UNIVERSITY COLLEGE of the FRASER VALLEY

PAC FORM #2

COURSE IMPLEMENTATION DATE: { Jan-2004 }
COURSE REVISED IMPLEMENTATION DATE: { Sep-2003 }
COURSE TO BE REVIEWED: { Sep-2007 }
(FOUR (4) YEARS AFTER IMPLEMENTATION 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 material will vary - see course syllabus available from instructor.

FACULTY/DEPARTMENT: CHEMISTRY

CHEM 214	CHEM 212	4
COURSE NAME/NUMBER	FORMER COURSE NUMBER	UCFV CREDITS

ORGANIC CHEMISTRY II
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

Organic Chemistry II continues the systematic examination of the reactions of common functional groups that were featured in Chem 213. Aromatic compounds including phenols, carbonyl condensation reactions, carboxylic acids and their derivatives are studied. Biological topics include amino acids, peptides, proteins, phospholipids, terpenes, steroids, nucleic acids and the Krebs Cycle. Spectroscopy is studied and the importance of spectroscopic techniques in the analysis of organic compounds is emphasized. These techniques will be used in the laboratory component of the course. With Chem 213, this course satisfies organic chemistry requirements for students pursuing careers in chemistry, biology, biochemistry, home economics, forestry, pre-medicine and pharmaceutical science.

PREREQUISITES: CHEMISTRY 213

COREQUISITES: NONE

SYNONYMOUS COURSE(S)

(a) Replaces: Chemistry 212 (Course #)

(b) Cannot take: _____ (Course #) for further credit

SERVICE COURSE TO:

_____ (Department / Program)

_____ (Department / Program)

TOTAL HOURS PER TERM: 84

STRUCTURE OF HOURS:

Lectures:	45 hrs.
Seminar:	hrs.
Laboratory:	39 hrs.
Field Experience:	hrs.
Student Directed Learning:	hrs.
Other (Exams):	hrs.

Combination of Lecture and Lab Hours: _____ **YES/NO**

TRAINING DAY-BASED INSTRUCTION

LENGTH OF COURSE: N/A

HOURS PER DAY: N/A

MAXIMUM ENROLMENT: 24

EXPECTED FREQUENCY OF COURSE OFFERING: at least once every year

WILL TRANSFER CREDIT BE REQUESTED?: (Lower-level courses only) **YES** X **NO** _____

WILL TRANSFER CREDIT BE REQUESTED?: (Upper-level requested by department) **YES** X **NO** _____

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

AUTHORIZATION SIGNATURES:

Course designer(s): Peter W. Slade, Arthur M. Last

Course reviewed by: (type name in this field)

Department Head: Noham Weinberg

Chairperson: (type name in this field) **(Curriculum Committee)**

Dean: Jackalyn Snodgrass

PAC Approval in Principle Date: (type date in this field)

PAC Final Approval Date: (December 4, 2002)

CHEM 214

COURSE NAME / NUMBER

LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:

Students enrolling in this course will be pursuing careers in chemistry or biology notably, but also other careers requiring a strong background in chemistry.

GENERAL: Students will understand the fundamental principles or organic chemistry.

SPECIFIC: Students will be able to use material from this course to:

1. Understand the basic principles underlying organic chemistry and apply them to new situations using a systematic and logical approach (e.g., in reaction syntheses).
2. Perform laboratory syntheses and analyses with care, precision and confidence.
3. Relate the information obtained in laboratory experimentation to the theoretical presentations in class sessions.
4. Appreciate the connection between organic syntheses and biological systems, where applicable.

METHODS:

Presentation of the course will be by inter-related class (theory) 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 may be collected and marked.

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

Credit can be awarded for this course through PLAR **YES** X **NO**

METHODS OF OBTAINING PLAR:

Course challenge

TEXTBOOKS, REFERENCES, MATERIALS:

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

TEXTBOOK: Organic Chemistry, 5th edition, John McMurry (Brooks/Cole)

UCFV Laboratory Manual for Chemistry 211 and 212

REFERENCES: Organic Chemistry, 4th edition, L.G. Wade Jr. (Prentice-Hall)

Organic Chemistry, 6th edition, Morrison and Boyd (Allyn and Bacon)

Organic Chemistry, 3rd edition, Fessenden & Fessenden (Brooks/Cole)

Organic Chemistry, 8th edition, T.W.G. Solomons and C. Fryhle (John Wiley & Sons)

SUPPLIES / MATERIALS:

Laboratory supplies required. Students are encouraged to purchase a set of molecular models.

