

**Sul Ross State University**  
**Syllabus for General Chemistry II: CHEM 1312- 21297 (Spring 2020)**

**Class:** General Chemistry II  
Room: WSB 307  
Time: MWF 10:00 am-10:50 am

**Instructor:** Dr. Hong Young Chang  
Office: WSB 219  
Office Hours: M-R 3:00-5:00pm  
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Office Phone: (432) 837-8113

**Date:** Jan 13 to May 06, 2020

## **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:** “*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 5<sup>th</sup> and 6<sup>th</sup> editions are ok to use).

**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.**

**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 will be the problem-sets assigned for each chapter. **NO LATE HOMEWORK WILL BE ACCEPTED. ELECTRONIC SUBMISSION OF HOMEWORK WILL NOT BE ACCEPTED.**

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

**NOTE: Homework and Exams MUST be completed in pen!**

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

## **PERCENTAGE BREAKDOWN OF MARKS:**

Homework & Assignments: 25%

Each Midterm Exam (16.67%): 50%

Final Exam: 25%

**Midterm Exam I:** Wednesday February 12<sup>th</sup>

**Midterm Exam II:** Wednesday March 4<sup>th</sup>

**Midterm Exam III:** Wednesday April 15<sup>th</sup>

**Final Exam:** Friday, May 1<sup>st</sup> at 10:15 am – 12:15 pm, WSB 307

## **Course Calendar**

**Lecture 1 (January 13):** Discussion on Syllabus. Importance of chemical energy and types of energy

**Lecture 2 (January 15):** Energy changes in chemical reactions, the first law of thermodynamics and enthalpy of chemical reactions

**Lecture 3 (January 17):** Calorimetry, discussion on selective questions and problems on Chapter 6

**NO CLASS: Day of Martin Luther King Jr. (January 20, Holiday)**

**Lecture 4 (January 22):** Kinetic molecular theory of liquids and solids, types of intermolecular forces, properties of liquids (*Homework Chapter 6 due*)

**Lecture 5 (January 24):** Phase Change, liquid-vapor equilibrium, and liquid-solid equilibrium,

**Lecture 6 (January 27):** Solid-vapor equilibrium, phase diagrams, discussion on selective questions and problems on Chapter 12

**Lecture 7 (January 29):** Types of solutions and concentration units (*Homework Chapter 12 due*)

**Lecture 8 (January 31):** Factors affecting solubility and colligative properties

**Lecture 9 (February 3):** Discussion on selective questions and problems on Chapter 13

**Lecture 10 (February 5):** Terminologies related to rate laws (*Homework Chapter 13 due*)

**Lecture 11 (February 7):** First and second order reactions and experimental determinations of rate laws

**Lecture 12 (February 10):** Exam Revision

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

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

**Lecture 15 (February 17):** Catalysis, discussion on selective questions and problems on Chapter 14

**Lecture 16 (February 19):** The concepts of chemical equilibrium and equilibrium constants (*Homework Chapter 14 due*)

**Lecture 17 (February 21):** Reaction quotients, calculation of equilibrium concentrations, factors affecting chemical equilibrium,

**Lecture 18 (February 24):** Discussion on selective questions and problems on Chapter 15, concepts of acids and bases

**Lecture 19 (February 26):** Acid-base properties of water, pH, strength of acids and bases (*Homework chapter 15 due*)

**Lecture 20 (February 28):** Ionization constants of weak acids and bases, percent ionization, ionization constants of conjugate acids-bases

**Lecture 21 (March 2):** Exam Revision

**Lecture 22 (March 4): Exam II: Chapters 14 & 15**

**Lecture 23 (March 6):** Determination of pH for weak acids and bases using ICE tables

**NO CLASS: SPRING BREAK (March 9 to March 13)**

**Lecture 24 (March 16):** Acid-base properties of salts, Lewis acids and bases

**Lecture 25 (March 18):** Discussion on selective questions and problems on Chapter 16, common ion effect in chemical equilibrium, Henderson-Hasselbalch equation

**Lecture 26 (March 20)** Concept of buffer solution, preparing buffer with a specific pH (*Homework Chapter 16 due*)

**Lecture 27 (March 23):** Strong acid-strong base titrations, weak acid-strong base titrations, acid-base indicators,

**Lecture 28(March 25):** Solubility product constant and molar solubility

**Lecture 29 (March 27):** Predicting precipitation reactions, common ion effect and pH on solubility

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

**Lecture 31 (April 1):** Spontaneous processes and entropy, microstates and entropy (*Homework Chapter 17 due*)

**Lecture 32 (April 3):** the second law of thermodynamics, entropy changes in systems and surroundings, the third law of thermodynamics

**Lecture 33 (April 6):** Gibbs free energy and chemical equilibrium

**Lecture 34 (April 8):** Discussion on selective questions and problems on Chapter 18

**NO CLASS: GOOD FRIDAY (April 10)**

**Lecture 35 (April 13):** Exam Revision (*Homework Chapter 18 due*)

**Lecture 36 (April 15): Exam III: Chapters 16, 17, & 18**

**Lecture 37 (April 17):** Redox reactions and balancing redox equations, spontaneous Galvanic cells, standard reduction potentials, and electromotive force (emf)

**Lecture 38 (April 20):** Nernst equation, concentration cells, and concepts of batteries

**Lecture 39 (April 22):** Concepts of corrosion and electrolysis

**Lecture 40 (April 24):** Discussion on selective questions and problems on Chapter 19 (*Homework Chapter 19 due*)

**Lecture 41 (April 27): Final Exam Revision (Chapters 6, 12, 13, 14, 15)**

**Lecture 42 (April 29): Final Exam Revision (Chapters 16, 17, 18, 19)**

**Final Exam (*Comprehensive*): Friday May 1<sup>st</sup> at 10:15 am – 12:15 pm, 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.*