COURSE ABBREVIATION  CHEM 2642
CREDIT HOURS  3 Semester Hours
COURSE TITLE  Fundamental Organic Chemistry II
PREREQUISITES  CHEM 2641 lecture and lab with C or better
COREQUISITE  CHEM 2642 Lab

CATALOG DESCRIPTION
This is the second in a two-semester sequence of organic chemistry. Topics include an in-depth study of reaction mechanisms, functional group transformations and the synthesis of moderately complex molecules by multi-step strategies. The study of molecular spectroscopy is included.

ENTRY LEVEL COMPETENCIES
Upon entering this course the student is expected to have mastery of topics commonly covered in the first semester of organic chemistry. In particular the student should be able:

1. Name simple acyclic or cyclic organic compounds consistent with the structural formula and draw the correct structure corresponding to its IUPAC name.
2. Identify reactive sites in molecules and ions and predict/explain the relative reactivities of substances based on structural (inductive, resonance, steric) effects.
3. Identify stereochemical relationships and draw structures of stereoisomers using conventional notations to express the correct absolute configurations of molecules containing chiral centers.
4. Predict and explain predominant reaction pathways of nucleophilic substitution, elimination, and addition reactions based on an analysis of thermodynamics and kinetic theory.
5. Use the concept of hybridized bonds to explain the geometry and reactivity of saturated hydrocarbons and unsaturated hydrocarbons.
6. Understand the role of nucleophiles, electrophiles and free radicals in organic reaction mechanisms.
7. Suggest appropriate reagents to perform organic reactions on examples similar to those studied in the course.
GENERAL EDUCATION OUTCOMES

I. This course addresses the general education outcome relating to communications as follows:
   a. Students develop their reading comprehension skills by reading the text, handout materials, and any other lecture materials not included in the text.
   b. Students develop their listening skills through lecture discussions and group exercises.
   c. Students develop their reading and writing skills by completing problems and exercises developed specifically to enhance their understanding of chemical principles. Students provide written or oral solutions to these exercises individually or as a group.

II. This course addresses the general education outcome relating to the student’s demonstration of effective critical thinking skills in a variety of individual or group settings as follows:
   a. Students learn critical thinking skills in individual and group settings by solving problems in the classroom or at home.
   b. Critical thinking skills are encouraged in many ways, one of which is by the solicitation of a student’s responses to questions asked in lecture.

III. This course addresses the general education outcome relating to a student’s ability to recognize and apply the scientific method of “inquiry” in a variety of settings as follows:
   a. Students apply the scientific method to the analysis of problems that illustrate the application of chemical principles in real systems.
   b. Students use quantitative mathematical models that quantitate scientific phenomenon; and where applicable, relate the results to other everyday situations.
   c. Students use abstract models or life situation models to understand new theories.

EXPECTED EDUCATIONAL RESULTS

Upon successful completion of this course, the students should be able to:

1. Predict the physical properties (e.g. hydrophilicity, lipophilicity, solubility, boiling point, etc.) of molecules and ions.
2. Demonstrate an understanding of the mechanistic use of acids, bases, nucleophiles, electrophiles and free radicals to explain the functional group transformation of alcohols, aromatic compounds, ethers, epoxides, thiols, sulfides, ketones, aldehydes, carboxylic acids, esters and ester derivatives.
3. Demonstrate proficiency in the use of reagents in a sequential manner in order to carry out complex multistep syntheses.
4. Differentiate between aromatic and nonaromatic compounds by the application of Hückel’s rule.
5. Predict the major product in the electrophilic aromatic substitution reactions of aromatic rings containing one or more directing groups.
6. Demonstrate proficiency in the nomenclature of all classification group discussed in CHEM 2642.
COURSE CONTENT

- Aromatic chemistry – the structure and properties of aromatic compounds, Hückel’s rule, and the reactions of aromatic compounds including ring reactions and side-chain reactions
- Organometallic compounds – preparation and synthetic application
- Alcohols, Ethers, Epoxides, Thiols and Sulfides – preparation and synthetic application
- Carbonyl chemistry – preparation of carbonyl compounds and reactions including nucleophilic additions and enolate chemistry
- Amine Chemistry
- Optional special topics (eg. carbohydrates, amino acids, lipids, or nucleic acids)

ASSESSMENT OF EXPECTED EDUCATIONAL OUTCOMES

A. Course Grade
   The course grade will be determined by the instructor (under the guidelines of the discipline) using a combination of quizzes, homework, special activities and exams. A comprehensive final exam is required. This exam must count for no less than 20% but no more than 30% of the course grade.

B. Program Assessment
   CHEM 2642 may be assessed each semester voluntarily by the instructor using an exam keyed to the expected learning outcomes or an independently based performance assessment tool such as the American Chemical Society standard organic examination, a commonly accepted national norm used by other schools in Georgia for this course. The GPC faculty may voluntarily compile these results annually in partial fulfillment of the program assessment of the chemistry curriculum in general. The organic faculty may voluntarily come to a common agreement each year on the appropriate assessment tool to be used for that year. The organic faculty members who choose to assess the organic curriculum shall be mindful that the chosen assessment tool should be one that lends itself to comparison to similar organic programs elsewhere.

C. Use of Assessment Findings
   The organic faculty and the chemistry curriculum committee will analyze the results of the assessment data to determine the effectiveness of the organic curriculum by seeking answers to the following questions:
   1. Are students showing an improvement in performance by a uniform assessment standard?
   2. Which learning outcomes correlate well with the performance standard of the accepted assessment tool?
   3. Which learning outcomes do not correlate well with the performance standard of the accepted assessment tool?
   4. What changes or modifications in course content, instructional strategies and learning outcomes are recommended in order to improve student performance?

EFFECTIVE DATE: August 2004  APPROVED DATE: May 5, 2004