**Angelina College**
**Science and Mathematics**
**Chemistry 1412: General Chemistry II (Lecture and Laboratory)**
**General Syllabus**

I. **Basic Course Information**

A. **Course Description**

1. Four hours credit. A continuation of CHEM 1411.
2. Topics Include: Electrochemistry; acids, bases and salts; reaction rates; liquids and solutions, thermodynamics, kinetics, equilibrium, buffers; and chemistry of the families of elements.
3. Three lecture hours and three lab hours each week.
4. Prerequisite: CHEM 1411.
5. Lab fee.

B. **Intended Audience**

1. This course is designated for science majors or for students with a major, which requires a four-credit-hour chemistry course beyond introductory chemistry.

C. **Instructor**


| | |
|---|---|
| Name: | Dr. Kirk Stephenson |
| Office: | S-104-B |
| Office Hours: | As Given by Instructor |
| Phone: | (936) 633-3214 |
| E-mail Address: | kstephenson@angelina.edu or via blackboard messages |


II. **Intended Student Outcomes**

A. **Core Objectives Required for this Course**

1. **Critical Thinking**: to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information.
2. **Communication**: 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.

B. **Course Learning Outcomes for all Sections**

1. State the characteristics of liquids and solids, including phase diagrams and spectrometry.
2. Articulate the importance of intermolecular interactions and predict trends in physical properties.
3. Identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationships.
4. Identify and balance oxidation-reduction equations, and solve redox titration problems.
5. Determine the rate of a reaction and its dependence on concentration, time, and temperature.
6. Apply the principles of equilibrium to aqueous systems using LeChatelier's Principle to predict the effects of concentration, pressure, and temperature changes on equilibrium mixtures.
7. Analyze and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy.
8. Discuss the construction and operation of galvanic and electrolytic electrochemical cells, and determine standard and non-standard cell potentials.
9. Define nuclear decay processes.
10. Describe basic principles of organic chemistry and descriptive inorganic chemistry.
11. Use basic apparatus and apply experimental methodologies used in the chemistry laboratory.
12. Demonstrate safe and proper handling of laboratory equipment and chemicals.
13. Conduct basic laboratory experiments with proper laboratory techniques.
14. Make careful and accurate experimental observations.
15. Relate physical observations and measurements to theoretical principles.
16. Interpret laboratory results and experimental data, and reach logical conclusions.
17. Record experimental work completely and accurately in laboratory notebooks and communicate experimental results clearly in written reports.
18. Design fundamental experiments involving principles of chemistry and chemical instrumentation.
19. Identify appropriate sources of information for conduction laboratory experiments involving principles of chemistry.

III. **Assessment Measures**

A. **Assessments for the Core Objectives**

1. **Critical thinking**: Students will complete a formal laboratory report that assesses inquiry, synthesis, analysis, and results. Evidence of critical analysis will be evaluated using a standardized AC rubric.
2. **Communication**: Students will complete a formal laboratory report that assesses organization, quality of informational sources, and written communication skills. Communication skills and abilities will be evaluated using a standardized AC rubric.
3. **Empirical and quantitative Skills**: Students will complete a formal laboratory report that assesses representation, calculation, interpretation, and application and analysis. Empirical and quantitative skills will be evaluated using a standardized AC rubric.
4. **Teamwork**: Students will complete a formal laboratory report that assesses effective communication with team members, team climate, contributions to a team, and responses to team members. Team members will evaluate the performance of one another. Teamwork will be evaluated using a standardized AC rubric.

