CHM 251 ORGANIC CHEMISTRY I

COURSE DESCRIPTION:

Prerequisites: CHM 152 with a C or better
Corequisites: None

This course provides a systematic study of the theories, principles, and techniques of organic chemistry. Topics include nomenclature, structure, properties, reactions, and mechanisms of hydrocarbons, alkyl halides, alcohols, and ethers; further topics include isomerization, stereochemistry, and spectroscopy. Upon completion, students should be able to demonstrate an understanding of the fundamental concepts of covered organic topics as needed in CHM 252. Laboratory experiments, including spectroscopy and chromatography, and computer-based exercises augment and reinforce the basic principles discussed in lecture as well as provide practical laboratory skills. This course has been approved to satisfy the Comprehensive Articulation Agreement for transferability as a major and/or elective course requirement. Course Hours Per Week: Class, 3. Lab, 3. Semester Hours Credit, 4.

LEARNING OUTCOMES:

Upon completion of this course, students will be able to:

a. Describe the electronic structure of the atom.
b. Explain electronegativity.
c. Write molecular and structural formulas.
d. Describe acids and bases.
e. Identify the potential for hydrogen bonding.
f. Identify functional groups.
g. Use organic nomenclature.
h. Describe alkanes, alkenes, and alkynes.
i. Describe geometric isomerism in alkenes and cyclic compounds.
j. Explain the properties of organohalogen compounds.
k.

D. Cycloalkanes

III. Introduction to molecular geometry
A. Ethane
B. Energy in molecules
C. Rotation and conformation
D. Intramolecular effects
E. *cis* and *trans* isomers
F. Physical properties of alkanes

IV. Hydrocarbons, alkenes and alkynes
A. Alkenes
B. Hybrid bonding in double and triple bonds
C. sp and sp^2 bonds
D. p - p covalent bonding, π bonds
E. Single bonds: σ bonds
F. s character, p character and the energy of bonding orbitals
G. Bond energy
H. Unsaturation equivalent
I. Introduction to nomco

VII. Making and breaking chemical bonds
- A. s character, p character and the energy of bonding orbitals
- B. Combustion
- C. Bond energy
- D. Free radical substitution
- E. Reactive intermediates

VIII. Addition reactions to orbitals
- A. Acids and bases
- B. Protons
- C. Energy changes
- D. Stereochemistry
- E. Introduction to electrophilic addition reactions

IX. Basic nomenclature
- A. Alkanes and branched alkanes
- B. Alkenes, alkynes
- C. Rings
- D. Alcohols
- E. Halides
- F. Multiple functionality

X. Electrophilic addition to π bonds
- A. Heterolytic cleavage
- B. Electrophiles
- C. Electrophilic attack
- D. Nucleophiles
- E. Markownikoff rule

XI. Unsaturated systems
- A. Electrophilic addition
- B. Dehydration of alcohols
- C. Stabilization of intermediates by resonance

XII. Introduction to stabilized systems
- A. Hydrogenation
- B. Heat of hydrogenation
- C. Dienes
- D. Introduction to resonance

XIII. Benzene
- A. Cyclohexane
- B. Cyclohexene
- C. Bonding
- D. Stabilization
- E. Aromaticity

XIV. Spectroscopy
- A. Infrared spectrum
- B. Nuclear magnetic resonance spectra

XV. Electrophilic addition to benzene and aromatic systems

A. Electrophilic addition
B.