UNIVERSITY COLLEGE of the FRASER VALLEY

COURSE IMPLEMENTATION DATE: September 1998
COURSE REVISED IMPLEMENTATION DATE: September 2007
COURSE TO BE REVIEWED: March 2011
(Four years after UPAC final approval date) (MONTH YEAR)

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 the material will vary - see course syllabus available from instructor

FACULTY/DEPARTMENT: **Faculty of Science, Health & Human Services/Chemistry**

CHEM 455		3
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

Chemistry of Biological and Synthetic Polymers
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This 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: CHEM 213 and CHEM 214
COREQUISITES:

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: **39**
STRUCTURE OF HOURS:

Lectures:	**39**	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 ENROLLMENT: **24**
EXPECTED FREQUENCY OF COURSE OFFERINGS: **Every two years**
WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only) ☐ Yes ☐ No
WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department) ☐ Yes ☒ No
TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE: ☐ Yes ☒ No

AUTHORIZATION SIGNATURES:

Course Designer(s): Lesley Spier
Chairperson: *(Science Curriculum Committee)* Art Last
Department Head: Art Last
Dean: Wanda Gordon
UPAC Approval in Principle Date:
UPAC Final Approval Date: Mar. 30, 2007

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

Upon successful completion of this course, students will:
- appreciate the significance of polymer chemistry in all aspects of modern life,
- 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.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Credit can be awarded for this course through PLAR (Please check:) ☒ Yes ☐ No

METHODS OF OBTAINING PLAR:

Examination

TEXTBOOKS, REFERENCES, MATERIALS:

[Textbook selection varies by instructor. An example of texts for this course might be:]

Introduction to Polymer Chemistry, C.E. Carraher, 2007

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

[An example of student evaluation for this course might be:]

In-term tests	30%
Problem sets	10%
Oral or written presentations	20%
Final examination	40%

COURSE CONTENT:

[Course content varies by instructor. An example of course content might be:]

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 polymers. 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.