UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE:[September 1998
COURSE REVISED IMPLEMENTATION DATE: September 2003
COURSE TO BE REVIEWED DATE: September 2007

(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 455		**3**
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

CHEMISTRY OF BIOLOGICAL AND SYNTHETIC POLYMERS

COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:
The course concentrates on: (a) the chemistry of synthetic organic, inorganic and biomedical polymers, with emphasis on polymerization reactions; the characterization, structure and properties of polymers and their role in industrial processes and (b) the chemistry of naturally occurring organic and inorganic polymers, with emphasis on the extraction and purification, characterization, structure and properties of proteins, nucleic acids, polysaccharides, cellulose, chitin, rubber and lignin and their role in biological processes.

PREREQUISITES: One of: CHEM 211 or CHEM 213; and one of: CHEM 212 or CHEM 214.

COREQUISITES: None

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

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): L. Spier
Chairperson: (*Curriculum Committee*)
Department Head: N. Weinberg
Dean: J. Snodgrass
PAC Approval in Principle Date:
PAC Final Approval Date: December 4, 2002

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COURSE NAME / NUMBER

LEARNING OBJECTIVES / GOALS / OUTCOMES/ LEARNING OUTCOMES:

The course is designed to enable students to appreciate the significance of polymer chemistry in all aspects of modern life, and to investigate and understand:

1. The applications of organic and inorganic chemistry to the preparation, properties and structures of polymers.
2. The use of physical methods to test and characterize polymers.
3. The relationship between structure and properties of polymers.
4. Industrial polymer technology.
5. The preparation and properties of biomedical polymers.

METHODS:

Presentation of the course will be by inter-related theory classes ("lectures") and discussion periods ("seminars"). Audio-visual aids will be used where appropriate. Students will be expected to be conversant with the use of an academic library.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

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

METHODS OF OBTAINING PLAR:

TEXTBOOKS, REFERENCES, MATERIALS:

Polymer Chemistry, 3rd Edn. - R.B. Seymour and C.E. Caraher, 1992.

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

Evaluation will be based on the following system:

First In-Term Test	20%
Second In-Term Test	20%
Problem Sets	10%
Oral or written presentations	10%
Final Examination	40%

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COURSE CONTENT:

The course will be based on the required text (Seymour and Carraher), and chapter numbers are from the text. The course will also make use of reprinted materials.

Part a: Synthetic Polymers.

1. **Introduction.** Origins of polymer science and the polymer industry. Nomenclature and definitions.

2. **Synthesis of Polymers.** Condensation, free-radical, ionic, Ziegler-Natta and other classes of polymerization reactions. Co-polymerization reactions.

3. **Characterization of Polymers**. Polymer structure. Rheology of polymer melts and solutions. Determination of molar mass of polymers. Physical tests: stress-strain relationships, deformation mechanisms and electrical properties.

4. **Reactions of Polymers.** Reactions of polyolefins, polyenes, polyamides, pendant aliphatic and aromatic groups. Condensation and chelation reactions. Reactivity of end-groups.

5. **Inorganic Polymers.** Inorganic reaction mechanisms. Condensation organometallic polymers. Coordination poymers. Addition polymers. Portland cement, silicon dioxide, asbestos, graphite and diamond. High-temperature superconductors.

Part b: Biological Polymers.

6. **Extraction and Purification.** Chromatography, elctrophoresis, ultracentrifugation and other techniques.

7. **Proteins.** The peptide bond. Primary, secondary, tertiary and quaternary structure. Enzymes, hormones and antibodies. Structural proteins: collagen, keratin, fibroin, elastin actin, myosin and chitin.

8. **Nucleic Acids.** Primary and secondary structure of deoxyribonucleic acid and ribonucleic acid. Replication and repair of deoxyribonucleic acid. Transcription and replication of ribonucleic acid. Messenger RNA and the genetic code. Mechanisms of protein synthesis. Control of nucleic acid function. Cancer and reverse transcription. Mutations. Antibiotics and nucleic acid function. Recombinant DNA.

9. **Polysaccharides.** Glycosidic and other bonds. Structures. Homopolysaccharides. Heteropolysaccharides. Glycosaminoglycans. Bacterial polysaccharides. Biosynthesis, chemical synthesis and industrial utilization of polysaccharides.

10. **Rubber and Lignin.** Rubber and gutta percha. Elasticity and structure. Biosynthesis. Chemical synthesis of polyisoprenes. Biosynthesis of lignin. Properties of lignin.

ADDITIONAL SUPPORTING MATERIALS:

Books:

Young, R.J. and Lovell, P.A. *Introduction to Polymers.* 2nd Edn. Chapman and Hall, 1991.

MacGregor, F. and Greenwood, R.J. *Polymers in Nature.* John Wiley and Sons, 1980.

Bovey, Frank A. *Chain Structure and Conformation of Macromolecules.* Academic Press, 1982.

Billmeyer, Fred W. *Textbook of Polymer Science.* John Wiley and Sons, 1989.

Kroschwitz, N. *Polymers: Biomaterial and medical Applications.* John Wiley and Sons, 1989.

Muzzarelli, Ricardo A. *Chitin.* Oxford University Press, 1977.

Dawids, F. *Polymers: Their Properties and Blood Compatibility.* Kluwer Academic. Publishers, 1989.

Elias, Hans-Georg. *Mega-Molecules.* Springer-Verlag 1987.

Seymour, R. and Carraher, C.E. *Giant Molecules.* John Wiley, 1990.

Benham, R. and Kinstle, J. *Chemical Reactions on Polymers.* A.C.S., 1988.

Szycher ,M. and Robinson, W.J. *Synthetic Biomedical Polymers*. Technomic Publishing, 1980.

Nevell, T.P. and Jeronian, S.H. *Cellulose Chemistry and its Applications.* Elis Horwood Ltd, 1985.