General Chemistry II
CHE 134 Syllabus

Department:
Chemistry & Biochemistry

Course Descriptions:
Lecture:
Equilibrium, kinetics, redox, descriptive chemistry and radiochemistry.
Lab:
Kinetics, spectrophotometry, quantitative/qualitative experiments.

Course Prerequisites and Corequisites: Prerequisites: CHE 133, 133L, and MTH 138. Corequisite: CHE 134L. Lab fee required.

Program Learning Outcomes: This is a general education core curriculum course and no specific program learning outcomes for this major are addressed in this course.

Core Objectives (CO):
1. Critical Thinking: to include creative thinking, innovation, inquiry and analysis, evaluation and synthesis of information.
2. Communication Skills: to include effective development, interpretation and expression of ideas through written, oral, and visual communication.
3. Empirical and Quantitative Skills: to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions.
4. Teamwork: to include the ability to consider different points of view and to work effectively with others to support a shared purpose or goal.

Student Learning Outcomes: Upon completion of this course, the students are expected to
- apply chemistry concepts using critical thinking skills and the scientific method to analyze and evaluate information to reach conclusions within problem sets and lab experiments. (COs 1 & 3)
- use communication skills to demonstrate their interpretation and analysis of scientific data. (CO 2)
- apply logic, quantitative reasoning, and pattern recognition to analyze and evaluate numerical data/observable facts to reach conclusions within problem sets and lab experiments. (COs 1 & 3)
- demonstrate the ability to cooperate within groups to gather results of an experiment, analyze data, and draw conclusions using communication skills. (COs 2 & 4)

TEXTS AND MATERIALS:
Lecture:
Brown, Lemay, et al. Chemistry: The Central Science, 12th ed. Pearson, 2012 (ISBN: 978-0-321-69672-4)
Lab:
Cates, C.; Langley, R.; Moore, J. Introductory Chemical Practice, 6th ed., Pearson Custom Publishing, Boston, MA, 2003.

COURSE REQUIREMENTS:
Lecture: (VARIES BY SECTION)
3-hour exams (100 pts per test) cumulative with emphasis on the material covered since last. These exams will be given in class on or around Feb. 12, Mar. 5, and April 9. These exams will consist of problems that must be set up and solved, discussion questions, and/or multiple choice.

Partial credit will be given for short answer problems worked partially correct; therefore, it is crucial to show your solutions to the problems, not just the answer. Credit will not be given for correct answers unless you show how you arrived at the answer. Multiple choice questions will have no partial credit.

Final Exam – comprehensive multiple choice exam worth 200 pts (42 questions).

Homework – Homework will total 50 points (#points correct*50 / total points available). The homework assignments will be completed via Internet with due dates assigned for the beginning of class. Any computer capable of connecting to the internet can assess the homework system at http://i-assign.com Enter teacher's 4-digit ID: 0002, course number: 4, your 4-digit student ID#: XXXX, your student password: XXXXXXXX (information handed out in class). First time you log in, please identify yourself on Main Menu screen and change password if you desire. **(COs: 1, 3)**

Lab:

Conduct 11 experiments – Lab Report is due at the beginning of the next class period. Lab reports will not be accepted late. Grade of "0" will be given for any experiment for which a lab report is not submitted. Note that experiments 17 and 26 are formal reports that must be uploaded to D2L for core objectives assessment **(COs: 1, 2, 3, 4)**.

Quizzes – There will be four quizzes over any previous experiments and upcoming experiment for that day.

Surveys – There will be two surveys via D2L that will assess the core objectives of oral communication and teamwork **(COs: 2, 4)**.

Outside Exercises – There will be one library exercises to be completed outside laboratory time that will be required.

Redox Quiz – There will be a quiz that will be given during class covering the redox outside exercise.

Final Exam – There will be a comprehensive final given during class.

