**ESSEX COUNTY COLLEGE**

**Division of Biology & Chemistry**

**CHM 104 – General Chemistry II**

**Course Outline**

**Course Number & Name:**  CHM 104 General Chemistry II

**Credit Hours:**  4.0 **Contact Hours:**  6.0 **Lecture:** 3.0 **Lab:**  3.0 **Other:**  N/A

**Prerequisites**:  Grade of “C” or better in CHM 103

**Co-requisites:** None **Concurrent Courses:** None

**Course Outline Revision Date:**  Fall 2010

**Course Description**: A continuation of CHM 103, atomic theory and bonding, elementary thermodynamics, electrochemistry and nuclear chemistry are discussed. Theory and practice of ionic equilibria in qualitative analysis are also covered. Laboratory introduces students to theory and practice of semi-micro qualitative analysis.

**General Education Goals**: CHM 104 is affirmed in the following General Education Foundation Category: **Scientific Knowledge and Reasoning.** The corresponding General Education Goal is as follows: Students will use the scientific method of inquiry through the acquisition of scientific knowledge.

**Course Goals:** Upon successful completion of this course, students should be able to do the following:

1. use mathematical skills proficiently to rearrange equations, determine significant figures, compute and round off numbers, and implement scientific notation;

2. demonstrate knowledge of the basic concepts of chemistry, which are part of the general education required for many professionals;

3. utilize critical thinking techniques to reason, listen, follow directions, make observations, and draw conclusions;

4. convert word problems to the appropriate mathematical language and solve them quantitatively; and

5. apply proficient laboratory skills.

**Measurable Course Performance Objectives (MPOs)**: Upon successful completion of this course, students should specifically be able to do the following:

1. Use mathematical skills proficiently to rearrange equations, determine significant figures, compute and round off numbers, and implement scientific notation:

 1.1 *correctly use significant figures, scientific notation, and round-off techniques in calculations and use a scientific calculator (as necessary)*;and

 1.2 *rearrange mathematically the many equations used to solve chemistry problems*

**Measurable Course Performance Objectives (MPOs)** (continued):

2. Demonstrate knowledge of the basic concepts of chemistry, which are part of the general education required for many professionals:

 2.1 *discuss, interpret, and calculate reaction rates for various chemical reactions*;

 2.2 *explain chemical equilibrium in reactions and calculate equilibrium constants and the amounts of reactants and products present at equilibrium;*

 2.3 *identify acids and bases, write acid-base reactions, and perform calculations involving acids and bases to solve related chemistry problems;*

 2.4 *explain the solubility product principle and perform calculations involving solubility products;*

 2.5 *explain chemical thermodynamics and the associated terms (entropy, enthalpy, and free energy) and perform thermodynamic calculations for various chemical reactions at various temperatures;*

 2.6 *describe the construction of voltaic cells, write the chemical reactions that occur in voltaic cells, and calculate cell potentials and the equilibrium constants and free-energy changes from cell potentials;* and

 2.7 *explain radioactive decay and how nuclear reactions differ from chemical reactions and calculate an element’s nuclear binding energy and mass defect*

3. Utilize critical thinking techniques to reason, listen, follow directions, make observations, and draw conclusions:

 3.1 *properly perform the various laboratory experiments and make the expected observations and conclusions*; and

 3.2 *solve a variety of problems that arise in chemistry*

4. Convert word problems to the appropriate mathematical language and solve them quantitatively:

 4.1 *recognize from the chemistry problem topic what mathematical equation is required and substitute the data given in the problem into the equation*; and

 4.2 *solve the mathematical problems to arrive at quantitative solutions*

5. Apply proficient laboratory skills:

 5.1 *select proper sample size, equipment size, and experimental setup*

 5.2 *correctly use laboratory equipment*; and

 5.3 *apply lecture concepts in the laboratory*

**Methods of Instruction**: Instruction will consist of a combination of lectures, laboratory experiments, and various learning exercise and problem assignments.

**Outcomes Assessment:** Homework, test and exam questions are blueprinted to course objectives. Lab experiments are scored with checklist rubrics for the presence of course objectives. Data is collected and analyzed to determine the level of student performance on these assessment instruments in regards to meeting course objectives. The results of this data analysis are used to guide necessary pedagogical and/or curricular revisions.

