Today's Date: 01/26/2016

Course ID: CHEM V12B
CC Approval: 04/02/2013
Effective Term: Fall 2013

Ventura College

COURSE OUTLINE OF RECORD

I. **Course Information** (Printed catalog data elements)

A. Discipline:
Chemistry

B. Course ID:
CHEM V12B

C. Course Title: General Organic Chemistry II
D. Units: 3.00
E. Hours:

Lecture/wk: 3.00
Total Semester Contact Hours (based on 17.5 week semester): 52.50

F. Prerequisite(s):
CHEM V12A with grade of C or better

G. Corequisite(s):
None

H. Recommended preparation:
None

I. Enrollment Limitation:
None

J.
Description:

This course continues the study of functional groups such as carboxylic acids and their derivatives, carbonyls, amines, and phenols. The emphasis is again on reaction mechanisms, structure determination using nuclear magnetic resonance and infrared spectroscopy, synthesis, and applications. A major part of this course is devoted to the study of biochemistry.

K. Former course ID: Chem 12B
L. Transfer Status:
CSU Recommended
UC Recommended

II. **Course Objectives**

- Upon successful completion of this course, the student will be able to demonstrate the following measurable skills and abilities:
  - A. Categorize, arrange and assemble structures of aldehydes, ketones, carboxylic acids, acid derivatives, amines, phenols, sugars and proteins using IUPAC, derived, and common systems of nomenclature.
  - B. Examine, evaluate, and formulate mechanisms for the reactions of aldehydes, ketones, carboxylic acids,

acid derivatives, amines, phenols, sugars, and proteins given reactant and target compounds, and propose alternate steps in reaction mechanisms for common reactions.

C. Examine, evaluate, and formulate appropriate multi-step synthetic pathways leading to target compounds involving aldehydes, ketones, carboxylic acids, acid derivatives, amines, phenols, sugars, and proteins.

D. Evaluate spectra (infrared, mass, hydrogen NMR, carbon NMR, UV) to formulate structures for organic compounds involving aldehydes, ketones, carboxylic acids, acid derivatives, amines, phenols, sugars, and proteins.

E. Analyze stereochemistry by building models and drawing three-dimensional models of aldehydes, ketones, carboxylic ac Ids, acid derivatives, amines, phenols, sugars, and proteins.

F. Relate principles of organic chemistry to biosynthetic reaction pathways.

G. Investigate organic chemical reaction, by evaluating chemical data, constructing hypotheses, and applying the scientific method to formulate conclusions based on logical reasoning of the available information.

III. **Course Content**

A. Chemistry of benzene: electrophilic aromatic substitution
1. Aromatic substitutions
2. Substituent effects in substituted aromatic rings
3. Nucleophilic aromatic substitution
4. Oxidation -reduction of aromatic compounds

B. Alcohols and phenols
1. Naming alcohols and phenols
2. Properties preparation and reactions of alcohols and phenols
3. Protection of alcohols
4. Spectroscopy of alcohols and phenols

C. Ethers and Epoxides: thiols and sulfides
1. Naming ethers
2. Structure, properties, and sources of ethers
3. Reactions of ethers epoxides and thiols
    a. Williamson ether synthesis
    b. Alkoxymercuration of alkenes
    c. Claisen rearrangement
    d. Expoide and thiol
4. Spectroscopy of ethers

D. Aldehydes and ketones: nucleophilic addition reactions
1. Naming aldehydes and ketones
2. Preparation and reactions of aldehydes and ketones
    a. Oxidation reduction
    b. Nucleophilic addition reactions
    c. Acetal formation
    d. Wittig
    e. Cannizzaro
    f. Conjugate nucleophilic addition
3. Nucleophilic addition of amines : imine and enamine
4. Spectroscopy of aldehydes and ketones

E. Carboxylic acids and derivatives
1. Naming carboxylic acids and derivatives
2. Structure and physical properties preparation and reactions of carboxylic acids and derivatives
3. Acidity of carboxylic acids and benzoic acids with substituent effects
4. Spectroscopy of carboxylic acids
5. Nucleophilic acyl substitution reactions
6. Reactions of acid halides, acid anhydrides, esters , amides, nitriles, polyamides and polyesters

F. Carbonyl alpha substitution reactions
1. Keto enol tautomerism

2. Reactivity of enols: the mechanism of alpha substitution reactions
    a. Alpha halogenation of aldehydes and ketones
    b. Hell Volhard Zlinskii reaction
    c. Acidity of alpha hydrogen atoms: enolate ion formation and reactivity of enolate ions
    d. Haloform reaction
3. Alkylation of enolate ions

G. Carbonyl condensation reactions
1. Carbonyl condensation reactions and related reactions
    a. Aldol and mixed aldol
    b. Alpha substitution
    c. Dehydration of aldol products
    d. Using aldol reactions in synthesis
    e. The Claisen and mixed claisen condensation reactions
    f. Dieckmann, Michael, Robinson and Stork Enamine reactions

H. Amines
1. Structure, bonding, properties, sources and reactions of amines
2. Basicity of substituted arylamines
3. Synthesis of amines
4. Tetraalkylammonium salts as phase transfer catalysts

