College of San Mateo
Course Outline

☐ New Course
☐ Update/No change
X Course Revision (Minor)
☐ Course Revision (Major)

Date: 10/26/10

Department: **Chemistry** **Number:** **210**

Course Title: **General Chemistry I** **Units:** **5.0**

Total Semester Hours **Lecture: 48** **Lab: 96** **Homework:** 80 **By Arrangement: 16**

Length of Course

X Semester-long
☐ Short course (Number of weeks___)
☐ Open entry/Open exit

Grading

X Letter
☐ Pass/No Pass
☐ Grade Option (letter or Pass/No Pass)

Faculty Load Credit (To be completed by Division Office; show calculations.)**:**

(3 hours per week times 16 weeks) / 16 weeks = 3 FLC for the lecture
{ (6 hours per week times 16 weeks) / 16 weeks } times 0.8 = 4.8 FLC for the lab
Total: 7.8 FLC

1. **Prerequisite** (Attach Enrollment Limitation Validation Form.)

Completion of MATH 120 or MATH 123 with a grade of C or better or appropriate placement test score or other measures that indicate a proficiency in intermediate algebra.

2. **Corequisite** (Attach Enrollment Limitation Validation Form.)
None.

3. **Recommended Preparation** (Attach Enrollment Validation Form.)

Completion of CHEM 192 with a grade of C or higher or equivalent.
Eligibility for ENGL 838 or 848.

4. **Catalog Description** (Include prerequisites/corequisites/recommended preparation. For format, please see model course outline.)
CHEM 210 General Chemistry I (5) Minimum of 48 lecture hours, 96 lab hours and 16 hours by arrangement per semester. Prerequisites: Completion of MATH 120 or MATH 123 with a grade of C or better or appropriate placement test score or other measures that indicate a proficiency in intermediate algebra. Recommended preparation:Completion of CHEM 192 with a grade of C or better. Eligibility for ENGL 838 or 848.
This is the first semester of a two-semester sequence class in general chemistry intended for students pursuing physical sciences, biological sciences, engineering and pre- professional majors. Includes a detailed study of basic principles of atomic and molecular structure and bonding, chemical reactions and equations including stoichiometry and thermochemistry,

solutions and gas laws with an emphasis on critical thinking and problem solving skills. This course also includes laboratory study of these concepts, experimental chemistry techniques and the analysis and interpretation of experimental findings. Students who have not previously completed a chemistry course with lab should take CHEM 192 first. Extra supplies may be required. A materials fee as shown in the Schedule of classes is payable upon registration. (AA: Area E5a, CSU: Area B1/ Area B3, UC: Area 5A)

5. Class Schedule Description (Include prerequisites/corequisites/recommended preparation. For format, please see model course outline.) **Prerequisites: Completion of MATH 120 or MATH 123 with a grade of C or better. Recommended preparation: Completion of CHEM 192 with a grade of C or better. Eligibility for ENGL 838 or 848.**
This is the first semester of a two-semester sequence class in general chemistry intended for students pursuing physical sciences, biological sciences, engineering and pre- professional majors. Includes a detailed study of basic principles of atomic and molecular structure and bonding, chemical reactions and equations including stoichiometry and thermochemistry, solutions and gas laws with an emphasis on critical thinking and problem solving skills. This course also includes laboratory study of these concepts, experimental chemistry techniques and the analysis and interpretation of experimental findings. Students who have not previously completed a chemistry course with lab should take CHEM 192 first. Extra supplies may be required. A $---- materials fee is payable upon registration. (AA: Area E5a, CSU: Area B1/ Area B3, UC: Area 5A)

6. Student Learning Outcomes (Identify 1-6 expected learner outcomes using active verbs.)
Upon successful completion of the course, the student will be able to:
1. describe and give examples of various classifications of matter.
2. understand and use scientific measurements in problem solving.
3. recognize the interrelationships of subatomic, atomic, molecular structure and the associated properties of matter.
4. competently perform experiments and evaluate data obtained from them.

7. Course Objectives (Identify specific teaching objectives detailing course content and activities. *For some courses, the course objectives will be the same as the student learning outcomes. In this case, "Same as Student Learning Outcomes" is appropriate here.)*
Same as Student Learning Outcomes.

8. Course Content (Brief but complete topical outline of the course that includes major subject areas [1-2 pages]. Should reflect all course objectives listed above. In addition, a sample course syllabus with timeline may be attached.)

A. Introduction to scientific methodology, scientific notation, metric units, error, significant figures and dimensional analysis.

