IMPERIAL COMMUNITY COLLEGE DISTRICT
IMPERIAL VALLEY COLLEGE
COURSE OUTLINE

DIVISION: Science, Mathematics, and Engineering **DATE**: October 2004

COURSE TITLE: Quantitative Chemistry **COURSE NO**. CHEM 208 **UNITS**: 4

LEC HRS. 2 **LAB HRS**. 6 HRS. TBA 0

If cross-referenced, please complete the following

COURSE NO.(s) _____ COURSE TITLE : _____

I. COURSE/CATALOG DESCRIPTION:

Theory and practice of volumetric, gravimetric and electrochemical methods of analysis with an introduction to instrumental techniques of analysis.

II. A. PREREQUISITES, if any:

CHEM 202 with a grade of "C" or better.

B. COREQUISITES, if any:

None

C. RECOMMENDED PREPARATION, if any:

MATH 090 with a grade of "C" or better

III. GRADING CRITERIA:

X Course must be taken on a "letter-grade" basis only

_____ Course may be taken on a "credit" basis or for a letter grade.

_____ Course must be taken on a "credit" basis only.

IV. MEASURABLE COURSE OBJECTIVES AND MINIMUM STANDARDS FOR GRADE OF "C":

1. The student will determine the sensitivity of an analytical balance and calibrate burettes and pipettes.

2. The student will develop statistical considerations by developing distribution curves, calculating both average and standard deviation, and using the test for rejection of data.

3. The student will perform gravimetric analysis of certain unknown samples while investigating the formation of precipitates with their corresponding properties and equilibria involved.

4. The student will develop secondary standards against known primary standards, and will prepare constant boiling hydrochloric acid to be used as a primary standard.

5. The student will determine the equilibrium constant for various indicators and determine its pH range.

6. The student will determine the amount of acid in an unknown mixture of KHP by neutralization techniques.

7. The student will perform an oxidation-reduction determination of iron using the ceric ion method.

8. The student will analyze a blood sample for its nitrogen content on a micro scale using the Kjeldahl method.

9. The student will perform certain complex-forming determinations using EDTA and erichrome black T for a mixture of calcium and magnesium.

10. The student will use instrumental methods in the following way:
    a. Electrochemistry for the electrodeposition of copper while considering overvoltage.
    b. Colorimetry using the spectronic 20 to determine the Beers-Lambert Law for a chromium standard followed by the analysis of a chromium unknown.
    c. Using a pH meter perform an electrometric determination for the titration of the three K values of phosphoric acid.

V. CORE CONTENT TO BE COVERED IN ALL SECTIONS:

	CORE CONTENT	**APPROX % OF COURSE**
1.	Analytical devices 1. Determination of sensitivity	8%
2.	Calibration of weights and volumetric glassware 1. Burette 2. Weights 3. Pipettes	8%
3.	Statistical considerations 1. Distribution curves 2. Calculation of standard deviation 3. Rejection of data	10%
4.	Gravimetric Analysis 1. Formation and properties of precipitates 2. Equilibria in precipitation reactions 3. Determination of chloride in a sample	12%
5.	Neutralization consideration 1. Standardization of constant boiling HC1 2. Standardize NaOH against HC1 3. Determination of an unknown acid by neutralization techniques 4. Consideration of the equilibria of indicators 5. Determination of a triprotic acid using a pH meter	14%
6.	Oxidation-Reduction 1. Determination of iron by ceric ion 2. The Nernst Equation	12%
7.	Nitrogen Analysis 1. Kjeldahl determination 2. Micro scale 3. Mixed indicators	10%
8.	Complex forming titrations 1. EDTA (sodium verscnate) buffered and erichrome black T 2. Complexing procedures and on exchange techniques in determination of mixed cations	12%
9.	Instrumental analysis 1. Electrochemistry a. Electrodeposition and overvoltage considerations 2. Colorimetry using the spectronic 20 a. Use of colorimetry in clinical determinations b. Titration of a complex using versene 3. Electrometric determinations a. pH meter	14%

VI. METHOD OF EVALUATION TO DETERMINE IF OBJECTIVES HAVE BEEN MET BY STUDENTS: (check all that apply)

Essay	X	Class Activity	X	Written Assignments	X
Problem Solving Exercise	X	Final Exam	X	Oral Assignments	
Skill Demonstration	X	Objective	X	Quizzes	X

Other

VII. INSTRUCTIONAL METHODOLOGY: (check all that apply)

Lecture	X	Discussion	X	Demonstration	X
Audio Visual	X	Group Activity	X	Lab Activity	X
Computer Assisted Instruction	X	Individual Assistance	X	Simulation/ Case Study	

Two (2) hours of independent work done out of class per each hour of lecture or class work, or 3 hours lab, practicum, or the equivalent per unit.

VIII. TEXTBOOK(S) AND SUPPLEMENT(S):

Refer to the current textbook list and syllabi.

Harris, Daniel C. Quantitative Chemical Analysis. 6th edition. W. H. Freeman. 2002

McMurray, John and Robert C. Fay. Chemistry. 2nd ed. Upper Saddle River, NJ: Prentice-Hall. 1998

Wentworth, R.A.D. Experiments in General Chemistry. 5th ed. Boston: Houghton Mifflin Co. 1999.

Gammon, Steven D. et al. Interactive Chemistry Journey. Upper Saddle River, NJ: Prentice-Hall. 1998

Hein, Morris and Susan Arena. Foundations of College Chemistry. 10th ed. Pacific Grove, CA: Brooks/Cole Publishing Co. 1999.

Ebbing, Darell D. and Steven D. Gammon. General Chemistry. 6th ed. Boston: Houghton Mifflin Co. 1999.

Brown, William H. and Christopher S. Foote. Organic Chemistry. 2nd ed. Fort Worth, TX: Saunders College Publishing. 1998.

Stanitski, Conrad, ed. Chemistry in Context: Applying Chemistry to Society. 3rd ed. New York: McGraw Hill. 2000.

Balling, Robert C. The Heated Debate. San Francisco: Pacific Research Institute for Public Policy. 1992.

Baggot,Jim. The Meaning of Quantum Theory: A Guide to Students of Chemistry and Physics. Oxford, England: Oxford University Press. 1992.

Gribbin, John. In Search of Shrodinger's Cat: Quantum Physics and Reality. New York: Bantam Doubleday Dell Publishers. 1985.