I. Biomolecules: carbohydrates
1. Classification of carbohydrates
2. Fischer projections, D, L sugars
3. Cyclic configurations of the aldoses
    a. Hemiacetal formation
    b. Mutarotation
4. Reactions of monosaccharides
5. The Fischer proof
6. Disaccharides and polysaccharides poly, and their synthesis

J. Blomolecules: amino acids, peptides, and proteins
1. Structures of amino acids, peptides and proteins
    a. Isoelectric points
    b. Synthesis
    c. Resolution of R,S amino acids
    d. Bonding and structure
2. Enzymes
3. Citrate synthase

K. Biomolecules: lipids waxes, fats, and oils
1. Soap
2. Phospholipids
3. Prostaglandins
4. Terpenes and biosynthesis of terpenes
5. Steroids and steroid biosynthesis

L. Biomolecules: heterocycles and nucleic acids
1. Structures of pyrrole, furan , and thiophene
    a. Electrophilic substitution reactions of pyrrole, furan, and thiophene
2. Pyridine, a six membered heterocycle
3. Electrophilic substitution of pyridine
4. Nucleophilic substitution of pyridine
5. Fused ring heterocycles
6. Nucleic acids and nucleotides
    a. Structure of nucleic acids
    b. Base pairing in DNA

c. Heredity

Total lecture content: 52.5 hours

Total Lecture Content Hours:

IV. Lab Content:

Total Lab Content Hours:

V. **Assignments**

A. **Representative In-class Assignments** that develop critical thinking (required for degree applicable courses) may include, but are not limited to:

Student Activities:	Write composition(s) and/or report(s) and/or essay(s)	Write research paper(s) and/or term paper(s) and/or other paper(s)	Solve computational and/or symbolic problems	Conduct and experiment or survey	Engage in analytical discussions	Prepare oral presentations	Develop skills in performance/activities	Create and analyze projects	Other (specify below)
Critical Thinking Skills	**Student Activities involved in each skill**								
Evaluating	✓		✓		✓				
Appraising and assessing	✓		✓		✓				
Justifying	✓		✓		✓				
Synthesizing	✓		✓		✓				
Developing and formulating	✓		✓		✓				
Analyzing	✓		✓		✓				
Solv problems	✓		✓		✓				
Applying principles	✓		✓		✓				
Comprehending concepts	✓		✓		✓				
Identifying knowledge	✓		✓		✓				
Other (describe): Comments:									

B. **Representative Out-of-class Assignments**

Reading: Read approximately 40 pages per week from text. (2 hours per week)
Writing: Minimum 5 page per week consisting of a minimum of 20 assigned homework problems. (1 hour per week)
Problem solving: Approximately 20 problems, I multi-step synthesis and I spectral analysis per week. (3 hours per week)
Research: On-line research required for spectra identification and syntheses problems.
Library Work: 3-16 hours per semester as needed.
Skills practice: -
Other: Total outside study: 105 hours
Total Outside Assignments Hours:

VI. **Representative Instructional Modes -**

Lecture
Audio Visual Presentations
Class Activities
Class Discussions
Collaborative Group Work
Computer-aided Presentation/Assignments
Demonstrations
Independent Study
Internet Research
One-on-one conference
Problem Solving
Reading Assignments
Small group activities

VII. **Evaluation Methods -** Substantively related to the course objectives.

A. **Writing.**
essay exam(s)
written homework

B. **Problem Solving.** Computational or non-computational problem-solving demonstrations, including:
exam(s)
quiz(zes)
homework problem(s)
other (specify) : On-line Exercises

C. **Skills demonstrations.** Including:
active and informed participation
other (specify) : On-line Exercises

D. **Objective examinations.** Including:
multiple choice
true/false
matching items
completion

VIII. **Textbooks**

List representative textbooks, manuals, and other instructional materials/publications, including those materials to be put in the Library/LRC(Learning Resources Center).

Author(s)	**Title(s)**	**Publisher(s)**	**Date(s)**
Bruice P	Organic Chemistry	Pearson	2011

Other appropriate publications/instructional materials such as representative recommended readings, repertoire, non-print media (eg.,websites, audio/visual recordings), and software.

Other
Other Appropriate Publications:

1. The chemistry website: http://fp.academic.venturacollege.edu/doliver

Discipline-specific websites: Yes

IX. **Minimum Qualifications**
Chemistry (Masters Required)

X. **Student Learning Outcomes**

CSLO-1 Categorize, arrange, and assemble structures of aromatics, ketones, aldehydes, carboxylic acids, esters, amines, and biochemical amino acids using IUPAC and common systems of nomenclature, in addition to continued ChemV12A knowledge.

CSLO-2 Examine, evaluate, and formulate mechanisms for the reactions of aromatics, ketones, aldehydes, carboxylic acids, esters, and amines given reactants and reagents; in addition to continued ChemV12A knowledge.

CSLO-3 Ability to propose the multi-step synthesis for common functional groups using all learned reagents from ChemV12 and ChemV12B.

CSLO-4 Evaluate spectra (infrared, msas spec, H1 NMR, C13 NMR) to formulate structures for alkanes, alkenes, alkynes, alkyl halides, cyclics, alcoholcs, ethers, ketones, aldehydes, carboxylic acids, esters, amines, and aromatics.