OBJECTIVES:**

### ***Student Learning Objectives (SLO):***

A student graduating with a ***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 an 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.

### ***BSc in Chemistry Marketable Skills***

1. Students will become good at punctuality and time management.
2. Students will analyze &/or synthesize molecules and perform spectroscopic characterization and interpret their results scientifically.
3. Students will become proficient at writing scientific papers and to identify appropriate references for their paper.
4. Students will become proficient at orally presenting scientific topics including the use of visual aids.

### ***Organic Chemistry II Learning Objectives:***

At the end of this course, a student should have a good understanding of:

- 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)

**REQUIRED TEXT BOOK and LAB MANUAL:** This organic chemistry II class is linked by organic chemistry II lab class. Therefore, you need to prepare for two books.

**Text Book:**

“Organic Chemistry” by T. W. Solomons, C. B. Fryle and S.A. Snyder (11<sup>th</sup> ed.), **2014**, John Wiley & Sons

**Lab Manual:**

“Techniques and Experiments for Organic Chemistry” (6th Edition) by A. Ault, 1998, University Science Books; (Molecular Model Set optional)  
The SRSU library has one copy of this textbook in the “Textbook Collection” section. Please ask the library front desk if you need help finding this textbook.

**Suggested Reading:** “Survival guide to organic chemistry: bridging the gap from general chemistry” by Patrick E. McMahon, Bohdan B. Khomtchouk and Claes Wahlestedt, **2017**, CRC Press, Taylor & Francis Group.

**SRSU Library Services: The Sul Ross Library offers FREE resources and services to the entire SRSU community.** Access and borrow books, articles, and more by visiting the library’s website, [library.sulross.edu](http://library.sulross.edu). Off-campus access requires your LoboID and password. Check out materials using your photo ID. Librarians are a tremendous resource for your coursework and can be reached in person, by email ([srsulibrary@sulross.edu](mailto:srsulibrary@sulross.edu)), or phone (432-837-8123).

***Electronic Tool to Draw Chemical Structures:***

ACD/ChemSketch is a computer program that you can use to draw organic structures, organic reactions, etc. You can download ACD/ChemSketch onto your own personal computer (PC or Mac):

[ChemSketch Download for Academic and Personal Use | ACD/Labs \(acdlabs.com\)](http://www.acdlabs.com)

The following chapters will be covered:

**Chapter 10:** Radical Reactions

**Chapter 11:** Alcohols and Ethers: Synthesis & Reactions

**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  $\alpha$  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 is a [Handy Homework \(HH\)](#). All homework will be assigned for each chapter. This HH has to be completed in pen. **NO LATE HOMEWORK WILL BE ACCEPTED.** HH has to be submitted into a paper using the given PDF. **It is not accepted by email.** The due day of HH is described on the following Course Calendar.

**NOTE: HH (Handy Homework) and Exams MUST be completed in pen!**

### ***EXAMINATIONS:***

There will be *three in-course* examinations and *a final* examination. **NO MAKE-UP EXAMS WILL BE GIVEN. All examinations will be completed by face-to-face.** The final exam is mandatory and comprehensive.

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

### **PERCENTAGE BREAKDOWN OF MARKS:**

HH (Handy Homework): 20%

Midterm Exam (each 20%): 60%

Final Exam: 20%

**100% score of organic chemistry II lecture class converts to 75% scores to combine the linked organic chemistry II lab class (it occupies 25%). Therefore, you will get 100% score in organic chemistry II from the lecture (75%) and the lab (25%).**

**Midterm Exam I: Monday, February 20<sup>th</sup>**

**Midterm Exam II: Friday, March 10<sup>th</sup>**

**Midterm Exam III: Monday, April 24<sup>th</sup>**

**Final Exam: Tuesday, May 16<sup>th</sup> (8:00-10:00 am)**

# CHEM3408 Organic Chemistry II Course Calendar

\* This course calendar could be changed. Before one week, your professor will let you know the changes.

| Date   | Lecture #  | Chapter #     | Topics                                                                                                                                           | Due work     |
|--------|------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Jan.18 | Lecture 1  | Ch 10         | Discussion on syllabus, free radical reactions of alkanes with halogens, understanding of chain reactions (initiation, propagation, termination) |              |
| Jan.20 | Lecture 2  |               | Allylic /benzylic radicals, radical addition to alkenes, chain growth polymers                                                                   |              |
| Jan.23 | Lecture 3  |               | Revision on Chapter 10                                                                                                                           |              |
| Jan.25 | Lecture 4  | Ch 11         | Structure and nomenclature of alcohols, general physical and chemical properties of alcohols                                                     | Ch 10 HW due |
| Jan.27 | Lecture 5  |               | Reactions of alcohols, overview of reactions of carbonyl compounds with nucleophiles                                                             |              |
| Jan.30 | Lecture 6  |               | Preparation of alcohols from carbonyl compounds                                                                                                  |              |
| Feb.1  | Lecture 7  |               | Oxidation of alcohols, reactions of organolithium and organomagnesium compounds                                                                  |              |
| Feb.3  | Lecture 8  |               | Revision on Chapter 11                                                                                                                           |              |
| Feb.6  | Lecture 9  | Ch 13         | Allylic substitution reactions                                                                                                                   | Ch 11 HW due |
| Feb.8  | Lecture 10 |               | 1,3-butadiene and stability of conjugated dienes                                                                                                 |              |
| Feb.10 | Lecture 11 |               | 1,4 addition on conjugated dienes, Diels-Alder reaction                                                                                          |              |
| Feb.13 | Lecture 12 |               | Revision on Chapter 13; Review on aromatic compounds. Nomenclature of benzene derivatives                                                        |              |
| Feb.15 | Lecture 13 | Ch 14         | Differences between alkenes and benzenes compounds in terms of general reactions                                                                 |              |
| Feb.17 | Lecture 14 | Review & Test | Exam I revision                                                                                                                                  | Ch 13 HW due |

