**MOHAWK VALLEY COMMUNITY COLLEGE**

**UTICA AND ROME, NEW YORK**

### COURSE OUTLINE

**CH247--Organic Chemistry 1** **C-3, P-4, Cr-5**

**Catalog Description**

Pre-requisites: CH141 General Chemistry 1 and CH142 General Chemistry 2

This course introduces organic chemistry for science and engineering students. It includes a systematic study of classes of carbon compounds. It stresses structure, optical activity, chemical physical properties, reaction mechanisms, methods of synthesis, and nomenclature. Topics includealkanes, alkenes, alkynes, organohalides, alcohols and phenols, and stereochemistry.

**Student Learning Objectives**

Upon the completion of Organic Chemistry 1, the students will be able to:

1. Demonstrate an understanding of the principles of atomic and molecular structure, bonding and acid-base chemistry.

2. Identify organic compounds that have chiral centers, specify their configuration and draw their mirror images.

3. Properly draw the structural formula/ write the IUPAC name, and demonstrate an understanding of the properties, of organic molecules with the following functional groups:

1. Alkanes
2. Alkenes
3. Alkynes
4. Organohalides
5. Alcohols and Phenols

4. Demonstrate an understanding of the kinetics and thermodynamics involved in chemical reactions.

5. Present the chemical reactions of the different functional groups studied (see item 3), and reasoning with reaction mechanisms.

6. Devise methods to synthesize organic compounds.

7. Utilize up-to-date instrumentation (GC and FTIR) in the laboratory.

8. Use communication skills effectively through written exams and lab reports.

9. Demonstrate critical thinking skills by predicting reactions and determining how to best synthesize certain organic compounds.

10. Demonstrate an understanding of hazardous waste and safety precautions that must be followed when dealing with organic chemicals.

11. Demonstrate an understanding of the importance of organic chemistry in life science and the world around.

**Major Topics**

Basic concepts — atomic, molecular and hybrid orbitals; covalent bonding, shapes of molecules; isomers; basic resonance theory; polarity of molecules and bonds; physical properties and intermolecular forces; functional groups and families of organic compounds; acid and base properties, equilibria, and relative acid/base strengths; potential energy diagrams of reactions, activation energies of reactions.

Hydrocarbons — structure and physical properties; conformational analysis of alkanes; relative stabilities of alkenes and alkynes.

Stereochemistry — chirality; optical activity, specific rotation, optical purity and meso compounds; enantiomers and diastereomers; resolution of a racemic mixture; ring strain and conformations of cycloalkanes; stereochemistry in reactions.

Organic Nomenclature — IUPAC Nomenclature of alkanes, cycloalkanes,

alkenes, cycloalkenes, alkynes, alkyl halides, and alcohols; E/Z Nomenclature system for alkenes.

Mechanisms — introduction to mechanisms; curved arrow notation.

Synthesis — basic retro-synthetic analysis; synthesis of alkanes, alkenes, alkynes, organohalides, alcohols and phenols.

Reactions — nucleophilic substitution reactions (SN1 and SN2); elimination reactions (E1, E2 and E1cB); hydrogenation of alkenes and alkynes; alkylation of terminal alkynes; reduction of alkyl halides; dehydrohalogenation of alkyl halides, Zaitsev and Hofmann rules; addition of hydrogen halides, sulfuric acid, water, and halogens to alkenes and alkynes; Oxidations of alkenes and alkynes, syn hydroxylation, oxidative cleavage, ozonolysis; dehydration of alcohols; formation of halohydrins; elimination of dihalides; free radical reactions, halogenation of alkanes and radical addition to alkenes.

**Organic Chemistry 1** **LABORATORY SCHEDULE**

The Organic Chemistry Laboratory sequence should accomplish several objectives: Illustrate organic lab techniques, demonstrate organic synthesis, demonstrate analysis of organic compounds, illustrate descriptive chemistry, and reinforce concepts presented in lecture.

The following sequence of laboratory exercises is one of many that would serve the purpose of the organic laboratory:

Experiments

(Technique 9)-Melting points of organic compounds

9-Acetaminophen

11B-Isolation of caffeine from tea

12- Isopentyl Acetate

13-Essential oils from cloves

25-Gas chromatographic analysis of gasolines

15-Isolation of chlorophyll and carotenoid pigments from spinach

22-4-Methylcyclohexene

Technique 25-Introduction to Infrared Spectroscopy

21-Synthesis of n-butyl bromide and t-pentylchloride

19- Reactivities of some alkyl halides

Updated on 4/11/2018