COURSE CALENDARS:

Lecture:

Review: Key points in General Chemistry I and Redox Reactions

Topic	**Date**	**Core Objective**
significant figures	1/15	
nomenclature	1/15	
molar mass / molarity	1/17	
solubility / net ionic eq / redox	1/22	CO 1: *Instructors* will demonstrate the use of critical thinking through the exercise of balancing redox equations. During the exercise, the Instructors will highlight their logic by connecting the concepts and theories of solubility, charges, bonding, and acid/base they used to guide their reasoning. Balancing redox equations takes a vast amount of reasoning and knowledge to complete the task accurately. The *students* will model this exercise in additional problem sets for the development of critical thinking skills.

reaction rates	1/24	
reaction order	1/24	CO 1: *Instructors* will demonstrate the process of critical thinking within problem sets involving the determination of reaction orders. Within the problem sets, the Instructors will focus their instruction on how to analyze data sets to formulate logical relationships between the concentrations of species to the overall rate of the reaction. The *students* will model this exercise in additional problem sets for the development of critical thinking skills.
determining rate law	1/24	CO 3: *Instructors* will demonstrate the process of quantitative reasoning within problem sets involving the determination of rate laws. Within the problem sets, the Instructors will demonstrate how to analyze data sets to formulate a logical mathematical relationship between the concentrations of species and the overall rate of the reaction to conclude the rate law for reactions. The *students* will model this exercise in additional problem sets for the development of quantitative reasoning skills.
rate constant k units	1/29	
first order integrated rate law	1/29	
zero and second order rate laws	1/29	
half-life	1/31	
activation energy, catalysis, intermediates	2/5	
elementary steps and mechanisms	2/5	
chemical equilibrium	2/7	
determination of K	2/7	
manipulating K	2/14	
determination of K (heterogeneous)	2/14	
direction of reaction, Q	2/19	
calculation of equil partial pressures (part I)	2/19	CO 3: *Instructors* will demonstrate the process of quantitative reasoning within problem sets that involve the determination of equilibrium partial pressures of a reaction. Within the problem sets, the Instructors will demonstrate how to analyze data, to make appropriate inferences, to manipulate data, and to calculate equilibrium partial pressures for reactions. The *students* will model this exercise in additional problem sets for

		the development of quantitative reasoning skills.
calculation of equil partial pressures (part II)	2/21	
calculation of equil partial pressures (part III)	2/21	
calculation of equil partial pressures (part IV)	2/26	
LeChatelier's Principle	2/26	CO 1: *Instructors* will demonstrate the process critical thinking within exercises used to determine the shift direction of a reaction after the addition of a stress to a system. Instructors will demonstrate how to apply LeChatelier's Principle to an equilibrium system. To determine the shift direction of a reaction takes a vast amount of chemistry knowledge that must be applied and analyzed before one can reason a logical conclusion. Instructors will highlight their logic by connecting the concepts they used to guide their reasoning. The *students* will model this exercise in additional problem sets for the development of critical thinking skills.
Bronsted-Lowry acids and bases	2/26	
acid and base strengths	2/28	
pH	2/28	
pH of strong acids and bases	2/28	
weak acid ionization constant, K_a	3/7	
pH of weak acid	3/7	
polyprotic acids	3/14	
weak base ionization constant, K_b	3/14	
pH of weak base	3/14	
acid and base properties of salt solutions	3/19	CO 1: *Instructors* will demonstrate the process of critical thinking within exercises used to analyze the acidity/basicity of salt solutions. During the exercise, the Instructors will apply the concepts of acids/bases and neutralization to salt solutions for determining if the solution is acidic, basic, or neutral. Instructors will highlight their logic used to guide them to their conclusions. The *students* will model this exercise in additional problem sets for the development of critical

