

**SUL ROSS STATE UNIVERSITY**  
**Syllabus for General Chemistry II-21478**  
**CHEM 1312-001 (Spring 2022)**

General Chemistry II: Lecture (3 credit)  
Room: WSB 307  
Time: T/Th: 12:30-1:45 pm  
Date: Jan. 10 to May 4

Instructor: Dr. Hong Young Chang  
Office: WSB 219  
Email: [hxc19tv@sulross.edu](mailto:hxc19tv@sulross.edu)  
Office Hours: M-Th 2:00-6:30pm  
(In person or zoom)  
(Appointments only)

**(The first week (Jan. 10 to Jan. 14) is on-line class (Blackboard)  
(Revert to Face-to-Face: Jan.18 to May.4)**

**It is strongly recommended to wear a suitable mask/face on campus (including lectures & laboratories) while you took COVID-19 vaccine shots. There will be COVID-19 Tests this semester. If you have tested positive for COVID-19 (or have been exposed to someone who has tested positive for COVID-19), please do self-report: <https://srinfo.sulross.edu/covid-19/self-report/>. In order to do self-report, you will need to be signed in with your SRSU credentials (yellow “log in” button on the bottom left-hand side of the above website). Other web-site of SRSU is also helpful for COVID-19.**

[COVID Regulations - SUL ROSS State University](#)

[Free COVID-19 testing for all SRSU students, faculty, and staff comes to Alpine, August 27-28 - Sul Ross State University Athletics \(srlobos.com\)](#)

**Disinfection of Classroom Surfaces:** Each person should disinfect their space at the beginning and end of every class meeting. The university has provided disinfectant wipes in the classroom. When you enter the classroom, please take a

wipe and use it to clean your space before settling in. Please wipe down your space before you leave the classroom.

**Orderly Dismissal:** When class is over, Dr. Chang will dismiss students row by row. Please wipe down your desk/leave when Dr. Chang dismisses your row.

**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 for accessibility service. Please contact Ms. Rebecca Greathouse Wren, M.Ed., LPC-S, Director/Counselor, Accessibility Services Coordinator, Ferguson Hall (Suite 112) at 432.837.8203; mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas 79832. E-mail: [rebecca.wren@sulross.edu](mailto:rebecca.wren@sulross.edu) Students should then contact the instructor as soon as possible to initiate the recommended accommodations.*

**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.***

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

### ***General Chemistry II Learning Objectives:***

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

1. The basic concepts of intermolecular forces
2. Physical properties of solutions
3. The basic concepts of chemical kinetics and equilibrium
4. The concepts of acid and bases
5. Chemical equilibrium in acid-base reactions
6. Laws of thermodynamics: Gibbs free energy and reaction spontaneity
7. Redox reactions
8. Organic molecules and hydrocarbons

### ***Core Objectives (CO):***

1. **Critical Thinking Skills** – Students will gain/improve their critical thinking ability by solving real life chemistry problems through inquiry, analysis, and

evaluation of available information. Students will be tested on their critical thinking ability in exams and through lab experiments.

2. **Communication Skills** – Students will have the opportunity of improving communication skills through oral discussion and writing reports (i.e. observation, explanation, and conclusion, etc.) on the experiments done in the lab sessions.

3. **Empirical and Quantitative Skills** – Students will use the mathematical skills needed to manipulate and analyze numerical data obtained through experimentation in order to form conclusions.

4. **Teamwork** – Students will use team-spirit and consider different points of view to work effectively while conducting experiments as a team working toward a shared purpose or goal.

**Text Book:** “*General Chemistry: The Essential Concepts 7<sup>th</sup> Edition*” by Raymond Chang and Kenneth A. Goldsby, McGraw-Hill, New York, United States of America, **2014**. (Older editions such as the 5th and 6th editions are ok to use).

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

### **Suggested Reading and References:**

1. “*OpenStax Chemistry 2e*” <https://openstax.org/details/books/chemistry-2e> by Paul Flowers, Klaus Theopold, Richard Langley, etc.

2. “*Chemistry LibreTexts*” (Beginning Chemistry (Ball), [Introductory, Conceptual, and GOB Chemistry - Chemistry LibreTexts](#))

*Calculator:* A scientific calculator is required for this course.

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

The following chapters will be covered in General Chemistry II:

**Chapter 6:** Energy Relationships in Chemical Reactions

**Chapter 12:** Intermolecular Forces and Liquids and Solids

**Chapter 13:** Physical Properties of Solutions

**Chapter 11:** Introduction of Organic Chemistry

**Chapter 14:** Chemical Kinetics

**Chapter 15:** Chemical Equilibrium

**Chapter 16:** Acids and Bases

**Chapter 17:** Acid-Base Equilibria and Solubility Equilibria

**Chapter 18:** Thermodynamics

**Chapter 19:** Redox Reactions and Electrochemistry

**Homework & Assignments:** There is two kinds of homework assigned for each chapter. *One homework will be solved in the SRSU Blackboard (multiple choice homework). You may try to solve the problem sets several times to attain the highest score. You need to keep their due day for each chapter. Their due day for each chapter will be notified.*

*The other homework will be done with your pen. This homework style is short answer problem sets. After downloading and printing the homework sheet, you need to solve the problem sets.* After solving the problem sets, you need to scan the sheet with your cellphone or scanner (your cellphone has this scanner function after downloading the corresponding application files. Please, turn in your homework as one PDF file). You also need to keep their due day for each chapter. **NO LATE HOMEWORK WILL BE ACCEPTED.** You may turn in this homework via email. Your professor will review and check this submitted homework to know whether you copy other students' homework or not.

