CHM 112
College Chemistry II

I. CHM 112, College Chemistry II, 4 Semester Hours

II. Course Description
This is the second course in a two-semester sequence designed primarily for the science or engineering major who is expected to have a strong background in mathematics. Topics in this course include chemical kinetics, chemical equilibria, acids and bases, ionic equilibria of weak electrolytes, solubility product principle, chemical thermodynamics, electrochemistry, oxidation-reduction, nuclear chemistry, and selected topics in organic chemistry, biochemistry, atmospheric chemistry, and descriptive chemistry, including the metals, nonmetals, semi-metals, coordination compounds, transition compounds, and post-transition compounds. Laboratory is required.

III. Prerequisite: CHM 111 (College Chemistry 1) and MTH 112 (Precalculus Algebra)

IV. Co-requisite: Individual colleges may elect to require CHM 122 (Chemistry Recitation II).

V. Textbook
Due to the varied selection of quality college level textbooks, each college will select the textbook needed to meet the requirements of this course.

VI. Course Competencies
At the end of the course the student will be able to:

A. Discuss chemical kinetics.
B. Solve kinetics problems.
C. Discuss chemical equilibrium.
D. Solve chemical equilibrium problems.
E. Discuss the concepts of acids and bases.
F. Solve acid and base problems, pH problems, and titration problems.
G. Discuss the ionization of weak electrolytes.
H. Solve problems related to the ionization of weak electrolytes.
I. Discuss the solubility product principle.
J. Solve solubility product principle problems.
K. Discuss chemical thermodynamics.
L. Solve thermodynamics problems.
M. Discuss electrochemistry.
N. Solve electrochemistry problems.
O. Discuss oxidation-reduction.
P. Solve oxidation-reduction problems.
Q. Discuss nuclear chemistry.
R. Solve nuclear chemistry problems.

**Selected Topics which may be included:**

- Discuss the properties, reactions, and uses of semi-metals, coordination compounds, transition compounds, and post-transition compounds.
- Discuss atmospheric chemistry.
- Name, draw, and show reactions and uses of selected organic compounds.
- Name, draw, and show reactions and uses of selected biochemical compounds.
- Discuss matters related to environmental chemistry.
- Discuss the properties, reactions, and uses of the nonmetals.

**VII. Course Outline of Topics**

**Lecture topics:**

- Kinetics
- Rate Laws
- Reaction Rates
- Half-Life
- Temperature
- Catalysts
- Mechanisms
- Equilibrium
- Law of Mass Action
- Equilibrium Constants
- LeChatelier’s Principle
- Acids and Bases
- pH and pOH
- Ionic Equilibria of Weak Electrolytes
- Hydrolysis
- Titration Curves
- Solubility Product Principle
- Multiple Equilibria
- Thermodynamics
- Entropy
- Enthalpy
- Free Energy and Equilibrium
- Oxidation-Reduction Reactions
- Electrochemistry
- Voltaic Cells
- Faraday’s Law
- Nuclear Chemistry
Selected Lecture topics (May be included)

Organic Chemistry (Basic structure, Functional groups)
Polymers
Introductions to Biochemistry
Descriptive Chemistry (Main Group Elements)
Transition Metals
Coordination Chemistry

Suggested Laboratory Topics

Check-in, Safety, Rules and Regulations
Kinetics
Equilibrium
pH measurement
Titrations
Electrochemistry
Thermodynamics
Qualitative Analysis
Group I Cations
Group II Cations
Group III Cations
Group IV Cations
Anions
Organic Compounds
Polymers

VIII. Evaluation and Assessment
Grades will be composed of tests, lab work, a comprehensive final exam, and may include other assignments; 75-80 percent lecture, 20-25 percent laboratory. A minimum of 3 tests and a comprehensive final exam will be given. A minimum of one test and a final exam will be given in laboratory. Grades will be given based upon A = 90 – 100%, B = 80 – 89%, C = 70 – 79%, D = 60 – 69%, and F = below 60%.

IX. Attendance
Students are expected to attend all classes for which they are registered. Students who are unable to attend class regularly, regardless of the reason or circumstance, should withdraw from that class before poor attendance interferes with the student’s ability to achieve the objectives required in the course. Withdrawal from class can affect eligibility for federal financial aid.

X. Statement on Discrimination/Harassment
The College and the Alabama State Board of Education are committed to providing both employment and educational environments free of harassment or discrimination related to
an individual’s race, color, gender, religion, national origin, age, or disability. Such harassment is a violation of State Board of Education policy. Any practice or behavior that constitutes harassment or discrimination will not be tolerated.

XI. **Americans with Disabilities Act**

The Rehabilitation Act of 1973 (Section 504) and the Americans with Disabilities Act of 1990 state that qualified students with disabilities who meet the essential functions and academic requirements are entitled to reasonable accommodations. It is the student’s responsibility to provide appropriate disability documentation to the College.