

**Sul Ross State University**  
**Syllabus for Organic Chemistry I: CHEM 3407 (Fall 2020)**

**Class:** Organic Chemistry I  
Room: WSB 201  
Time: MWF 9:00-9:50am  
Lab:L01 Wed 2:00-4:50 pm  
Lab:L02 Thurs 2:00-4:50 pm

**Instructor:** Dr. David Leaver  
Office: WSB 318  
Virtual Office Hours:  
M-R 2:00-4:30pm (Phone or Zoom)  
Zoom (appointments only)  
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.

### ***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 be become proficient at orally presenting scientific topics including the use of visual aids.

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

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

- A. The language of aliphatic based organic chemistry
- B. The major functional groups in organic compounds
- C. Retrosynthetic analysis to design simple and complex organic molecules
- D. Applications of thermodynamic and kinetic principles to predict regiochemical and stereochemical outcomes of organic reactions
- E. Infrared (IR), nuclear magnetic resonance (NMR) and mass spectroscopy

### **REQUIRED RESOURCES AND TEXTS:**

**You must wear a suitable mask/face covering while on campus (including lectures & laboratories). You will be asked to leave the classroom if you come to class without a suitable mask/face covering.**

<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html>

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

**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.

**The SRSU library has one copy of this book in the “Textbook Collection” section. Please ask the library front desk if you need help finding this book.**

*Lab Manual*: “Techniques and Experiments for Organic Chemistry” (6<sup>th</sup> Edition) by A. Ault, 1998, University Science Books

**Safety glasses are required for Organic Chemistry laboratories, which can be purchased from the SRSU Bookstore. You will NOT be allowed to participate in Organic Chemistry laboratories without safety glasses!**

Laboratory coats are recommended for Organic Chemistry laboratories, which can be purchased from the SRSU Bookstore.

Molecular model set is recommended (soft jelly candy with toothpicks can work!).

Scientific calculator is recommended.

**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).**

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

<http://sitelicense.cambridgesoft.com/sitelicense.cfm?sid=3000>

Make sure you follow the requirements for the password and use your SRSU email address to register.

Alternatively you can access ChemDraw in the GIS lab (computer room next to the chem TA room) by searching for “ChemDraw” whenever there is no class in that room (open computer lab when no classes are being taught).

The following chapters will be covered:

**Chapter 1: The Basics: Bonding and Molecular Structure**

**Chapter 2: Families of Carbon Compounds: Functional Groups and Intermolecular Forces**

**Chapter 3: Acids and Bases: Introduction to Organic Reactions and Their Mechanisms**

**Chapter 4: Nomenclature and Conformations of Alkanes and Cycloalkanes**

**Chapter 5: Stereochemistry: Chiral Molecules**

**Chapter 2.15: Infrared Spectroscopy & Chapter 9: Nuclear Magnetic Resonance and Mass Spectrometry: Tools for Structure Determination**

**Chapter 6: Ionic Reactions: Nucleophilic Substitution and Elimination Reactions of Alkyl Halides**

**Chapter 7: Alkenes and Alkynes I: Properties & Synthesis**

**Chapter 8: Alkenes and Alkynes II Addition Reactions**

**Chapter 10: Radical Reactions**

**Chapter 11: Alcohols and Ethers: Synthesis & Reactions (*If time permits*)**

***HOMEWORK:***

There will be a homework assigned for each chapter covered. **NO LATE HOMEWORK WILL BE ACCEPTED.**

**NOTE: Homeworks 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.** The final exam will be online and is mandatory and comprehensive.

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

**PERCENTAGE BREAKDOWN OF MARKS:**

Homework: 15%

Each Midterm Exam (15%): 45%

Final Exam: 20%

Laboratory: 20%

**Midterm Exam I:** Monday September 21<sup>st</sup>

**Midterm Exam II:** Wednesday October 21<sup>st</sup>

**Midterm Exam III:** Monday November 16<sup>th</sup>

**Final Exam (online):** Tuesday December 8<sup>th</sup> (8:00-10:00 am)

## **Course Calendar**

**Lecture 1 (August 24):** Discussion on Syllabus, background of organic chemistry, overview of chemical bonding

**Lecture 2 (August 26):** Lewis structures and formal charges, resonance structure, basics of hybridization, bond lengths, geometric isomerism and three dimensional formulas