		thinking skills.
relationship between K_a and K_b	3/19	
pH of salt solutions	3/19	
buffers	3/21	
preparation of a buffer	3/21	
strong acid and strong base titrations	3/26	CO 3: *Instructors* will demonstrate the process of quantitative reasoning within problem sets that involve determining the pH of solutions. Within the problem sets, the Instructors will demonstrate how to analyze data, to make appropriate inferences, and to calculate the pH of the solution. The *students* will model this exercise in additional problem sets for the development of quantitative reasoning skills.
weak strong titrations	3/28	CO 3: *Instructors* will demonstrate the process of quantitative reasoning within problem sets that involve determining the pH of solutions. Within the problem sets, the Instructors will demonstrate how to analyze data, to make appropriate inferences, and to calculate the pH of the solution. The *students* will model this exercise in additional problem sets for the development of quantitative reasoning skills.
solubility product constant, K_{sp}	4/2	
K_{sp} and water solubility	4/2	
K_{sp} and common-ion effect	4/4	
precipitation formation	4/4	
First Law of Thermodynamics	4/11	
Hess' Law	4/16	
standard enthalpies of formation	4/18	
Second Law of Thermodynamics	4/18	
Gibbs Free Energy	4/23	
standard reduction potentials	4/25	
Nernst equation	4/30	
nuclear chemistry	5/2	

Lab:

Activity	**Date**	**Core Objective**
Orientation, Lab Safety	Jan.17	CO 2 (written): *Instructors* will lecture over the skills involved in communicating through writing effectively. The instructor will review the required written report format for lab (attached) in great detail. CO 2 (oral): *Instructors* will lecture over the proper way to orally communicate with a lab partner, which involves answering, asking, and listening effectively to contribute to the group's purpose. The instructor will discuss how students should orally contribute thoughtful, concise, and insightful ideas to their group if they want to successfully complete the lab experiments safely, efficiently, and accurately. CO 4: *Instructors* will lecture over the skills involved in teamwork. The instructor will explain the importance of teamwork in the lab if the group wants to successfully complete the lab experiments safely, efficiently, and accurately. The instructor will lecture over the proper techniques for a team to gather the results, analyze the results, and draw conclusions based on the team's viewpoints.
Safety quiz (Quiz 1), Check-in, Exp. 13 – Volumetric Analysis: Acid-Base Titration	Jan. 24	
Exp. 15 – Volumetric Analysis: Total Hardness of Water by EDTA	Jan. 31	
Exp. 16 – Volumetric Analysis: Redox Titration Begin Outside Exercise II in lab manual – Balancing Redox by Ion-Electron Method (p. 199)	Feb. 7	
Exp. 18 – Spectrophotometric Analysis: Concentration of a Solution Using Beer's Law	Feb. 14	
Exp. – "The Quantitative Determination of Food Dyes in some Drink Mixes" ** Handout of the Experiment will be given to Students on Feb. 21	Feb. 21	

Quiz 2, Exp. 17 – Kinetics: Determination of the order of a Reaction **Formal lab report including excel graph must be uploaded to D2L for assessment of core objectives: visual communication, written communication, and quantitative reasoning.**	Feb. 28	CO 2 (visual): *Instructors* will lecture over the skills involved in visual communication. The instructor will review the proper techniques of representing data within graphs and tables with several examples. CO 2 (written): The *students* will demonstrate written communication skills in experiment 17. Students will apply during the semester the information on written communication discussed on day 1 of the semester and develop their writing skills while obtaining feedback from the instructor. The students will upload a formal report to D2L and be assessed using a written communication rubric over experiment 17 Kinetics lab report. CO 2 (visual): The *students* will demonstrate visual communication skills in experiment 17. Students will apply the information on visual communication discussed prior to this experiment. Students must graph the volume of oxygen generated over time to determine the rate of reaction for three different experiments. The student must graph this information in an organized, clear, and accurate manner. The students will upload the graph within the formal lab report to D2L and be assessed using a visual communication rubric for the graph in experiment 17. CO 3: The *students* will model the process of quantitative reasoning in experiment 17 which involves the determination of a rate law. This experiment requires students to collect rate data while varying the concentration of the reactants. Students must graph the volume of oxygen generated over time to determine the rate of reaction for each experiment. The student will analyze the data and graphs to formulate a logical mathematical relationship between the concentrations of species and the overall rate of the reaction to conclude the rate law for the reaction. The students will upload the quantitative results within the formal lab report to D2L and be assessed using a quantitative reasoning rubric over the quantitative calculations, analysis, and interpretation of results in experiment 17.
Quiz 3, Exp. 20 - Spectrophotometric Analysis: Determination of the Equilibrium Constant for a Reaction	Mar. 7	
Spring Break	Mar. 14	

