UNIVERSITY COLLEGE OF THE FRASER VALLEY

COURSE INFORMATION

DISCIPLINE/DEPARTMENT: Chemistry **IMPLEMENTATION DATE**:

Revised: June 1994

Chemistry 222	Physical Chemistry	4
SUBJECT/NUMBER OF COURSE CREDITS	**DESCRIPTIVE TITLE**	**UCFV**

CALENDAR DESCRIPTION: Fundamental aspects of chemical thermodynamics are considered and applied to equilibria involving pure substances, mixtures, and reactions. Various aspects of ions in solution (electrochemistry, conductivity) and the theory and practice of reaction kinetics complete the semester. Laboratory work focuses on analytical techniques, and on the topics covered in lectures.

RATIONALE:

COURSE PREREQUISITES: CHEM 112, or CHEM 101 and 102 (Grade B or better), and MATH 211

COURSE COREQUISITES: MATH 211 must be taken previously or concurrently.

HOURS PER TERM FOR EACH STUDENT	**Lecture**	**56**	**hrs**	**Student Directed Learning**	**hrs**
	Laboratory	**36**	**hrs**	**Other - specify:**	
	Seminar		**hrs**		
	Field Experience		**hrs**		**hrs**
				TOTAL 92	**HRS**

MAXIMUM ENROLMENT: 24

Is transfer credit requested? : **Yes** **9** **No**

AUTHORIZATION SIGNATURES:

Course Designer(s): Lillian Martin **Chairperson**: T. Cooper
Curriculum Committee

Department Head: E. Kroeker **Dean**: K. Wayne Welsh

PAC: Approval in Principle _____ **PAC: Final Approval**: November 27, 1996
(Date) **(Date)**

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Chemistry 222
NAME & NUMBER OF COURSE

SYNONYMOUS COURSES:

(a) replaces N/A
(course #)

(b) cannot take Chem 323 for further credit
(course #)

SUPPLIES/MATERIALS:

TEXTBOOKS, REFERENCES, MATERIALS (List reading resources elsewhere)

TEXTS:

Physical Chemistry, 5th ed., P.W. Atkins, W.H. Freeman

OBJECTIVES:

Students will understand the basic principles of physical chemistry as regards to ideal and real gases, the 1st and 2nd Laws, changes of state, electrochemistry and kinetics.

METHODS:

Lecture, Demonstration, Small group practice, Discussion, Audio-visual presentation, Use of models and charts.

STUDENT EVALUATION PROCEDURE:

Assignments	20%
Midterm examination	30%
Laboratory	20%
Final examination	30%

Note: It is the policy of the Chemistry department that in order to pass a course a student must obtain at least a P grade in the laboratory and lecture evaluations, considered separately. The lecture evaluation includes the assignments, and midterm and final examinations.

Chemistry 222
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COURSE CONTENT:

1. Introduction; Math Review; Definitions.

2. Gases: Ideal gases; Real gases; Critical and corresponding states.

3. The First Law (You Can't Win): Work; Heat; Thermochemistry; Enthalpy; Heat capacities; Ideal gas expansions and compressions.

4. The Second Law (You Can't Break Even): Entropy; Spontaneous processes; Efficiencies; Helmholtz and Gibbs functions; Chemical Potentials.

5. Changes of State: Phase diagrams; Phase Stability and phase transitions; Mixtures of gas and liquids; Real solutions; Phase rule; Degrees of freedom; Chemical reactions.

6. Equilibrium electrochemistry

7. Chemical Kinetics: Empirical laws; Reaction mechanisms; Kinetic theories.

LABORATORY EXPERIMENTS

Ten experiments from the following list will be chosen.

Experiment 1: Gravimetric Determination of Aluminum

Experiment 2: The Determination of Cu^{2+} in Copper Ore Concentrate by Iodimetry

Experiment 3: Atomic Absorption Spectroscopy

Experiment 4: Use of the Gas Liquid Chromatography to Establish a Phase Diagram

Experiment 5: Calorimetry - The Energy of Combustion

Experiment 6: Determination of Molecular Mass by Freezing Point Depression

Experiment 7: Vapour Pressure of a Pure Liquid and of a Binary Solution

Experiment 8: Electrochemical Determination of Thermodynamic Quantities

Experiment 9: Determination of Enthalpy and Entropy of Dissolution

Experiment 10: Conductance of Solutions

Experiment 11: A Homogeneously Catalyzed Reaction

Experiment 12: Chemical Kinetics: The Hydrolysis of Ethyl Acetate