Sul Ross State University
Syllabus for CHEM 1311 (Spring 2016)

Class: General Chemistry I
Instructor: Dr. Yanfeng Yue
Room: WSB 301; Office: WSB 217
Time: Monday, Wednesday, Friday 10:00-10:50 am
Office Hours: Monday, Wednesday, Friday: 11:00am-12:00 noon
Office Phone: (432) 837-8217
Email: yanfeng.yue@sulross.edu

Program Learning Objectives (PLO):
A student graduating with the chemistry major is expected to demonstrate that s(he) is able to:

1. Explain atomic and molecular structures, bonding, thermodynamics, chemical equilibria and kinetics, stoichiometry, and electrochemical processes;
2. Write and explain inorganic/organic reactions, coordination chemistry, stereochemistry, and reactions in biological systems;
3. Understand and use essential modern instruments to perform chemistry experiments in the laboratory (Fourier transform infrared spectroscopy and Nuclear magnetic resonance);
4. Summarize basic principles of research design and analyze experimental data using appropriate computer programs (e.g. Chemdraw, Excell, Origin, etc.) in regards to the chemistry discipline;
5. Basic training for the Chemical Research (Scifinder, Web of Science and Google Scholar).

Student Learning Objectives (SLO):
At the end of this course, a student should have a good understanding of:

1. The basic concepts and terms used in chemistry
2. The electronic structures of atoms and the periodic table
3. The basic concepts of chemical bonding
4. Chemical reactions in aqueous solutions
5. The ideal gas equation
6. The converting between mass and number of moles
7. Basic chemical reactions in Biology (coordination chemistry, chiral molecules e.g. amino acids/peptides)
8. Inorganic reactions related to Geology (metal ions and oxidation, color transformations)

Core Objectives (CO):
1. **Interests of Chemistry** – Inspire and keep the students' interests of chemistry.
2. **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.
3. **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.

4. **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.
5. **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.
6. **Career Goals** – Students will be trained in a broad set of skills in many disciplines that are ideal for pursuing jobs in industry or academics in graduate schools.

Lecture sessions are designed to fulfill PLO 1, CO – 1, 2, 3, 4, and 5. Lab sessions are designed to fulfill PLO 3, CO 1-6.

Text: General Chemistry by Raymond Chang (5th Edition or newer); Lab Manual: Freshman Chemistry by Rangra and Houston.
The following chapters will be covered:
Chapter 1: Basic Concepts: Classification of Matter; Physical and Chemical Properties of Matter; Measurement; Handling Numbers; Dimensional Analysis in Solving Problems (SLO 1)
Chapter 2: Atoms, Molecules, and Ions (SLO2)
Chapter 3: Stoichiometry (SLO 1)
Chapter 4: Reactions in Aqueous Solutions (SLO 2)
Chapter 5: The Ideal Gas Equation (SLO 5)
Chapter 7: The Electronic Structure of Atoms (SLO 2)
Chapter 8: The Periodic Table (SLO 2)
Chapter 9 and 10: Chemical Bonding (SLO 3)

Homework: There will be problems assigned for each chapter. **NO LATE HOMEWORK WILL BE ACCEPTED.**

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

1) **If one midterm exam missed, the score of the missed midterm exam can be averaged out from the other 3 exams (two midterm exams and the final exam).**
2) **Two midterm exams or final examination missing will result in failing the course.**

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: 40%
Midterm Exam I: Friday, September 25
Midterm Exam II: Friday, October 16
Midterm Exam III: Friday, November 6
Final Exam: Monday, November 23 (8:00 am)

