Miami Dade College

GENERAL INFORMATION	
Name: Marta Goicochea-Pappas	Phone #: 305-237-0848
Course Prefix/Number: **CHM 3120**	Course Title: **Introduction to Analytical Chemistry**
Number of Credits: 3 Credits	
Degree Type	☐ B.A. ☒ B.S. ☐ B.A.S ☐ A.A. ☐ A.S. ☐ A.A.S. ☐ C.C.C. ☐ A.T.C. ☐ V.C.C
Date Submitted/Revised: 03/10/08	Effective Year/Term: 20081
☐ New Course Competency ☒ Revised Course Competency	
Course to be designated as a General Education course (part of the 36 hours of A.A. Gen. Ed. coursework): ☐ Yes ☒ No	
The above course links to the following Learning Outcomes: ☐ Communication ☒ Numbers / Data ☒ Critical thinking ☒ Information Literacy ☐ Cultural / Global Perspective ☐ Social Responsibility ☐ Ethical Issues ☐ Computer / Technology Usage ☐ Aesthetic / Creative Activities ☒ Environmental Responsibility	
Course Description: This course expands and deepens the student's knowledge of the theories, calculations, and methodologies used in analytical chemistry. Students will learn about acid-base equilibria and titrations; precipitation and complex formation; electrochemistry; oxidation-reduction; spectrophotochemical analytical methods; chromatographic techniques; statistical treatment of data; and sampling methods.	
Prerequisite(s): CHM 1046 and 1046L with a grade of C or better.	Co-requisite(s): CHM3120L

Course Competencies:

Competency 1: The student will demonstrate knowledge of statistical treatment of data by:

1. Applying statistical analysis to determine the validity and usefulness of experimental data.
2. Providing, treating, and manipulating analytical data.
3. Comparing and contrasting analytical precision and accuracy.

Competency 2: The student will demonstrate knowledge of volumetric analysis by:

1. Calculating concentrations.
2. Interconverting among concentration units.
3. Performing volumetric stoichiometric calculations.
4. Performing titration calculations (acid-base, reduction-oxidation, complexometric, precipitation).
5. Interpreting titration data and curves.
6. Plotting titration curves.
7. Selecting appropriate indicators that correctly signal the equivalence point in a titration.

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Competency 3: The student will demonstrate knowledge of gravimetric analysis by:

1. Performing gravimetric stoichiometric calculations.
2. Explaining those factors (nucleation, particle growth, digestion, adsorption, absorption) that influence and cause precipitation.

Competency 4: The student will demonstrate knowledge of acid-base theory by:

1. Identifying properties and characteristics of acids, bases, salts, and buffers.
2. Explaining the use of buffers, buffering action, buffering capacity, buffer preparation, and the common-ion effect.
3. Demonstrating the relationship between acidity, alkalinity, neutrality, K_a, K_b, pK_a, and pK_b.
4. Predicting the outcome of acid-base equilibrium reactions.

Competency 5: The student will demonstrate knowledge of the mathematical treatment of equilibria by:

1. Writing equilibrium expressions.
2. Manipulating equilibrium constants.
3. Identifying the characteristics of a dynamic equilibrium.
4. Calculating solubility products (K_{sp}).
5. Explaining the common-ion effect and its quantitative effect on equilibria.
6. Calculating the pH, pOH, $[H^+]$, and $[OH^-]$ of acids, bases, salts and buffers as a function of concentration.
7. Solving equilibria problems.
8. Calculating the equilibrium constant for weak acids (monoprotic and polyprotic) and weak bases (monobasic and polybasic).
9. Predicting how various factors affect equilibria using the Le-Châtelier's Principle.
10. Expressing the relationship that exists between E^o (standard cell potential) and the equilibrium constant.
11. Explaining the effect of ionic strength on the solubility of salts.
12. Using activity coefficients in equilibrium calculations.

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Competency 6: The student will demonstrate knowledge of electrochemistry by:

1. Comparing and contrasting oxidation and reduction.
2. Identifying the components of oxidation-reduction reactions.
3. Balancing oxidation-reduction reactions.
4. Relating Coulombs to quantity of reaction.
5. Relating current to the rate of reaction.
6. Describing the components and functions of Galvanic cells.
7. Using cell / line notation to describe an electrochemical cell.
8. Calculating standard potentials from half-cell potentials.
9. Using the Nernst equation to solve electrochemical problems.
10. Calculating electrical work.
11. Using standard electrochemical potentials to calculate equilibrium constants and standard Gibbs free energy.
12. Comparing and contrasting the use of various electrodes in potentiometry.
13. Describing standard electrode potentials, their measurement, and how electromotive force (EMF) is measured.
14. Describing the effect of concentration on electrode potentials.

Competency 7: The student will demonstrate knowledge of chromatographic methods by:

1. Explaining the main tenets of chromatographic analytical methods.
2. Explaining the instruments and techniques necessary for chromatographic analysis.
3. Explaining factors that affect chromatographic separation.
4. Analyzing and interpreting chromatograms.

Competency 8: The student will demonstrate knowledge of spectrophotometric absorption and emission methods by:

1. Applying Beer's Law and explaining its limitations.
2. Comparing and contrasting various spectrophotometric analytical methods.
3. Describing procedures and instruments used in spectrophotometric analysis.