|        |            |               |                                                                                                                                            |                             |
|--------|------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Feb.20 | Lecture 15 |               | <b>Exam I (It covers chapters 10, 11, &amp; 13)</b>                                                                                        |                             |
| Feb.22 | Lecture 16 | Ch 14         | Stability of benzene; Revision on Chapter 14                                                                                               |                             |
| Feb.24 | Lecture 17 | Ch 15         | Electrophilic aromatic substitution reactions                                                                                              |                             |
| Feb.27 | Lecture 18 |               | Friedel-Crafts alkylation/acylation                                                                                                        | <b>Ch14<br/>HW<br/>due</b>  |
| Mar.1  | Lecture 19 |               | Effect of substituents on reactivity and orientation, synthetic applications, revision on Chapter 15                                       |                             |
| Mar.3  | Lecture 20 | Ch 16         | Nomenclature of aldehydes and ketones, synthesis of aldehydes and ketones, nucleophilic addition to the carbon-oxygen double bond          | <b>Ch 15<br/>HW<br/>due</b> |
| Mar.6  | Lecture 21 |               | Synthesis of hemiacetals and acetals, addition of primary and secondary amines to carbonyl groups, Wittig reaction; Revision on Chapter 16 |                             |
| Mar.8  | Lecture 22 | Review & Test | <b>Exam II revision</b>                                                                                                                    |                             |
| Mar.10 | Lecture 23 |               | <b>Exam II (It covers chapters 14, 15, &amp; 16)</b>                                                                                       | <b>Ch 16<br/>HW<br/>due</b> |
| Mar.20 | Lecture 24 | Ch 17         | Nomenclature and physical properties of carboxylic acids and acid derivatives, preparation of carboxylic acids                             |                             |
| Mar.22 | Lecture 25 |               | Synthesis and reactions of esters and amides                                                                                               |                             |
| Mar.24 | Lecture 26 |               | Decarboxylation of carboxylic acids, Summary of the reactions of carboxylic acids and their derivatives, review on Chapter 17              |                             |
| Mar.27 | Lecture 27 | Ch 18         | Reactions via enols and enolate anions                                                                                                     | <b>Ch 17<br/>HW<br/>due</b> |
| Mar.29 | Lecture 28 |               | Acetoacetic and malonic ester syntheses, enamine chemistry                                                                                 |                             |
| Mar.31 | Lecture 29 |               | Review on Chapter 18                                                                                                                       |                             |
| Apr.3  | Lecture 30 | Ch 19         | Claisen & Dieckmann condensation reactions                                                                                                 | <b>Ch 18<br/>HW<br/>due</b> |



|        |            |               |                                                                                                                                              |                             |
|--------|------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Apr.5  | Lecture 31 |               | Aldol condensations continued                                                                                                                |                             |
| Apr.10 | Lecture 32 |               | Addition to unsaturated aldehydes and ketones                                                                                                |                             |
| Apr.12 | Lecture 33 |               | Synthesis of substituted acetic acids, Michael additions, a summary of important reaction of dicarbonyl compounds<br>Revision on Chapter 19. |                             |
| Apr.14 | Lecture 34 | Ch 20         | Nomenclature and physical properties of amines, basicity of amines, amines vs. amides, preparation of amines                                 | <b>Ch 19<br/>HW<br/>due</b> |
| Apr.17 | Lecture 35 |               | Reactions of amines, revision on Chapter 20                                                                                                  |                             |
| Apr.19 | Lecture 36 | Ch 21         | Structure and nomenclature of phenols, physical properties and synthesis of phenols                                                          |                             |
| Apr.21 | Lecture 37 | Review & Test | <b>Exam III revision</b>                                                                                                                     |                             |
| Apr.24 | Lecture 38 |               | <b>Exam III (It covers chapters 17, 18, 19, &amp; 20)</b>                                                                                    | <b>Ch 20<br/>HW<br/>due</b> |
| Apr.26 | Lecture 39 | Ch 21         | Reactions of phenols                                                                                                                         |                             |
| Apr.28 | Lecture 40 |               | Reactions of phenols continued.                                                                                                              |                             |
| May.1  | Lecture 41 |               | Revision on Chapter 21                                                                                                                       |                             |
| May.3  | Lecture 42 | G             | Special Topic G                                                                                                                              | <b>Ch 21<br/>HW<br/>due</b> |
| May.5  | Lecture 43 | Review & Test | <b>Revision of Ch. 10, 11, &amp; 13</b>                                                                                                      |                             |
| May.8  | Lecture 44 |               | <b>Revision of Ch. 14, 15, &amp; 16</b>                                                                                                      | <b>G HW<br/>due</b>         |
| May.10 | Lecture 45 |               | <b>Final Exam revision</b>                                                                                                                   |                             |
| May.16 | Lecture 46 |               | <b>Tuesday, 8:00 - 10:00 AM, WSB 307</b>                                                                                                     |                             |