Course Calendar (Section 1)
Lecture 1 (Jan 20): Discussion on Syllabus, importance of chemistry
Lecture 2 (Jan 22): Classifications of matter, overview of states and properties of matter, physical and chemical changes, units of measurements (length, volume, density, temperature etc.), and Scientific notation and significant figures
Lecture 3 (Jan 25): Precision and accuracy
Lecture 4 (Jan 27): Review on Chapter 1
Lecture 5 (Jan 29): Dalton's atomic theory, discoveries of subatomic particles (electron, proton, and neutron), Rutherford's atomic model, atomic number, mass number, and isotopes; **(Homework 1 due)**
Lecture 6 (Feb 1): Molecules, compounds, ions, molecular formula and empirical formulas
Lecture 7 (Feb 3): Chemical nomenclature, naming of compounds, acids, bases, oxides, and oxoacids.
Lecture 8 (Feb 5): Review on Chapter 2
Lecture 9 (Feb 8): Molecular mass, mole, molar mass, atomic mass, formula mass and their relations **(Homework 2 due)**
Lecture 10 (Feb 10): Chemical equations and balancing chemical equations, calculations of product/reactant amounts using balanced chemical equations, limiting reagents, and percent yields
Lecture 11 (Feb 12): Review on Chapter 3
Lecture 12 (Feb 15): terminologies related to solutions, electrolytes, non-electrolytes, precipitation reactions (**Homework 3 due**)
Lecture 13 (Feb 17): Exam Revision Chapters 1, 2, and 3
Lecture 14 (Feb 19): Exam I, Chapters 1, 2 & 3
Lecture 15 (Feb 22): Writing balanced ionic equations, acid-base reactions; oxidation numbers; oxidation-reduction reactions- types with examples; solution stoichiometry, concentration units, and gravimetric analysis
Lecture 16 (Feb 24): Review on Chapter 4
Lecture 17 (March 2): Physical properties of gases-relation between temperature, pressure, volume and amount of gases
Lecture 18 (March 2): Ideal gas law and its applications, gas stoichiometry-calculation of reactant/product amounts in gaseous reactions using ideal gas equation (**Homework 4 due**)
Lecture 19 (March 4): Kinetic theory of ideal gases, deviation of deal gas, properties, modification of ideal gas law for real gases
Lecture 20 (March 7): Revision on Chapter 5
Lecture 21 (March 9): Properties of light, black-body radiation and photo-electric effect (**Homework 5 due**)
Lecture 22 (March 11): Exam Revision on Chapters 4 and 5

Spring break March 14-18
Lecture 23 (March 16): Exam II, Chapters 4 and 5
Lecture 24 (March 18): Atomic spectra and Bohr atomic theory De Broglie equation, dual nature of particles
Lecture 25 (March 21): Schrodinger wave, equation and orbital concept
Lecture 26 (March 23): electronic configuration-Aufbau principle, Hund's rule, paramagnetism
Lecture 27 (March 25): Review on Chapter 7
Lecture 28 (**March 28**) Introductory discussion on periodic table (**Homework 6 Due**)
Lecture 29 (March 30): Classification of elements, and electronic configuration of ions
Lecture 30 (April 1): Periodic variation of properties of elements
Lecture 31 (April 4): Group properties of elements
Lecture 32 (**April 6**): Review on chapter 8
Lecture 33 (April 8): Basic concepts of chemical bonding, ionic bonds, lattice energy (**Homework 7 due**)
Lecture 34 (April 11): Calculation of lattice energy, covalent bonds, polar covalent bonds and polarity
Lecture 35 (April 13): Lewis structures of molecules, formal charge calculation, resonance structures and bond energy
Lecture 36 (April 15): Exam Revision on Chapters 7, 8 and 9 (**Homework 8 due**)
Lecture 37 (April 18): Exam III, Chapters 7, 8 & 9
Lecture 38 (**April 20**): Molecular geometry-Valence shell electron repulsion theory
Lecture 39 (April 22): prediction of molecular geometry and polarity
Lecture 40 (April 25): Molecular geometry- Valence bond and molecular orbital theories
Lecture 41 (April 27): Review on Chapter 10
Lecture 42 (April 29): Exam Revision, Chapters 1-4 (**Homework 9 due**)
Lecture 41 (May 2): Exam Revision, Chapters 5-7
Lecture 41 (**May 4**)**:** Exam Revision, Chapters 8-10
May 5-6, Thursday & Friday Dead Days,
Final Exam (May 9): 10:15 a.m. - 12:15 p.m.

Students with Special Needs: *Sul Ross State University is committed to equal access in compliance with the Americans With Disabilities Act of 1973. It is the student's responsibility to initiate a request for accessibility services. Students seeking accessibility services must contact Mary Schwartze, M. Ed., L.P.C., in Counseling and Accessibility Services, Ferguson Hall, Room 112. The mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas 79832. Telephone: 432-837-8203. E-mail: mschwartze@sulross.edu*.

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 (not recommended), but must be hand written and scanned (either with a scanner or a smart phone) and emailed to Dr. Leaver at: djl14jh@sulross.edu or david.leaver@sulross.edu. Homework electronically completed in Microsoft Word or other similar programs will NOT be accepted.