**Lecture 3 (August 28):** Structural basics of hydrocarbons; revision on Chapter 1

**Lecture 4 (August 31):** Introduction to functional groups (*Homework Chapter 1 due*)

**Lecture 5 (September 2):** Physical properties and molecular structure

**Lecture 6 (September 4):** Intermolecular forces; revision on Chapter 2

**September 7: NO CLASS: LABOR DAY HOLIDAY**

**Lecture 7 (September 9):** Overview on acid base theories and reactions  
(*Homework Chapter 2 due*)

**Lecture 8 (September 11):** Factors affecting acidity of compounds

**Lecture 9 (September 14):** Introduction to organic acids and bases, acid base reactions involving organic molecules

**Lecture 10 (September 16):** Revision on Chapter 3 (*Homework Chapter 3 due*)

**Lecture 11 (September 18):** Exam Revision

**Lecture 12 (September 21):** Exam I (Chapters 1, 2 & 3)

**Lecture 13 (September 23):** Nomenclature and physical properties of alkanes and cycloalkanes and derivatives thereof

**Lecture 14 (September 25):** Conformational isomerism of alkanes and cycloalkanes

**Lecture 15 (September 28):** Synthesis of alkanes and index of hydrogen deficiency

**Lecture 16 (September 30):** Revision on Chapter 4

**Lecture 17 (October 2):** Isomerism, constitutional and stereoisomers, chiral molecules (*Homework Chapter 4 due*)

**Lecture 18 (October 5):** Nomenclature and physical properties of enantiomers

**Lecture 19 (October 7):** Introduction to synthesis of chiral molecules, molecules with more than one stereogenic center.

**Lecture 20 (October 9):** Revision on Chapter 5, Introduction to IR Spectroscopy

**Lecture 21 (October 12):** IR Spectroscopy & NMR Spectroscopy (*Homework Chapter 5 due*),

**Lecture 22 (October 14):** NMR Spectroscopy and Mass Spectroscopy (MS)

**Lecture 23 (October 16):** Revision on IR, NMR and MS, Nucleophilic substitution reactions, basic mechanism, kinetics and examples of  $S_N2$ , (*Homework for Chapter 9 due*).

**Lecture 24 (October 19):** Exam revision

**Lecture 25 (October 21):** Exam II (Chapters 4, 5 & 9)

**Lecture 26 (October 23):**  $S_N1$  reaction mechanism and stereochemistry of nucleophilic, factors affecting the rate of  $S_N1$  and  $S_N2$  reactions substitution reactions

**Lecture 27 (October 26):** Functional group transformation using  $S_N2$  reactions; Revision on Chapter 6

**Lecture 28 (October 28):** Introduction to elimination reactions, E2 and E1 mechanisms and examples, and substitution vs elimination (*Homework Chapter 6 due*)

**Lecture 29 (October 30):** Synthesis of alkenes and alkynes by elimination reactions and acidity of terminal hydrogen of alkynes, hydrogenation of alkenes and alkynes

**Lecture 30 (November 2):** Introduction to retrosynthetic analysis & addition reactions to alkenes; Chapter 7 Revision

**Lecture 31 (November 4):** Addition of hydrogen halides to alkenes & synthesis of alcohol from alkenes via addition reactions (*Homework Chapter 7 due*)

**Lecture 32 (November 6):** Addition of halogens to alkenes and alkynes, oxidation of alkenes and alkynes

**Lecture 33 (November 9):** Revision on Chapter 8, free radical reactions of alkanes (*Homework Chapter 8 due*)

**November 11: NO CLASS: VETERANS DAY HOLIDAY**

**Lecture 34 (November 13): Exam Revision**

**Lecture 35 (November 16): Exam III (Chapters 6, 7 & 8)**

**Lecture 36 (November 18):** Free radical reactions of alkenes, revision on Chapter 10

**Lecture 37 (November 20):** Structure and nomenclature of alcohols, general physical and chemical properties of alcohols (*Homework Chapter 10 due*)

**Lecture 38 (November 23):** Reactions of alcohols, overview of reactions of carbonyl compounds with nucleophiles (*online recording*)

**November 25-27: NO CLASS: THANKSGIVING HOLIDAY**

**Lecture 39 (November 30):** Revision on Chapter 11 (*Homework Chapter 11 due*), final exam revision (*online recording*)

**Lecture 40 (December 2):** Final exam revision (*online recording*)

**Final Exam (Comprehensive) (Tuesday December 8): 8:00-10:00 am (*online exam*)**

**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.*



*Please inform Dr. Leaver and the Organic Chemistry TA if you are pregnant or get pregnant during this semester as chemicals used in the Organic Chemistry laboratory could have harmful effects on an unborn child and extra safety precautions and due diligence need to be taken into consideration during laboratory periods.*

**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, but it must be hand written and scanned (either with a scanner or a smart phone) and emailed to Dr. Leaver at: [david.leaver@sulross.edu](mailto:david.leaver@sulross.edu). [.pdf is the preferred format for electronically submitted homework]*