B. **Assessments for Course Learning Outcomes**

1. Students will demonstrate their ability to state the characteristics of liquids and solids, including phase diagrams and spectrometry by answering directed lecture questions and/or exam questions.
2. Students will demonstrate their ability to articulate the importance of intermolecular interactions and predict trends in physical properties by answering directed lecture questions and/or exam questions.
3. Students will demonstrate their ability to identify the characteristics of acids, bases, and salts, and solve problems based on their quantitative relationships by answering directed lecture questions and/or exam questions.
4. Students will demonstrate their ability to identify and balance oxidation-reduction equations, and solve redox titration problems by answering directed lecture questions and/or exam questions.
5. Students will demonstrate their ability to determine the rate of a reaction and its dependence on concentration, time, and temperature by answering directed lecture questions and/or exam questions.
6. Students will demonstrate their ability to apply the principles of equilibrium to aqueous systems using LeChatelier's Principle to predict the effects of concentration, pressure, and temperature changes on equilibrium mixtures by answering directed lecture questions and/or exam questions.
7. Students will demonstrate their ability to analyze and perform calculations with the thermodynamic functions, enthalpy, entropy, and free energy by answering directed lecture questions and/or exam questions.
8. Students will demonstrate their ability to discuss the construction and operation of galvanic and electrolytic electrochemical cells, and determine standard and non-standard cell potentials by answering directed lecture questions and/or exam questions.
9. Students will demonstrate their ability to define nuclear decay processes by answering directed lecture questions and/or exam questions.
10. Students will demonstrate their ability to describe basic principles of organic chemistry and descriptive inorganic chemistry by answering directed lecture questions and/or exam questions.
11. Students will demonstrate their ability to use basic apparatus and apply experimental methodologies used in the chemistry laboratory by answering directed lecture questions and/or exam questions.
12. Students will demonstrate their ability to demonstrate safe and proper handling of laboratory equipment and chemicals by answering directed lecture questions and/or exam questions.
13. Students will demonstrate their ability to conduct basic laboratory experiments with proper laboratory techniques by answering directed lecture questions and/or exam questions.
14. Students will demonstrate their ability to make careful and accurate experimental observations by answering directed lecture questions and/or exam questions.
15. Students will demonstrate their ability to relate physical observations and measurements to theoretical principles by answering directed lecture questions and/or exam questions.
16. Students will demonstrate their ability to interpret laboratory results and experimental data, and reach logical conclusions by answering directed lecture questions and/or exam questions.
17. Students will demonstrate their ability to record experimental work completely and accurately in laboratory notebooks and communicate experimental results clearly in written reports by answering directed lecture questions and/or exam questions.
18. Students will demonstrate their ability to design fundamental experiments involving principles of chemistry and chemical instrumentation by answering directed lecture questions and/or exam questions.
19. Students will demonstrate their ability to identify appropriate sources of information for conduction laboratory experiments involving principles of chemistry by answering directed lecture questions and/or exam questions.

20.

IV. **Instructional Procedures**

A combination of in-class chemistry demonstrations, molecular models, laboratory demonstrations and supplemental information (both printed and digital) augment lecture presentations. Audio-visual materials and Internet resources are also employed.

V. **Course Requirements and Policies**

A. Required Textbooks and Recommended Readings, Materials and Equipment.

1. Chemistry by OpenStax College (https://openstax.org/details/chemistry)
2. Experiments in General Chemistry by Barrett and Stephenson, (Rhaeadr Publishing) 2nd Edition.
3. Access to Blackboard (www.angelina.blackboard.com)
4. Calculator capable of scientific notation
5. For exams: (a) "Scantron" forms and (b) #2 pencil

B. **Course Policies** – This course conforms to the policies of Angelina College as stated in the Angelina College Handbook.

