UNIVERSITY COLLEGE of the FRASER VALLEY

PAC FORM #2

COURSE IMPLEMENTATION DATE:[**September 1997**]
Revised: November 1999
COURSE TO BE REVIEWED DATE:[**January 2003**]
(Four years after implementation date)

OFFICIAL COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.

Shaded headings are subject to change at the discretion of the department and material will vary - see course syllabus available from instructor

FACULTY/DEPARTMENT: **CHEMISTRY DEPARTMENT**

CHEM 451		**3**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

BIO-INORGANIC CHEMISTRY
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

Bio-inorganic chemistry is a rapidly expanding area and provides an important bridge between chemistry and biology. Students will study a variety of biological systems involving both main-group and transition metals.

PREREQUISITES: CHEM 221 and CHEM 231

COREQUISITES: None

SYNONYMOUS COURSE(S)
(a) Replaces: N/A
(Course #)
(b) Cannot take N/A for further credit
(Course #)

SERVICE COURSE TO:
(Department / Program)
(Department / Program)

TOTAL HOURS PER TERM: **42**

STRUCTURE OF HOURS:

Lectures:	42	hrs
Seminar:		hrs
Laboratory:		hrs
Field Experience:		hrs
Student Directed Learning:		hrs
Other (Specify):		hrs

TRAINING DAY-BASED INSTRUCTION
LENGTH OF COURSE:
HOURS PER DAY:

MAXIMUM ENROLMENT: **24**

EXPECTED FREQUENCY OF COURSE OFFERING:

WILL TRANSFER CREDIT BE REQUESTED? **YES** ____ **NO** **X**

TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE: **YES** ____ **NO** **X**

AUTHORIZATION SIGNATURES:

Course designer(s): N. Dance
Chairperson: *(Curriculum Committee)*
Department Head: N. Weinberg
Dean: K. Wayne Welsh
PAC Approval in Principle Date:
PAC Final Approval Date: Nov 24, 1999

CHEM 451

COURSE NAME / NUMBER

LEARNING OBJECTIVES / GOALS / OUTCOMES/ LEARNING OUTCOMES:

The course is designed to enable students to relate the more theoretical aspects of inorganic chemistry, covered in Chem 221 and Chem 231, such as bonding and structure, to the properties of biological systems.

METHODS:

Presentation of the course will be by interrelated theory classes ("lectures"), and discussion periods ("seminars"). Audio visual aids will be used where appropriate, and students will be expected to use the ucfv library for literature research. Students may be required to present seminars or research papers.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Credit can be awarded for this course through PLAR YES _____ NO ___X___

METHODS OF OBTAINING PLAR:

TEXTBOOKS, REFERENCES, MATERIALS:

S.J. Lippard and J.M. Berg. Principles of Bioinorganic Chemistry

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

Evaluation will be based on the following system:

First in-term test	20%
Second in-term test	20%
Collected assignments or seminar presentations	20%
Final examination	40%

COURSE CONTENT:

The course will be based on the required text. The course will also make use of reprint materials.

1. **Introduction** - Essential and non-essential elements. Cycles of macronutrients and trace elements. Biological ligands and ligand specificity. Hard and soft acids and bases. Stability constants. Kinetics of aquo exchange processes. Binding residues in amino acids.

2. **Phosphorus Chemistry** - Transport enzymes involving ATP. Kinases, role of group IA and IIA cations. Cell membranes.

3. **Review of Protein Structure, Enzymes, Coenzymes.**

4. **Metals in Photosynthesis** - Role of magnesium and manganese.

COURSE CONTENT: (contd.)

5. **Dioxygen Carriers and Storage** - Hb Mb Hc and Hr and O_2 binding. Synthetic models for oxygen-binding proteins. O_2 activation. Monooxygenases. Cytochrome P450. Tyrosinase. Methene mono--oxygenase. Role of copper. Dioxygenases and oxidases. Superoxide Dismutase. Horse Radish Peroxidases. Catalase.

6. **Electron Transfer Processes** - Cytochrome a, b and c. Blue copper protein. Fe-S protein. Molybdoenzymes and cabalamins.

7. **Non-Redox Metalloenzymes.**

8. **Nitrogen Fixation** - Nitrogenases. Nitrate reductase. Fe and Mo proteins and enzymes.

9. **Pharmaceuticals** - Therapeutic activity of chelating agents. Platinum complexes in chemotherapy. Biological chemistry of gold complexes. Radiopharmaceuticals.

10. **Toxicity of Heavy Metals and Other Elements** - Toxicity of Cu, Cd, Pb, Hg, Se, As, Be, V, Cr, Mn, Ni.

11. **Physical Methods** - Illustrative examples involving electronic spectroscopy, ORD, CD, EXAFS, ESR, NMR, Mossbauer spectroscopy and cyclic voltametry.

Reading Resources:

Lippard, Stephen J. and Berg, Jeremy M. Principles of Bioinorganic Chemistry, 1st ed., University Science Books, 1994.

Kaim, Wolfgang and Schwederski, Brigitte. Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life, 1st ed., Wiley, 1994.

Cowan, James A. Inorganic Biochemistry: An Introduction, 1st ed., VCH, 1993.

Frausto da Silva, J.J.R. and Williams, R.J.P. The Biological Chemistry of the Elements: the Inorganic Chemistry of Life,1st ed., Oxford University Press, 1991.

Ochiai, Ei-ichiro. General Principles of Biochemistry of the Elements., 1st ed., Plenum Press, 1987, Inc., 1967.

Hay, Robert W. Bio-Inorganic Chemistry, 1st ed., Halsted Press, 1984.