STUDENT EVALUATION:

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

This will conducted under a flexible system guided by the following:

Laboratory (reports and techniques)	25%
Mid-Terms	2 x 20%
Final	35%

CHEM 214
COURSE NAME / NUMBER

COURSE CONTENT:

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

Aromatic Compounds: McM ch. 15, ch. 16, (ch 28?)

Aromaticity, Huckel's rule, common aromatic heterocyclic compounds.

Electrophilic substitution (nitration, alkylation, halogenation, sulphonation), mechanism and effect of substituents on rate and position of substitution. Side chain derivatives.

Phenols: McM ch. 7 (7.10 - 7.11). Structure and nomenclature. Physical properties (H-bonding, acidity - contrast with alcohols and acids).

Preparations and reactions (ring substitution, ether formation, effect of ring substitution on acidity).

Spectroscopy: McM ch. 12 (12.1 - 12.8) & ch. 13. Mass spectrometry - interpretation of spectra for alkanes and alkyl fragments, and the behaviour of common functional groups. Infra-red - bond stretching and bending, identification of major functional groups by stretching and bending modes (C-H, C-O, C-C, O-H, COOH, N-H, N-O). PMR - basic concepts, shielding, chemical shift, spin-spin coupling, application to spectra. Determination of unknown structures by ir and pmr spectroscopy. General application to lab work.

Carboxylic Acids and Derivatives: McM ch. 20, ch. 21 (omit 21.10), *27.1, *27.2.

Review of nomenclature. Preparation (oxidation, Grignard reagents, hydrolysis of nitriles). Structures of acids and acid derivatives. Acidity.

Nucleophilic acyl substitutions to acids and their derivatives using reaction mechanisms. Use of acids and derivatives in multi-step syntheses.

Reactions (conversion to esters, amides, anhydrides, acid chlorides). *fats, oils, soap and detergents.

Aldehydes and Ketones: Carbonyl condensation reactions, Ch. 22(22.3 - 22.5 & 22.7); ch. 23 (23.1 - 23.7 & [23.8 - 23.9]).

Condensation - aldol, crossed, aldol, Claisen. Use of crossed aldol reactions in multi-step syntheses. Malonic acid and acetoacetic ester syntheses.

Amines: McM ch. 24. Nomenclature, preparation (reduction of nitro compounds, alkylation, reductive amination, reduction of nitriles, Gabriel method. Basicity and effect of ring substitution of electron donating and electron withdrawing groups on the basicity of aromatic amines. Reactions of amines with alkyl halides, benzene sulphonyl chloride, and nitrous acid. Use of diazonium compounds in multi-step syntheses and in coupling reactions. Sulphanilamide and sulpha drugs: synthesis and function.

Amino Acids and Proteins: McM ch. 26.

Structures and nomenclature of amino acids. Isoelectric point, cationic, anionic, and zwitterionic forms. Synthesis of amino acids by ammonolysis, amination, (Strecker synthesis), modified Gabriel and Gabriel/Malonic ester methods. Peptide and protein structures. Dipeptide and polypeptide syntheses, use of protecting group, coupling. Merrifield automated protein synthesis. Analysis by Edman or Sanger degradation, partial hydrolysis, sequencing.

Phospholipids, Terpenes and Steroids: McM ch 27 (27.3 - 27.8)

Mainly structural details.

Nucleic acids

McM ch 28 (28.8 - 28.10)

Structure of nucleotides, A/T/G/C, phosphate esters, pk_a of phosphate, base-pairing in DNA and RNA.

?Citric Acid Cycle/Krebs Cycle?: McM ch. 29 and/or instructor handouts. Study of glycolysis and Krebs Cycle to demonstrate biochemical efficiency. Study of Krebs Cycle to illustrate previously discussed reactions:

(a) aldol condensation, (b) dehydration, (c) hydration, (d) oxidation, and (e) decarboxylation.

LABORATORY EXPERIMENTS

1. Synthesis and Separation of Ortho- and Para-Nitrophenols (two week)
2. Infra-red Spectroscopy: Liquid and solid Samples
3. Synthesis of a Carbonyl Compound (vacuum distillation): Synthesis of Sulcatol
4. Qualitative Organic Analysis: Sodium Fusion and Functional Group Tests
5. Carboxylic Acids and their Derivatives (amide and anilide)
6. Syntheses of Amines (tribromoaniline, p-bromoacetanilide, p-bromoaniline) (two week)
7. Reactions of Amines: Characterization by Derivative Formation and Identification.