UNIVERSITY COLLEGE OF THE FRASER VALLEY

COURSE INFORMATION

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

Course Revised Implementation Date: January 1997

Chemistry 112	Principles of Chemistry II	4
SUBJECT/NUMBER OF COURSE	**DESCRIPTIVE TITLE**	**UCFV CREDITS**

CALENDAR DESCRIPTION: Chemistry 112 is a continuation of CHEM 111 and focuses on chemical reactions through a study of thermodynamics, kinetics, equilibrium, oxidation-reduction processes, electrochemistry, and acid-base behaviour. Students are also introduced to the fundamentals of organic chemistry. Work performed in the laboratory component of the course complements the material covered in lectures. Many of the experiments have been designed to introduce students to some of the important techniques that will be encountered in subsequent chemistry courses.

RATIONALE:

COURSE PREREQUISITES: CHEM 111

COURSE COREQUISITES: MATH 112 and PHYS 102 or 112

HOURS PER TERM FOR EACH STUDENT	**Lecture**	**75**	**hrs**	**Student Directed Learning**		**hrs**
	Laboratory	**30**	**hrs**	**Other - specify:**		
	Seminar		**hrs**			**hrs**
	Field Experience		**hrs**	**TOTAL**	**105**	**HRS**

MAXIMUM ENROLMENT: 35

Is transfer credit requested? : Yes 9 No

AUTHORIZATION SIGNATURES:

Course Designer(s): P. Slade/N.S. Dance/L. Martin/A. Last **Chairperson**: T. Cooper
Curriculum Committee

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

PAC: Approval in Principle _____ **PAC: Final Approval**: November 7, 1996
(Date) **(Date)**

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Chemistry 112
NAME & NUMBER OF COURSE

SYNONYMOUS COURSES:

(a) replaces N/A
(course #)

(b) cannot take Chem 102 for further credit
(course #)

SUPPLIES/MATERIALS:

TEXTBOOKS, REFERENCES, MATERIALS (List reading resources elsewhere)

TEXTS:

Chemistry, Principles and Practice, 2nd ed., Reger, Goode and Mercer (Saunders)
UCFV Laboratory Manual for Chemistry 112 & 112

REFERENCES:

Chemistry and Chemical Reactivity, 1st/2nd ed., John Kotz & Keith Purcell (Saunders)
Chemistry, A Conceptual Approach, 6th ed., Charles E. Mortimer (Wadsworth)
Chemistry: Experiment and Theory, Allen & Keefer (Harper and Row)
Chemical Principles, 4th ed., Dickerson, Gray, Darensbourg & Darensbourg (W.A. Benjamin)

OBJECTIVES:

Students enrolling in this course should have a strong background in chemistry, hence an "in-depth" approach to most topics can be attempted.

GENERAL: Students should be able to demonstrate a knowledge of basic principles and apply them to new situations and calculations using mathematics where required. The critical and rational thought processes will be continually challenged and developed.

SPECIFIC: Students should be able to perform the following:

a) Develop fundamental theories from experimental data and/or observations.
b) Appreciate the connection between the theoretical and experimental.
c) Be aware of the need for an ordered yet flexible approach to the varied topics.
d) Be aware of the need for care, precision, and accuracy in the subject generally, and in the laboratory particularly.
e) Appreciate and be competent in combining the uncertainties inherent in experimental data.

Chemistry 112
NAME & NUMBER OF COURSE

METHODS:

Presentation of the course will be through interrelated class (theory), seminar, and laboratory sessions. Class sessions will promote active student participation to ensure continual mutual feedback in order to reinforce the learning process. Films and audio-visual aids will be used where appropriate. Problem assignments will be continually given. Some selected problems will be collected and marked.

STUDENT EVALUATION PROCEDURE:

Students will be evaluated according to the following scheme:

Laboratory (reports and techniques)	20%
In-term examinations (2 or 3)	35-45%
Instructor assessment: assignments, class participation, attendance	5-10%
Final examination	30-35%

* Less vocal students will be positively encouraged to express opinions.

COURSE CONTENT

Oxidation-Reduction: Oxidation numbers, balancing redox equations by the half-equation and oxidation number methods. Redox stoichiometry.

Electrochemistry: Electrochemical cells, standard electrode potentials, Nernst equation and calculations. Electrolytic cells, Faraday's Laws and calculations. Relationship - with spontaneity; cell reversibility, overvoltage, etc.

Thermodynamics: State functions, constant volume/constant pressure situations, internal energy, enthalpy, Hess's Law, 1st Law, bond energies and associated calculations. Spontaneity, entropy, Gibbs Energy, 2nd Law, $\Delta G = \Delta H - T\Delta S$ and calculations. 3rd Law and absolute entropies. Thermodynamic aspects of cells.

Kinetics: Concentration and temperature dependence of rate. Rate constant, order of reaction, Arrhenius equation, activation energy, all associated calculations. Catalysis and collision theory. Reaction mechanisms-time permitting (steady state approximation and equilibrium law application).

Chemical Equilibria: Equilibria in gaseous and heterogeneous systems. K_c, K_p calculations, Le Chatelier's Principle.

Ionic Equilibria: Arrhenius, Bronsted-Lowry acids and bases. Ionization of water, pH, strong and weak acids and bases, salt hydrolysis, titrations, buffer solutions, solubility product, sulphide precipitations, calculations on all aforementioned.

Chemistry 112
NAME & NUMBER OF COURSE

COURSE CONTENT: (contd.)

Descriptive Chemistry: Relating to previous principles.

Organic Chemistry - Carbon in relation to its neighbours, bonding, nomenclature, preparations and reactions of various functional groups (alkanes, alkenes, alkynes, alcohols, aldehydes, ketones, carboxylic acids, esters, alkyl halides). Isomerism: structural isomers, stereoisomers: - geometric/cis-trans (E/Z nomenclature), optical isomers (enantiomers). Reaction mechanism (S_N1, S_N2).
Time permitting: polymers, biochemistry.

LABORATORY EXPERIMENTS

Selected for recommendation to Lab Instructors:
(These may be varied from year to year at the Lab Instructor's discretion)

1. The Chemistry of Chromium and Manganese
2. Electrochemical and Electrolytic Cells.
3. Thermodynamics: The Entropy and Enthalpy of Solution of Lead(II) Chloride in Water
4. Rate of Chemical Reactions: The Iodine Clock Reaction
5. Ionic Equilibria: Potentiometric Acid-Base Titrations
6. Reversible Reactions and Chemical Equilibrium (lab transferred from Chemistry 112)
7. Qualitative Analysis of Cations (two week lab)
8. Organic Chemistry: The Chemistry of Hydrocarbons and Alcohols
9. Organic Chemistry: Preparation of Benzoic Acid (choose one method)

Alternate labs that can be used at the Lab Instructor's discretion:

1. Oxidation-Reduction Titration (Use of Potassium Permanganate)
4. Rate of Chemical Reactions: The Bromination of Acetone
10. Preparation of Aspirin