

**SUL ROSS STATE UNIVERSITY**  
**Syllabus for General Chemistry II-21438**  
**CHEM 1312-001 (Spring 2021)**

General Chemistry II: Lecture (3 credits)  
Room: WSB 307  
Time: MWF: 10:00-10:50 am  
Date: Jan. 11 to May. 5

Instructor: Hong Young Chang  
Office: WSB 219  
Email: hxc19tv@sulross.edu  
Office Hours: TBD

(The first two weeks (Jan. 11 to Jan. 22) is on-line class)  
(Revert to Face-to-Face: Jan.25 to May.5)

**Due to the COVID-19 pandemic, 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>

## 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.

### ***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. Laws of thermodynamics
6. Redox reactions

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

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. For the “OpenStax Chemistry 2e”, you can do free-downloading the book file as PDF. Among two textbooks, you can choose one.

**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 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: 25%  
(multiple-choice 12.5 % and short-answer 12.5%)  
Each Midterm Exam (16.67%): 50%  
Final Exam: 25%

**Midterm Exam I:** Wednesday February 10<sup>th</sup> as face-to-face

**Midterm Exam II:** Wednesday March 3<sup>rd</sup> as face-to-face

**Midterm Exam III:** Wednesday April 14<sup>th</sup> as face-to-face

**Final Exam:** Monday, May 3<sup>rd</sup> at 10:00 am as face-to-face in WSB 307

**Course Calendar**

**Lecture 1 (January 11):** Discussion on Syllabus. Importance of chemical energy and types of energy

**Lecture 2 (January 13):** Energy changes in chemical reactions, the first law of thermodynamics and enthalpy of chemical reactions

**Lecture 3 (January 15):** Calorimetry, discussion on selective questions and problems on Chapter 6

**NO CLASS: Day of Martin Luther King Jr. (January 18, Holiday)**

**Lecture 4 (January 20):** Kinetic molecular theory of liquids and solids, types of intermolecular forces, properties of liquids (*Short-Answer Homework Chapter 6 due*)

**Lecture 5 (January 22):** Phase Change, liquid-vapor equilibrium, and liquid-solid equilibrium,

**Lecture 6 (January 25):** Solid-vapor equilibrium, phase diagrams, discussion on selective questions and problems on Chapter 12

**Lecture 7 (January 27):** Types of solutions and concentration units (*Short-Answer Homework Chapter 12 due*)

**Lecture 8 (January 29):** Factors affecting solubility and colligative properties

**Lecture 9 (February 1):** Discussion on selective questions and problems on Chapter 13

**Lecture 10 (February 3):** Terminologies related to rate laws (*Short-Answer Homework Chapter 13 due*)

**Lecture 11 (February 5):** First and second order reactions and experimental determinations of rate laws

**Lecture 12 (February 8):** Exam Revision

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

**Lecture 14 (February 12):** Activation energy and temperature dependence of rate constants, elementary reactions, reaction mechanism

**Lecture 15 (February 15):** Catalysis, discussion on selective questions and problems on Chapter 14

**Lecture 16 (February 17):** The concepts of chemical equilibrium and equilibrium constants (*Short-Answer Homework Chapter 14 due*)

**Lecture 17 (February 19):** Reaction quotients, calculation of equilibrium concentrations, factors affecting chemical equilibrium,

**Lecture 18 (February 22):** Discussion on selective questions and problems on Chapter 15, concepts of acids and bases

**Lecture 19 (February 24):** Acid-base properties of water, pH, strength of acids and bases on Chapter 16 (*Short-Answer Homework chapter 15 due*)

**Lecture 20 (February 26):** Ionization constants of weak acids and bases, percent ionization, ionization constants of conjugate acids-bases

**Lecture 21 (March 1):** Exam Revision

**Lecture 22 (March 3):** **Exam II: Chapters 14 & 15**

**Lecture 23 (March 5):** Determination of pH for weak acids and bases using ICE tables

**NO CLASS: SPRING BREAK (March 8 to March 12)**

**Lecture 24 (March 15):** Acid-base properties of salts, Lewis acids and bases

**Lecture 25 (March 17):** Discussion on selective questions and problems on Chapter 16, common ion effect in chemical equilibrium, Henderson-Hasselbalch equation

**Lecture 26 (March 19)** Concept of buffer solution, preparing buffer with a specific pH (*Short-Answer Homework Chapter 16 due*)

**Lecture 27 (March 22):** Strong acid-strong base titrations, weak acid-strong base titrations, acid-base indicators,

**Lecture 28(March 24):** Solubility product constant and molar solubility

**Lecture 29 (March 26):** Predicting precipitation reactions, common ion effect and pH on solubility

**Lecture 30 (March 29):** Discussion on selective questions and problems on Chapter 17

**Lecture 31 (March 31):** Spontaneous processes and entropy, microstates and entropy (*Short-Answer Homework Chapter 17 due*)

**NO CLASS: Good Friday (April 2)**

**Lecture 32 (April 5):** the second law of thermodynamics, entropy changes in systems and surroundings, the third law of thermodynamics

**Lecture 33 (April 7):** Gibbs free energy and chemical equilibrium

**Lecture 34 (April 9):** Discussion on selective questions and problems on Chapter 18

**Lecture 35 (April 12):** Exam Revision (*Short-Answer Homework Chapter 18 due*)

**Lecture 36 (April 14): **Exam III: Chapters 16, 17, & 18****

**Lecture 37 (April 16):** Redox reactions and balancing redox equations, spontaneous Galvanic cells, standard reduction potentials, and electromotive force (emf)

**Lecture 38 (April 19):** Nernst equation, concentration cells, and concepts of batteries

**Lecture 39 (April 21):** Concepts of corrosion and electrolysis

**Lecture 40 (April 23):** Discussion on selective questions and problems on Chapter 19 (*Homework Chapter 19 due*)

**Lecture 41 (April 26): Final Exam Revision (Chapters 6, 12, 13, 14, 15)**

**Lecture 42 (April 28): Final Exam Revision (Chapters 16, 17, 18, 19)**

**Final Exam (Comprehensive): Monday May 3<sup>rd</sup> at 10:00 am, WSB307**

**Students with Special Needs:** *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.*