July 19, 2013

1. College: **Sciences & Mathematics**
2. Department: **Chemistry & Biochemistry**
3. Course status: **existing; does not require modification**
4. Course prefix and number: **CHE 134**
5. Course title: **General Chemistry II (CHEM 1312); CHE 134L General Chemistry Lab II (CHE 1112)**
6. Course catalog description: **Equilibrium, kinetics, redox, descriptive chemistry, and radiochemistry.**
7. Number of semester credit hours: **4**
8. Estimated total course enrollment per year: **200**
9. Course prerequisites and/or required qualifications for enrolling in the class: **Co-requisite: CHE 134L. Prerequisite: CHE 133, 133L, and MTH 138.**
10. Course **is/will be** available online.
11. Foundational Component Area: **Life and Physical Sciences**
12. Explain why this course fits into this foundation component area: **Chemistry, a branch of physical science, is the study of the composition, properties and behavior of matter. CHE 134 is a general chemistry course that builds upon the chemistry foundation that was covered in general chemistry I, CHE 133. The course addresses the basic principles and applications of chemistry dealing with the topics of equilibrium, kinetics, redox, acids/bases, and thermodynamics. A chemistry lab is included to reinforce the ideas learned in lecture. The course is designed for students pursuing degrees in the sciences and engineering, especially degrees in the fields of chemistry. Students will interpret the chemical behavior of substances using the body of knowledge in chemistry as a foundation. With their chemistry knowledge, students will focus on describing, explaining, and predicting natural phenomena using the scientific method. CHE 134 will inform students on the concepts of chemistry and their impact on science, technology, society, the environment, and their influence on human life.**
13. Core Objectives
    - Critical Thinking - Chemistry courses demonstrate critical thinking by emphasizing logic, qualitative reasoning, and recognizing patterns of chemical behavior based on the body of knowledge in chemistry as a foundation. Instructors will demonstrate the process of critical thinking through exercises in which the instructor will highlight their thought process during the exercise. The instructor will explain their logic by connecting the chemical concepts and theories used to guide their reasoning. Instructors will do this with several topics such as balancing redox equations, determining reaction orders, calculating equilibrium partial pressures, and determining the pH of salt solutions. All of these exercises require a vast amount of reasoning and knowledge to obtain accurate conclusions. The students will model these exercises in additional problem sets for the development of their critical thinking skills. The students will actually be assessed on critical thinking in laboratory experiment 26 – Qualitative Analysis: Chemical Sleuthing of a Set of Solutions using the scientific method. This experiment requires students to identify pertinent chemical information from

the literature to devise a scheme to collect appropriate experimental data to identify 9 unknown substances. Conclusions will be based on the analysis of the theoretical information gathered and experimental data collected. Students must use logic to devise the appropriate experiments and deduce an accurate evaluation of data to reason out conclusions. This experiment is conducted with very little guidance from instructors. The students will be assessed using a critical thinking rubric over experiment 26.

- Communication Skills - Instructors will lecture during the first day of lab over the skills involved in communicating effectively using writing and oral techniques. The instructor will review the required written report format for lab in great detail. Students will apply during the semester the information on written communication discussed on day 1 and develop their writing skills while obtaining feedback from the instructor. The students' written communication skills will actually be assessed in experiment 17 Kinetics: Determination of the order of a reaction. The students will be assessed using a written communication rubric over experiment 17 Kinetics' lab report. Instructors will lecture over the proper way to orally communicate with a lab partner, which involves answering, asking, and listening effectively to contribute to the group's purpose. The instructor will discuss how students should orally contribute thoughtful, concise, and insightful ideas to their group if they want to successfully complete the lab experiments safely, efficiently, and accurately. Students will apply during the semester the information on oral communication discussed on day 1 to develop their oral skills between group members. The students' oral communication skills will actually be assessed in experiment 26 Qualitative Analysis: Chemical Sleuthing of a Set of Solutions. Since this experiment has very little guidance from the instructor, this experiment depends heavily on good oral communication if the group is to be successful in accomplishing the experiment efficiently and accurately. The conclusions in this experiment are draw based on the team's oral discussion of the collected data. The students will be assessed by each other using an oral communication rubric over experiment 26. Instructors will lecture over the skills involved in visual communication prior to experiment 17 Kinetics; this experiment requires a complex graph to complete the analysis of the collected data. The instructor will review the proper techniques of representing data within graphs and tables with several examples. The students will demonstrate visual communication skills in experiment 17. Students must graph the volume of oxygen generated over time to determine the rate of reaction for three different experiments. The student must graph this information in an organized, clear, and accurate manner. The students will be assessed using a visual communication rubric for the graph in experiment 17.
- Empirical and Quantitative Skills - Instructors will demonstrate the process of quantitative reasoning within several problem sets involving the determination of rate laws, determination of equilibrium partial pressures, and the determination of pH of solutions. Within the problem sets, the instructors will demonstrate how to analyze data sets to formulate logical mathematical relationships within the data by analyzing the data, making appropriate inferences, and manipulating the data. The students will model these exercises in additional problem sets to develop their

quantitative reasoning skills. The students will model the process of quantitative reasoning in experiment 17 which involves the determination of a rate law. This experiment requires students to collect rate data while varying the concentration of the reactants. Students must graph the volume of oxygen generated over time to determine the rate of reaction for each experiment. The student will analyze the data and graphs to formulate a logical mathematical relationship between the concentrations of species and the overall rate of the reaction to conclude the rate law for the reaction. The students will be assessed using a quantitative reasoning rubric over the quantitative calculations, analysis, and interpretation of results in experiment 17.

- Teamwork - Instructors will lecture over the skills involved in teamwork. The instructor will explain the importance of teamwork in the lab if the group wants to successfully complete the lab experiments safely, efficiently, and accurately. The instructor will lecture over the proper techniques for a team to gather the results, analyze the results, and draw conclusions based on the team's viewpoints. The students will demonstrate teamwork skills in experiment 26 Qualitative Analysis: Chemical Sleuthing of a Set of Solutions. Students will apply during the semester the information on teamwork discussed on day 1 of the semester and develop their teamwork skills. However, in this particular experiment, teamwork is extremely crucial because of the lack of detailed instruction. The students must work together to essentially design the experiment, gather the results, analyze the results, conduct additional experiments, and draw conclusions based on the team's viewpoints. A total group effort is required to complete the task at hand efficiently and accurately. The students will be assessed by each other using a teamwork rubric over experiment 26.

Contact person for questions about this submission:

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