1. **Academic Assistance** – If you have a disability (as cited in Section 504 of the Rehabilitation Act of 1973 or Title II of the Americans with Disabilities Act of 1990) that may affect your participation in this class, you should see the Office of Special Student Support Services, Room 208 of the Student Center. At a post-secondary institution, you must self-identify as a person with a disability; Ms. Bowser will assist you with the necessary information to do so. To report any complaints of discrimination related to disability, you should contact Mr. Steve Hudman, Student Center, Room 205-B or 936-633-5292.
2. Attendance – Attendance is required as per Angelina College Policy and will be recorded every day. Any student with three (3) consecutive absences of four (4) cumulative absences may be dropped from the class. Records will be turned in to the academic dean at the end of the semester. **Do not assume that non-attendance in class will always result in an instructor drop.** You must officially drop a class or risk receiving an F. This is official Angelina College Policy. The last day to drop the class with a "W" is April 3, 2017.
3. Additional Policies Established by the Instructor
    a. Be prepared to begin class on time and do not prepare to leave before class is over.
    b. No eating or drinking is allowed in class.
    c. Cell phones should be turned off during class time.
    d. Children and other guests are not permitted in the classroom. Children are not allowed to wait in the hall unsupervised. See Student Services for child-care problems.
    e. Students are expected to participate in the instruction through courteous, relevant comments and questions during class. Behavior that interferes with the learning environment will not be tolerated. Conferences outside of class are available by appointment during the instructor's office hours.

VI. **Course Outline:** Description of the course activities including: due dates, schedules, and deadlines.

# Lecture Schedule

**CHEM 1412** **Spring 2017**

**TR** **Dr. Stephenson**

| Class | Day | Date | Chapter/Section | Description |
|---|---|---|---|---|
| 1 | T | 17-Jan | 10.1-10.2 | Intermolecular Forces, Properties of Liquids |
| 2 | R | 19-Jan | 10.3-10.4 | Phase Transitions and Diagrams |
| 3 | T | 24-Jan | 11.1-11.2 | Dissolution Process, Electrolytes |
| 4 | R | 26-Jan | 11.3-11.5 | Solubility, Colligative Properties, Colloids |
| 5 | T | 31-Jan | 12.1-12.2 | Reaction Rates, Factors Affecting Reaction Rates |
| 6 | R | 2-Feb | 12.3 | Rate Law |
| 7 | T | 7-Feb | 12.4-12.5 | Integrated Rate Law, Collision Theory |
| 8 | R | 9-Feb | 12.6-12.7 | Reaction Mechanism, Catalysis |
| 9 | T | 14-Feb | | **Exam 1** |
| 10 | R | 16-Feb | 13.1 | Chemical Equilibria |
| 11 | T | 21-Feb | 13.2 | Equilibrium Constants |
| 12 | R | 23-Feb | 13.3 | Le Châtelier's Principle |
| 13 | T | 28-Feb | 13.4 | Equilibrium Calculations |
| 14 | R | 2-Mar | 14.1-14.2 | Brønsted-Lowry Acids and Bases, pH and pOH |
| 15 | T | 7-Mar | 14.3-14.4 | Acid/Base Strength, Hydrolysis of Salt Solutions |
| 16 | R | 9-Mar | 14.5-14.6 | Polyprotic Acids, Buffers |
| | T | 14-Mar | | |
| | R | 16-Mar | | |
| 17 | T | 21-Mar | 14.7 | Acid-Base Titrations |
| 18 | R | 23-Mar | | **Exam 2** |
| 19 | T | 28-Mar | 5.3, 7.5 | Enthalpy, Bond Strength |
| 20 | R | 30-Mar | 16.1-16.2 | Spontaneity, Entropy |
| 21 | T | 4-Apr | 16.3-16.4 | 2nd and 3rd Laws of Thermodynamics, Free Energy |
| 22 | R | 6-Apr | 17.1-17.2, 4.2 | Ox-Red Reactions (p193-5), Galvanic Cells |
| 23 | T | 11-Apr | 17.3-17-4 | Std Reduction Potentials, The Nernst Equation |
| 24 | R | 13-Apr | 17.5-17.7 | Batteries, Fuel Cells, Corrosion, Electrolysis |
| 25 | T | 18-Apr | 21.1-21.2 | Nuclear Structure, Stability, Equations |
| 26 | R | 20-Apr | 21.3-21.4 | Radioactive Decay, Transmutation, Nuclear Energy |
| 27 | T | 25-Apr | 20.1-20.4 | Organic Chemistry Overview |
| 28 | R | 27-Apr | | **Exam 3** |
| 29 | T | 2-May | | Review |
| 30 | | TBA | | Final Exam (Comprehensive) |