**Course Requirements:** All students are expected to:

1. Attend class regularly and be on time. Excessive absences or late arrivals negatively affect student understanding of the material and, therefore, performance in the course.

2. Complete assigned reading, homework, and laboratory assignments as scheduled.

3.    Take exams when scheduled. Policies regarding make-up tests/exams are established by individual instructors.

**Methods of Evaluation:** Final course grades will be computed as follows:

 **% of**

**Grading Components final course grade**

* **Attendance/Punctuality 5%**

Attendance is essential as students cannot otherwise participate in class discussions or laboratory activities, which are designed to enhance understanding of the course objectives.

* **Homework 20%**

Homework is assigned to reinforce the course objectives and give students the practice and know-how to do similar problems on the tests/exams. A perusal of homework problems will provide evidence of the achievement of course objectives.

* **Laboratory Experiments 15%**

Laboratory experiments measure the students’ abilities in the lab and reinforce the relevance of the laboratory topics to the textbook. Lab performance is evaluated for the presence of various course objectives.

* **4 or more Tests** (dates specified by the instructor) **60%**

Tests, which include content from the textbook, the lectures, and the laboratory experiments, will show evidence of the extent to which students meet course objectives.

**Academic Integrity:** Dishonesty disrupts the search for truth that is inherent in the learning process and so devalues the purpose and the mission of the College.  Academic dishonesty includes, but is not limited to, the following:

* plagiarism – the failure to acknowledge another writer’s words or ideas or to give proper credit to sources of information;
* cheating – knowingly obtaining or giving unauthorized information on any test/exam or any other academic assignment;
* interference – any interruption of the academic process that prevents others from the proper engagement in learning or teaching; and
* fraud – any act or instance of willful deceit or trickery.

Violations of academic integrity will be dealt with by imposing appropriate sanctions.  Sanctions for acts of academic dishonesty could include the resubmission of an assignment, failure of the test/exam, failure in the course, probation, suspension from the College, and even expulsion from the College.

**Student Code of Conduct:** All students are expected to conduct themselves as responsible and considerate adults who respect the rights of others. Disruptive behavior will not be tolerated. All students are also expected to attend and be on time all class meetings. No cell phones or similar electronic devices are permitted in class. Please refer to the Essex County College student handbook, *Lifeline*, for more specific information about the College’s Code of Conduct and attendance requirements.

**Course Content Outline:** based on the text **General Chemistry**, 9th edition, by Ebbing and Gammon; published by Brooks Cole/Cengage Learning; and laboratory manual **Modular Laboratory Program in Chemistry**, published by Chemical Education Resources, Inc.

Note: A hand-held scientific calculator is also required for this course.

**Week Chapter/Topic**

1 Chapter 13 Rates of Reaction

2 Chapter 13 Rates of Reaction (continued)

 Lab: Chemical Kinetics: the Iodine Clock Reaction

3 Chapter 14 Chemical Equilibrium

4 Chapter 14 Chemical Equilibrium (continued)

 Lab: Chemical Equilibrium

5 **Test 1** on Chapters 13 & 14 and labs

 Chapter 15 Acids and Bases

5 Chapter 16 Acid-Base Equilibria

6 Chapter 16 Acid-Base Equilibria (continued)

 Lab: Neutralization Equivalent and Cost Effectiveness of Commercial Antacids

7 **Test 2** on Chapters 15 & 16 and labs

8 Chapter 17 Solubility and Complex-Ion Equilibria

9 Chapter 17 Solubility and Complex-Ion Equilibria (continued)

 Lab: Solubility Product Constant of a Slightly Soluble Compound

10 Chapter 18 Thermodynamics and Equilibrium

11 Chapter 18 Thermodynamics and Equilibrium (continued)

 **Test 3** on Chapters 17 & 18 and labs

12 Chapter 19 Electrochemistry

13 Chapter 20 Nuclear Chemistry

14 Chapter 20 Nuclear Chemistry (continued)

 **Test 4** on Chapters 19 & 20 and labs

15 Review of course material covered