Exp. 21 – Acid-Base Equilibria: Ionization Constant of an Acid Redox quiz over Outside Exercise II (p. 199) Begin Outside Exercise III in lab manual – part 5	Mar. 21	
Easter	Mar. 28	
Exp. 12 – Synthesis: Preparation of Alum Redox quiz over Outside Exercise II (p. 199)	Apr 4	
Exp. 25 – Qualitative Analysis: An Alternative Approach	Apr 11	
Quiz 4, Exp. 26 - Qualitative Analysis: Chemical Sleuthing of a Set of Solutions **Formal lab report must be uploaded to D2L for assessment of core objective: critical thinking.** **Surveys will be completed by students via D2L for assessment of core objectives: oral communication and teamwork.**	Apr 18	CO 1: The *students* will model the process of critical thinking in experiment 26 using the scientific method. This experiment requires students to identify pertinent chemical information from the literature to devise a scheme to collect appropriate experimental data to identify 9 unknown substances. Conclusions will be based on the analysis of the theoretical information gathered and experimental data collected. Students must use logic to devise the appropriate experiments and deduce an accurate evaluation of data to reason out conclusions. This experiment is conducted with very little guidance from instructors. The students will upload a formal report to D2L and be assessed using a critical thinking rubric over this experiment. CO 2 (oral): The *students* will demonstrate oral communication skills in experiment 26. Students will apply during the semester the information on oral communication discussed on day 1 of the semester and develop their oral skills between group members. Students must verbally communicate with their lab partner, which involves answering, asking, and listening effectively to contribute to the group's purpose. The students will contribute orally with thoughtful, concise, and insightful ideas to their group. Since this experiment has very little guidance from the instructor, this experiment depends heavily on good oral communication if the group is to be successful in accomplishing the experiment efficiently and accurately. The conclusions in this experiment are draw based on the team's oral discussion of the collected data. The

		students will answer a survey via D2L regarding their partner's oral communication skills during experiment 26. CO 4: The *students* will demonstrate teamwork skills in experiment 26. Students will apply during the semester the information on teamwork discussed on day 1 of the semester and develop their teamwork skills. However, in this particular experiment, teamwork is extremely crucial because of the lack of detailed instruction. The students must work together to essentially design the experiment, gather the results, analyze the results, conduct additional experiments, and draw conclusions based on the team's viewpoints. A total group effort is required to complete the task at hand efficiently and accurately. The students will answer a survey via D2L regarding their partner's teamwork skills during experiment 26.
Check-out/ Review. note: must check out otherwise you will not be allowed to take the final exam.	Apr 25	
Lab Final	May 2	

GRADING POLICY:

Lecture: (VARIES BY SECTION)

The final grade will be based upon percentage of points obtained in the following:

exam 1	100 pts
exam 2	100 pts
exam 3	100 pts
final exam	200 pts
homework	50 pts
Total	650 pts

Grading scale - A= 90 - 100%; B= 80 - 89%; C= 70 - 79%; D= 60 - 69%; F= below 60%

Lab:

The final grade will be based upon percentage of points obtained in the following:

10 experiments (10 pts each)	100 pts (drop lowest lab; unexcused labs are not dropped)
Quizzes	35 pts (5, 10, 10, 10 pts)
Surveys	5 pts (2.5, 2.5 pts)
Redox	20 pts
Library exercise III – part 5	5 pts
Final exam	50 pts
Total	215 points

Grading scale - A= 210 – 193, B= 192 – 172, C= 171 – 150; D= 149 – 129; F= 128 and below

ATTENDANCE POLICY:

Lecture:

Attendance of class is mandatory. A total of four unexcused absences will result in the student being dropped from the class with a grade of "F". There will be **no make-up** exams.

Lab:

Attendance of class is mandatory. A total of two unexcused absences will result in the student being dropped from the class with a grade of "F". There will be **no make-up** exams, quizzes, or labs.