Note: Schedule is subject to change. *Last Day to drop with a "W" is April 3rd

VII. **Laboratory Outline:** Description of the course activities including: due dates, schedules, and deadlines.

| Lab Session | Week of | Quiz | Exp # | Experiment Description |
|---|---|---|---|---|
| 1 | 23-Jan | | 1 | Check-in, Safety and Equipment, Nomenclature |
| 2 | 30-Jan | A | 12 | Determination of Molecular Weight from Freezing Point Depression |
| 3 | 6-Feb | B | 14 | Kinetics: Reaction Rate Factors |
| 4 | 13-Feb | C | 15 | Kinetics: Rate Law Determination*<br>**Begin writing Formal Written Report* |
| 5 | 20-Feb | D | 17 | Equilibrium Constant (Kc) Determination |
| 6 | 27-Feb | E | 18 | Le Châtelier's Principle<br>**Formal Written Report 1st Draft Due* |
| 7 | 6-Mar | F | 16 | Determination of Equilibrium Constant for a Weak Acid |
| | 13-Mar | | | Spring Break |
| 8 | 20-Mar | G | 19 | Acid-Base Titration Curves<br>**Formal Written Report Final Draft Due* |
| 9 | 27-Mar | H | 22 | Workshop 2: Thermodynamics |
| 10 | 3-Apr | I | 13 | Hess's Law and Conservation of Energy |
| 11 | 10-Apr | J | 23 | Workshop 3: Redox Equations |
| 12 | 17-Apr | K | 20 | Electrochemistry<br>Final Review |
| 13 | 24-Apr | | | **Lab Final Exam** |

Note: Schedule is subject to change. *Last Day to drop with a "W" is April 3rd

VIII. **Evaluation and Grading**

A. **Grading Criteria**

Course grades are assigned in light of a numerically determined course score (see subsection "B" for details), according to the following table

| Course Score | Course Letter Grade |
|---|---|
| 90-100 | A |
| 80-89 | B |
| 70-79 | C |
| 60-69 | D |
| <60 | F |

B. **Course score will be determined according to the following percentages.**

1. 25% from the Final Exam; 50% from the average of Exams 1, 2, and 3; 25% from the Laboratory score (see subsection "C" for details).
2. The three components are weighted according to the equation:

Course Score = 0.25 (Final Exam Score) + 0.50 (average of all midterm exams) + 0.25 (Laboratory Score)

C. **Overall Laboratory Score (a component of the overall Course Score)**

1. 70% from the average score of the assigned laboratory experiments (see subsection "D" for details); 10% from the formal written lab report; 20% from the written laboratory final exam.
2. The three components are weighted according to the equation:

Laboratory Score = 0.70 (average individual exp score) + 0.10 (formal written report) + 0.20 (laboratory Final Exam Score)

D. **Scoring of Individual Experiments**

1. A student must be physically present during the laboratory period, and actively participate in the experiment, to receive credit for any of the two scored components that follow.
2. 30% from the on-line pre-lab quiz; 70% from the experiment report form and post-lab questions
3. The two components are weighted according to the equation:

Individual Experiment Score = 0.30 (on-line quiz score) + 0.70 (report form/post lab questions)

E. **Make-up exams**

1. There are NO make-up exams; however, an exception *may* be approved if requested *prior* to exam date.
2. If the request to take a make-up exam is approved, then the make-up exam must nevertheless be taken *within one week* of the original exam date, after which permission is automatically rescinded.

F. **Changes to Curriculum**

1. The instructor may modify the provisions of the syllabus to meet individual class needs by informing the class in advance as to the changes being made.