

**I. CATALOG DESCRIPTION:**

A. Division: Science and Math  
Department: Chemistry  
Course ID: CHEM 104  
Course Title: Introduction to Organic and Biochemistry  
Units: 4  
Lecture: 3 hours  
Laboratory: 3 hours  
Prerequisite: CHEM 101

B. Course Description:  
An introduction to the structure, bonding and typical chemical properties of the different classes of organic compounds and biomolecules. Introduction to Chemistry.

Schedule Description:  
An introduction to the structure, bonding and typical chemical properties of the different classes of organic compounds and biomolecules. Introduction to Chemistry.

**II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One**

**III. EXPECTED OUTCOMES FOR STUDENTS**

Upon completion of the course, the student should be able to:

- A. Recognize and identify chemical formulas and structures
- B. Investigate toxicity, use, and dosage of chemicals in standard references
- C. Recognize the uses of common organic chemicals
- D. Identify nucleic acids and recognize their role in the organism
- E. Differentiate between common plastics and polymers and their uses
- F. Identify common, safe food-additives
- G. Recognize hazardous household chemicals
- H. Acquire a basic knowledge of the role and the metabolism of carbohydrates, lipids, and proteins.
- I. Recognize the foods that are necessary for healthy nutrition
- J. Recognize the role of enzymes, hormones, and neurotransmitters
- K. Recognize the physiological role of blood and other extracellular fluids

**IV. CONTENT:**

- A. Saturated Hydrocarbons organic and inorganic compounds structural features of Organic compounds
  - Isomerism and functional groups
  - Alkanes and cycloalkanes
  - Naming alkanes and cycloalkanes
  - Chemical properties of alkanes
- B. Unsaturated Hydrocarbons
  - Occurrence and naming the alkanes
  - Geometric isomers
  - Addition reactions to the double bond.
  - Reaction mechanism of addition reactions
  - Addition polymers
  - Benzene ring and aromatic properties
  - Naming benzene compounds

- C. Alcohols, Phenols, Ethers and Thioalcohols Occurrence, types, and Names of alcohols
  - Phenols
  - Ethers
  - Thioalcohols and Disulfides
- D. Aldehydes and ketones
  - Structure and physical properties of aldehydes and ketones
  - Naming aldehydes and ketones
  - Oxidation and reduction of Aldehydes and ketones
  - Reaction of aldehydes and ketones with alcohols
- E. Carboxylic acids and esters
  - Occurrence, names and physical properties of carboxylic acids
  - Acidity of carboxylic acids
  - Conversion of acids to esters
  - Occurrence, names, and physical properties of esters
  - Reactions of esters
  - Organophosphate esters and anhydrides
- F. Amines and amides
  - Occurrence, Names, and Physical properties of amines
  - Chemical Properties of Amines
  - Amides of carboxylic acids
- G. Optical Isomers
  - Types of Isomerism
  - Molecular Chirality
  - Optical Activity
- H. Carbohydrates
  - Monosaccharides
  - D- and L- Families of Carbohydrates
  - Cyclic Forms of Monosaccharides
  - Disaccharides
  - Polysaccharides
- I. Lipids
  - What Lipids Are
  - Chemical Properties of Triacylglycerols
  - Phospholipids
  - Steroids
  - Cell Membranes
- J. Proteins
  - Amino Acids and Protein Structure
  - Primary Structures of Proteins
  - Secondary Structures of Proteins
  - Tertiary Structures of Proteins
  - Quaternary Structures of Proteins
  - Properties of Protein
  - Glycoprotein components of Cell Membranes
  - Classes of Protein
- K. Enzymes, Hormones, and Neurotransmitters
  - Enzymes and the Substrate Complex
  - Regulation of Enzymes
  - Enzymes in Medicine
  - Chemical Communication
  - Hormones and Neurotransmitters

- L. Extracellular Fluids of the body
  - Digest juice
  - Blood and Absorption of Nutrients by Cells
  - Blood and the exchange of Respiratory Gases
  - Acid-Base Balance of the Blood
  - Blood and the functions of the Kidneys
- M. Nucleic Acids
  - Heredity and the Cell
  - Structure of Nucleic Acids
  - Ribonucleic Acids
  - m RNA – Directed Polypeptide Synthesis
  - Viruses
  - Recombinant DNA Technology and Genetic Engineering
  - Hereditary Disease and Genetic Engineering
- N. Metabolism of Carbohydrates
  - Glycogen Metabolism
  - Glucose Tolerance
  - Catabolism of Glucose
  - Gluconeogenesis
- O. Metabolism of Lipids
  - Absorption and Distribution of Lipids
  - Storage and Mobilization of Lipids
  - Oxidation of Fatty Acids
  - Bio synthesis of Fatty Acids
  - Ketoacidosis
- P. Metabolism of Nitrogen compounds
  - Synthesis of Amino Acids in the Body
  - Catabolism of Amino Acids
  - Formation of Urea
  - Catabolism of Other Nitrogen Compounds
- Q. Nutrition
  - General Nutritional Requirements
  - Protein Requirements
  - Vitamins
  - Minerals
  
- V. **METHODS OF INSTRUCTION:**
  - A. Lecture
  - B. Laboratory
  - C. Discussion
  - D. Demonstration
  - E. Video
  - F. Examination
  - G. Models
  
- VI. **TYPICAL ASSIGNMENTS:**
  - A. Lecture - Read chapter on Aldehydes and Ketones  
Do problems at end of chapter.
  - Lab - Do exercises on Structure Alcohol , Oxy Carbonyl and Ester  
Quiz on Exp 46, Exp 47, & Exp. 48 From last week

**VII. EVALUATION(S):**

A. Methods of Evaluation

- 1) Exams
- 2) Quizzes

Typical Multiple Choice Exam

How many aldohexoses are possible?

- a) 2    b) 4    c) 8    d) 16    e) Some other number

Typical Problem Solving question

Using glucose draw and label both possible anomers. Can a furanose structure exist as anomers?

- 3) Laboratory performance

Criteria:

Attendance  
Participation  
Safety skills  
Lab reports  
Quizzes

B. Frequency of Evaluations

Exams are given every couple of weeks, so typically 4 to 5 exams a semester are given, and a comprehensive final is given during "finals week."

Quizzes (optional) are given every about every week.

Lab work and assignments are on a weekly basis.

**VIII. TYPICAL TEXT(S):**

John R. Holum, Organic & Biological Chemistry, New York, NY  
John Wiley & Son Inc, 1996

Laboratory Manual

John R. Holum, Fundamentals of General, Organic and Biological Chemistry, New York, NY  
John Wiley & Son Inc, 1994

Or

Bettelheim and March, Introduction to Organic and Biochemistry, 3<sup>rd</sup> ed.; San Diego, CA,  
Harcourt Brace, 1998.

(Optional)

John R. Holum, Study Guide For Organic & Biological Chemistry, New York, NY  
John Wiley & Son Inc, 1996

**IX. OTHER SUPPLIES REQUIRED OF STUDENTS:**

Scientific Calculator  
Lab Coat or apron  
Detergent and Towel  
Matches