**Examinations:** There will be *three midterm* examinations and *a final* examination. The final is mandatory and comprehensive. *The final exam will be taken on as the face to face style.*

**NO MAKE-UP EXAMS WILL BE GIVEN.**

**NOTE: all exams MUST be completed in pen as the face-to-face style!**

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

## **PERCENTAGE BREAKDOWN OF MARKS:**

Homework & Assignments: 20%

(multiple-choice 10 % and short-answer 10 %)

Each Midterm Exam (20 %): 60%

Final Exam: 20%

**Midterm Exam I:** Thursday February 11<sup>th</sup> as face-to-face

**Midterm Exam II:** Thursday March 4<sup>th</sup> as face-to-face

**Midterm Exam III:** Thursday April 15<sup>th</sup> as face-to-face

**Final Exam:** Tuesday, May 4<sup>th</sup> at 9:30 – 11:30 am, as face-to-face in WSB 307

## **Course Calendar**

**Lecture 1 (January 11):** Discussion on Syllabus. Importance of chemical energy, types of energy, energy changes in chemical reactions

**Lecture 2 (January 13):** The first law of thermodynamics, enthalpy of chemical reactions, and calorimetry.

**Lecture 3 (January 18):** Discussion on selective questions and problems on Chapter 6.

**Lecture 4 (January 20):** Types of intermolecular forces, properties of liquids, liquid-vapor equilibrium, liquid-solid equilibrium, and solid-vapor equilibrium.  
*(Homework Chapter 6 due)*

**Lecture 5 (January 25):** Phase diagrams and discussion on selective questions and problems on Chapter 12 and Types of solutions and concentration units.

**Lecture 6 (January 27):** Discussion on selective questions and problems on Chapter 12, and Factors affecting solubility *(Homework Chapter 12 due)*



**Lecture 7 (February 1):** Colligative properties

**Lecture 8 (February 3):** Classification of organic compounds and aliphatic/aromatic hydrocarbons and nomenclature on hydrocarbons and their structures.

**Lecture 9 (February 8):** Functional groups in organic chemicals. **Exam Revision**  
(*Homework Chapter 13 due*)

**Lecture 10 (February 10):** **Exam I: Chapters 6, 12 & 13**

**Lecture 11 (February 15):** Discussion on selective questions and problems on Chapter 11. Understanding on terminologies related to rate laws. First & second order reactions and experimental determination of rate laws.

**Lecture 12 (February 17):** Activation energy and temperature dependence of rate constants, elementary reactions, reaction mechanism, and catalysis. Discussion on selective questions and problems on Chapter 14. (*Homework Chapter 11 due*)

**Lecture 13 (February 22):** Understanding on the concepts of chemical equilibrium, equilibrium constants, reaction quotients, calculation of equilibrium concentrations, and factors affecting chemical equilibrium.

**Lecture 14 (February 24):** Discussion on selective questions and problems on chapter 15. Understanding on concepts of acids and bases, acid-base properties of water, pH, strength of acids and bases, ionization constants of weak acids and bases, and percent ionization. (*Homework Chapter 14 due*)

**Lecture 15 (March 1):** **Exam Revision** (*Homework Chapter 15 due*)

**Lecture 16 (March 3):** **Exam II: Chapters 11, 14, & 15**

**NO CLASS: SPRING BREAK (March 7 to March 11)**

**Lecture 17 (March 15):** Ionization constants of conjugate acids-bases, determination of pH for weak acids and bases using ICE tables, acid-base properties of salts, Lewis acids and bases, and discussion on selective questions and problems on Chapter 16

**Lecture 18 (March 17):** Common ion effect in chemical equilibrium, Henderson-Hasselbalch equation, concept of buffer solution, and preparing buffer with a specific pH

**Lecture 19 (March 22):** Strong acid-strong base titrations, weak acid-strong base titrations, acid-base indicators (*Homework Chapter 16 due*)

**Lecture 20 (March 24):** Solubility product, molar solubility, predicting precipitation reactions, common ion effect and pH on solubility

**Lecture 21 (March 29):** Discussion on selective questions and problems on Chapter 17, spontaneous processes and entropy, and microstates related to entropy

**Lecture 22 (March 31):** The second law of thermodynamics, entropy changes in systems and surroundings, and the third law of thermodynamics (*Homework Chapter 17 due*)

**Lecture 23 (April 5):** Gibbs free energy chemical equilibrium, and discussion on selective questions and problems on Chapter 18

**Lecture 24 (April 7):** Redox reactions, balancing redox equations, spontaneous Galvanic cells, and standard reduction (*Homework Chapter 18 due*)

**Lecture 25 (April 12):** Potentials electromotive force (emf), Nernst equation, concentration cells, concepts of batteries. **Exam Revision**

**Lecture 26 (April 14): Exam III: Chapters 16, 17, & 18**

**Lecture 27 (April 19):** Concepts of corrosion, electrolysis, and discussion on selective questions and problems on Chapter 19

**Lecture 28 (April 21):** **Final Exam Revision** (Chapters 6, 12, 13, 11, 14, 15)  
(*Homework Chapter 19 due*)

**Lecture 29 (April 26):** **Final Exam Revision** (Chapters 16, 17, 18, 19)

**NO CLASS: DEAD DAY (April 28)**

**Final Exam (Comprehensive):** **Wednesday, May 4<sup>th</sup>** at 10:15 am-12:15 pm,  
WSB307