ACADEMIC INTEGRITY (A-9.1):

Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

Definition of Academic Dishonesty

Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit.

Please read the complete policy at http://www.sfasu.edu/policies/academic_integrity.asp

Any student found cheating will be subject to the penalties as stated in the Student Code of Conduct handbook; including but not limited to a score of zero on exam, expulsion from the class or expulsion from the University.

WITHHELD GRADES SEMESTER GRADES POLICY (A-54):

Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

The circumstances precipitating the request must have occurred after the last day in which a student could withdraw from a course. Students requesting a WH must be passing the course with a minimum projected grade of C.

STUDENTS WITH DISABILITIES:

To obtain disability related accommodations, alternate formats and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be

provided. Failure to request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices/.

ACCEPTABLE STUDENT BEHAVIOR:

Classroom behavior should not interfere with the instructor's ability to conduct the class or the ability of other students to learn from the instructional program (see the Student Conduct Code, policy D-34.1). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic or other penalties. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Students who do not attend class regularly or who perform poorly on class projects/exams may be referred to the Early Alert Program. This program provides students with recommendations for resources or other assistance that is available to help SFA students succeed.

LAB NOTEBOOK/REPORT:

The laboratory notebook must be a permanently bound book with alternating white and yellow quadrille ruled sheets. The yellow sheets will be used to make carbon copies of the original white sheets. The carbon copies are to be handed in as the lab report.

RULES FOR LAB NOTEBOOK

a**.) Must obtain TA's or instructor's initials in notebook before leaving lab each day. Lab reports that do not have initials will receive a grade of "0".**

b.) ALL DATA IS TO BE RECORDED IN BLACK INK DIRECTLY IN THE NOTEBOOK!!!!

c.) Label and date all entries.

d.) An error should be lined through with a single horizontal line, initialed and briefly explained.

e.) A single diagonal line should be drawn across any page that is to be ignored, initialed and briefly explained. This includes completely blank pages.

f.) The backs of the yellow pages may be used for scratch work BUT, measurements and readings are to be recorded as DATA.

g.) Number all the pages in the notebook in the upper right hand corner of the page. The yellow carbon copies must bear the same number as the white originals.

h.) Use page 1 for a TABLE OF CONTENTS. This should be maintained on a current basis at all times.

i.) Use page 2 for a PREFACE and a table of abbreviations. Include your name, classification, major, course title, number, section, semester, year, and instructor.

RULES FOR LAB NOTEBOOK REPORTS ***(except for experiments 17 and 26 which will be formal reports that must be uploaded to D2L)***

1.) **Title and Introduction (done before class and checked by TA)**
Give the title of the experiment and a 1 or 2 sentence description of the experiment. This should be done in your own words -- do not copy from the manuals. Important chemical reactions should also be included here.

2.) **Experimental Plan (done before class and checked by TA)**
Provide a summary of the experimental procedure. Read the lab and be familiar with what will be happening. Summarize the steps in your own words.

3.) **Procedure and Data**
This section is the laboratory "diary" in which you write a step-by-step description of what you do in the lab. Enter data as it is collected. Any observations are to be recorded here also (colors, odors,

temp., apparatus used, amounts of reagents, etc.). Draw pictures if appropriate, use tables, graphs, equations, etc. Record details such as Instrument name and maker, model number and serial number, chemical manufacturer, grade, lot number and expiration date, etc.

4.) **Calculations**

Give one example of each type of calculation used in the experiment that has not been included in the previous section. In general, this section will deal with the calculation of the final results. Be sure to include a set-up with all appropriate units. Whenever multiple samples of the unknown are analyzed, the average and the standard deviation (s) should be calculated.

5.) **Discussion**

This section includes all relevant results and supporting chemical theories and concepts pertaining to the experiment. You must be able to convey your understanding of what went on in the experiment. Any deviation of results from the expected results must be addressed and explained. Objectively evaluate the results in terms of their precision/accuracy. Speculate as to any sources of error.

6.) **Conclusion**

Report unknown number and final results. Final results will be graded on quantitative/qualitative basis.