B. Presentation of basic chemical concepts, properties, chemical and physical changes, pure substances and mixtures.

C. Understanding of basic chemical nomenclature, reaction types, chemical equations and reaction stoichiometry. Nomenclature of common inorganic chemicals to include simple molecular compounds, ionic salts and common acids will be presented. Oxidation numbers of common ions will be used to form appropriate compounds. Various categories of chemical reactions will be recognized and strategies for balancing reaction equations will be learned. Simple redox concepts will be presented but redox equation balancing will be left for the second semester course. Students will learn the mole concept, formula and

molecular mass calculations, percentage composition, empirical and molecular formula determinations. Students will apply these principles to calculate theoretical yields for reactions, recognize limiting reagents, and will understand percentage yields.

D. Introduction to atomic theory. The student will understand modern atomic theory will regard to the major subatomic particles. Basic properties of atoms, ions and isotopes will be understood with regard to mass, isotopes, nuclear composition and ion formation. Electronic structure will be explored particularly with regard to quantum theory, electron energy levels, atomic orbitals and their associated shapes. Students will have an understanding of electronic configurations and their relationships to the periodic table. The periodic table will be presented so that the element classifications, periodic law, characteristics of families, and periodic properties will be appreciated.

E. Chemical bonding and resulting chemical structures will be studied. Ionic versus covalent bonding will be understood with an appreciation of the resulting chemical behaviors. Students will learn how molecular shapes are determined and presented by using tools such as Lewis structures, formal charge and VSEPR theories. Various ideas will reinforce the appreciation of chemical structure such as atomic hybridization and resulting bond angles, polarization of molecules, electron pair distribution and overall molecular geometry. Intermolecular forces due to molecular polarity will be explored. Students will understand liquid and solid formation processes for molecular, ionic and metallic materials.

F. Students will explore the states of matter. Gas laws will be studied in depth for ideal behavior as determined by common gas laws such as Boyle's, Charles', Gay-Lussac's, Dalton's and Avogadro's. The ideal gas law and its common applications will be presented. Qualitative reasoning for gas law deviations will be presented and the kinetic molecular theory will be understood. The common properties of the liquid state will be presented along with the energy considerations for transitions between states. Solids will be studied for typical bonding attractions, phase change behavior and crystalline behavior. Students will understand basic phase diagrams and transitions between states.

G. Solution formation will be presented at both the atomic level (solvation processes) and the macro level in terms of solution concentrations and volumetric techniques. Basic solubility properties will be explored and colligative properties will be presented. Energetics of solution formation will be presented and students will understand ionic solution reactions and net ionic equations.

H. Energy of chemical reactions will be explored during a presentation of introductory thermo chemistry. The nature of enthalpy, bond energies, calorimetry and Hess's Law will be understood.

9. Representative Instructional Methods (Describe instructor-initiated teaching strategies that will assist students in meeting course objectives. Describe out-of-class assignments, required reading and writing assignments, and methods for teaching critical thinking skills. **If hours by arrangement are required, please indicate the additional instructional activity which will be provided during these hours, where the activity will take place, and how the activity will be supervised.**)

Some but not necessarily all of the following methods are employed when teaching this course to assist the students in achieving the course objectives.

Lecture style presentation of material.
Video programs and computer programs.
Games to challenge the student's comprehension of the material.
A minimum of two in class exams and a comprehensive final.
Six hours of laboratory per week.
Group work on problems in lecture and experimental procedures in lab.
Short quizzes in lecture and in lab.
Homework assignments from the chapter questions and/ or handouts.
Design a lab procedure and check to see if it works.

Chemistry 210 Hours by Arrangement
Each student will be required to complete an additional 16 hours by arrangement. Assignments will be given and collected that will add up to 16 total hours. These assignments will consist of one of the following depending on the lecture material being covered and may be completed at the Integrated Science Center or during an instructors' office hours.

Watching a video and turning in your notes on the video or answering questions about the video.
Researching a topic on the internet and turning in your results.
Completing and turning in a handout with additional practice problems.
Completing a Mastering Chemistry assignment online.

10. Representative Methods of Evaluation (Describe measurement of student progress toward course objectives. Courses with required writing component and/or problem-solving emphasis must reflect critical thinking component. If skills class, then applied skills.)

Some but not necessarily all of the following methods are employed when teaching this course to assist the students in achieving the course objectives.

A minimum of two in class exams and a comprehensive final exam.
Short quizzes in lecture and in lab.
Laboratory experiment reports.
Homework assignments from the chapter questions and/or handouts.

11. Representative Text Materials (With few exceptions, texts need to be current. Include publication dates.)

Principles of Chemistry by Tro. Copyright 2010
Chem 210 lab manual Fall 2010

Prepared by: _____
(Signature)

Email address: deline@smccd.edu

Submission Date: _____