COURSE INFORMATION FORM

DISCIPLINE
Chemistry

COURSE TITLE
Organic Chemistry II

CR.HR 5  LECT HR. 3  LAB HR. 4  CLIN/INTERN HR.  C CLOCK HR. 

CATALOG DESCRIPTION
Nomenclature, reactions, stereochemistry, physical properties, and spectroscopy of aromatic compounds, alcohols, ethers, aldehydes, ketones, amines, carboxylic acids, and their derivatives. Further explorations of the mechanisms and kinetics of organic reactions. Introduction to biochemical compounds.

PREREQUISITES
CHEM 221 with a grade of C or better.

EXPECTED STUDENT OUTCOMES IN THE COURSE (ESO)
Upon completion of this course, the student will be able to:

1. Describe shapes of organic molecules using bonding theory.
2. Infer molecular conformation based on minimizing potential energy and strain.
3. Evaluate stereochemical properties of organic and biochemical compounds.
4. Employ kinetics, thermodynamics, and stereochemistry to explain reaction mechanisms.
5. Use IUPAC rules to name organic and simple biochemical compounds.
6. Analyze the relationship between structure and physical properties of organic and biochemical compounds.
8. Infer structures of molecules from chemical tests and spectroscopic data.
9. Demonstrate safe and proper laboratory techniques for experimental chemistry procedures.
10. Collect, organize, and evaluate experimental data.
11. Use chemical reference material to locate information on chemical topics.
12. Evaluate and make informed appraisals of social and political issues involving chemical processes.
13. Communicate chemical information clearly.
GENERAL EDUCATION OUTCOMES (ESO)
Specify which general education outcomes, if any, are substantially addressed by the course. Numbers in parentheses identify the Expected Student Outcomes linked to the specific General Education Outcome.

CLASS-LEVEL ASSESSMENT MEASURES
Student accomplishment of expected student outcomes may be assessed using the following measures. (Identify which measures are used to assess which outcomes.)

1. Homework assignments (1-8, 12, 13)
2. Laboratory notebooks and reports (6, 8, 10, 11, 13)
3. Quizzes (1-8, 12, 13)
4. Examinations (1-8, 12, 13)
5. Instructor evaluation of performance of laboratory work (9)
Individual instructors may order this outline as fits the needs of their individual courses. In addition, they may place more emphasis on some areas than on others. What is assured is that this particular list is covered in the course. Other topics may be added to a course as the instructor sees fit, and as time and interest allow. An *asterisk can be used to mark an item as optional.

I. Alcohols
   A. Nomenclature and physical properties
   B. Preparation
   C. Reactions and their mechanisms
      1. Substitution
      2. Elimination

II. Ethers
   A. Nomenclature and physical properties
   B. Preparation and reactions
   C. Epoxides
   D. Arene oxides
   E. Crown ethers

III. Thiols, sulfides, sulfonium salts
   A. Nomenclature and physical properties
   B. Preparation and reactions

IV. Organometallic compounds
   A. Organolithium compounds
   B. Organomagnesium compounds
   C. Coupling reactions

V. Aromatic compounds
   A. Criteria for aromaticity
   B. Chemical consequences of aromaticity

VI. Benzene
   A. Nomenclature
   B. Electrophilic aromatic substitution reactions
      1. Halogenation
      2. Nitration
      3. Sulfonation
      4. Friedel-Crafts acylation
      5. Friedel-Crafts alkylation
VII. Substituted benzenes
   A. Nomenclature
   B. Substituent effects
      1. Reactivity
      2. Orientation
      3. $\text{pK}_a$
   C. Synthetic applications of arene diazonium salts
   D. Nucleophilic aromatic substitution

VIII. Polycyclic aromatic compounds

IX. Carbonyl compounds
   A. Nomenclature and physical properties
   B. Reactions
      1. Hydrolysis
      2. Nucleophilic acyl substitution
      3. Nucleophilic acyl addition
      4. Nucleophilic addition-elimination
      5. Reactions of $\alpha, \beta$-unsaturated carbonyl compounds
      6. Reactions at the $\alpha$-carbon
      7. Protecting groups

X. Oxidation-reduction reactions
   A. Oxidizing agents and oxidation reactions
      1. Alcohols
      2. Aldehydes and ketones
      3. Alkenes
      4. Oxidative cleavage
   B. Reducing agents and reactions

XI. Amines
   A. Nomenclature
   B. Preparation and physical properties
   C. Acid-base properties
   D. Reactions
   E. Phase transfer catalysis
   F. Heterocycles

XII. Carbohydrates*
   A. Classification
   B. Stereochemistry
   C. Monosaccharides
   D. Hemiacetals
   E. Disaccharides
   F. Polysaccharides
XIII. Proteins*
   A. Amino acids
   B. Peptide bonds
   C. Peptide synthesis
   D. Protein structure
      1. Primary
      2. Secondary
      3. Tertiary
      4. Quaternary
   E. Denaturation

XIV. Nucleic acids*
   A. Nucleosides and nucleotides
   B. Structure of DNA and RNA
   C. Biosynthesis
      1. Replication
      2. Transcription
      3. Translation

XV. Lipids*
   A. Fatty acids
   B. Waxes
   C. Fats and oils
   D. Biological membranes
   E. Prostaglandins
   F. Terpenes
   G. Steroids

XVI. Synthetic polymers*

XVII. Laboratory component
   A. Experiments correlated to lecture topics
   B. Introduction to qualitative organic analysis