CHEM 121 - General Chemistry 2 Course Outline

Approval Date: 09/11/2014
Effective Date: 06/14/2015

SECTION A

Unique ID Number	CCC000315196
Discipline(s)	
Division	Science and Engineering
Subject Area	Chemistry
Subject Code	CHEM
Course Number	121
Course Title	General Chemistry 2
TOP Code/SAM Code	1905.00 - Chemistry, General / E - Non-Occupational
Rationale for adding this course to the curriculum	Expand the course content to satisfy the requirements of C-ID.
Units	5
Cross List	*N/A*
Typical Course Weeks	
Total Instructional Hours	

	Contact Hours
Lecture	54.00
Lab	108.00
Activity	0.00
Work Experience	0.00
Outside of Class Hours	108.00

Total Contact Hours	162
Total Student Hours	270
Open Entry/Open Exit	No
Maximum Enrollment	
Grading Option	Letter Grade or P/NP
Distance Education Mode of Instruction	

SECTION B

General Education Information:

SECTION C

Course Description

Repeatability May be repeated 0 times

Catalog Description A continuation of CHEM 120. Topics include solutions, acid-base and redox equilibria, thermodynamics, kinetics, pH, buffers, solubility product, complex ions, thermodynamics, electrochemistry, biochemistry and nuclear chemistry.

Schedule Description

SECTION D

Condition on Enrollment

1a. Prerequisite(s)

- CHEM 120

1b. Corequisite(s): *None*

1c. Recommended: *None*

1d. Limitation on Enrollment: *None*

SECTION E

Course Outline Information

1. Student Learning Outcomes:

A. Communicate chemical and physical processes at the molecular level and how they relate to the macroscopic environment.
B. Solve both qualitative and quantitative chemistry problems while demonstrating the reasoning clearly and completely.
C. Implement laboratory techniques correctly using appropriate safety procedures and express them clearly in written laboratory reports.

2. Course Objectives: Upon completion of this course, the student will be able to:

A. Explain the development of chemical principles and concepts based on experiments.
B. Analyze and solve complex or extended problems involving mathematical skills as well as an ability to place these problems in an environment, biological, economic or social context.
C. Design a laboratory experiment by defining the problem, collecting data, obtaining results, deriving conclusions, and preparing a report to communicate the information to others in writing.
D. Explain the concepts related to rates of reaction, activation energies, mechanisms of reactions, as applied to the kinetic molecular theory.
E. Relate equilibrium information from chemical systems to the free energy, enthalpy and entropy. Determine the equilibrium constants and show how the spontaneity of the system is related to the driving force of the reaction.
F. Apply the equilibrium system concepts to acid/base, solubility, redox, and complex ion formation reaction systems.
G. Indicate how an electrochemical cell can be used to establish the standard free energy of a chemical reaction, and measure the pH of a system.
H.

3. Course Content

A. Chemical Kinetics
    a. Rate Laws
    b. Activation Energy

c. Mechanisms
d. Catalysis

B. Chemical Equilibrium
   a. LeChatlier's Principle
   b. Homogenous Systems
   c. Heterogeneous Systems

C. Acids & Bases
   a. Strong and Weak acids
   b. pH
   c. Buffers
   d. Titration Curves

D. Applications of Aqueous Equilibria
   a. Solubility
   b. pH controlled Solubility
   c. Complex Ions
   d. Amphoterism

E. Spontaneity, Entropy and Free Energy
   a. Effect of Temperature
   b. Work and Efficiency

F. Electrochemistry
   a. Balancing Oxidation-Reduction Reactions
   b. Nernst Equation
   c. Standard State Potentials

G. Nuclear Chemistry
   a. Radioactive Decay
   b. Carbon Dating
   c. Half Life
   d. Nuclear Transformations

H. Organic Chemistry
   a. Nomenclature
   b. Functional Groups
   c. Free-Radical Halogenation
   d. Substitution and Elimination Reactions

I. Topics in Biochemistry May Include
   a. Enzyme Kinetics
   b. Michaelis-Menton Equation
   c. Lineweaver Burke Plot
   d. Biological Buffers
   e. Action Potential
   f. Amino Acids and Zwitterions
   g. Ionic Strength and Osmotic Pressure
   h.

4. Methods of Instruction:

Lecture:

Other (Specify):

Other: Lectures. Chemical demonstrations. Video presentations. Individual and group problem solving in the classroom. Individual and group laboratory experiments. Peer oriented guided instruction where the students help one another under the guidance of an instructor.

5. Methods of Evaluation: Describe the general types of evaluations for this course and provide at least two, specific examples.

Additional assessment information:

Four exams will be given, including the final exam. Exams will be fill in, multiple choice, true/false, and short answer, and will be graded on a point scale. A sample question may be, "What is the pH of a 0.1M acetic acid solution?" or "How many steps are required for a fourth order reaction?" or perhaps, "Please draw a working electrochemical cell indicating the composition of the electrodes, cell concentrations, and direction of electron flow."

Regular attendance in the laboratory. All labs will be checked off by the instructor prior to the student leaving the lab.

Letter Grade or P/NP

6. Assignments: State the general types of assignments for this course under the following categories and provide at least two specific examples for each section.

A. Reading Assignments
   Daily reading of text; weekly reading of lab manual (ex: Read Chapter 15,"Chemical Thermodynamics," Sections 15.1 through 15.9 in your text and read the first lab, "The Kinetics of the Acid Decomposition of a Compound.")
B. Writing Assignments
   Problem sets are provided for homework.
   Laboratory write-ups are assigned weekly.
   Sample tests/study sheets are provided for each of the four exams.
C. Other Assignments
   -

7. Required Materials

A. EXAMPLES of typical college-level textbooks (for degree-applicable courses) or other print materials.

Book #1:

Author:	McMurry & Fay
Title:	Chemistry
Publisher:	Prentice Hall
Date of Publication:	2011
Edition:	6th

Book #2:

Author:	Chang and Overby
Title:	General Chemistry: The Essential Concepts
Publisher:	McGraw-Hill
Date of Publication:	2010
Edition:	6th

Book #3:

Author:	Tro
Title:	Chemistry: A Molecular Approach
Publisher:	Prentice Hall
Date of Publication:	2012
Edition:	2nd

Book #4:

Author: Atkins & Jones
Title: Chemical Principles
Publisher: W.H. Freeman
Date of Publication: 2012
Edition: 6th

Manual #1:
Author: Brown , LeMay, Bursten, Murphy, Woodward, Nelson & Kemp
Title: Laboratory Experiments for Chemistry: The Central Science
Publisher: Prentice Hall
Date of Publication: 05-18-2008

Manual #2:
Author: Brown , LeMay, Bursten, Murphy, Woodward, Nelson & Kemp
Title: Laboratory Experiments for Chemistry: The Central Science
Publisher: Prentice Hall
Date of Publication: 05-18-2008

Manual #3:
Author: Postma, Roberts & Holenberg
Title: Chemistry in the Laboratory
Publisher: W.H. Freeman
Date of Publication: 03-12-2004

Manual #4:
Author: Fawl
Title: Laboratory, General Chemistry
Publisher: NVC Reproduction Services
Date of Publication: 08-22-2012

B. Other required materials/supplies.