

**STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK**



COURSE OUTLINE

CHEM 302 – Organic Chemistry II

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**SCHOOL OF SCIENCE, HEALTH & PROFESSIONAL STUDIES
SCIENCE DEPARTMENT
May 2015**

CHEM 302– Organic Chemistry II

- A. **TITLE:** Organic Chemistry II
- B. **COURSE NUMBER:** CHEM 302
- C. **CREDIT HOURS:** 4 credit hours
- D. **WRITING INTENSIVE COURSE (OPTIONAL):** N/A
- E. **COURSE LENGTH:** 15 weeks
- F. **SEMESTER(S) OFFERED:** Spring
- G. **HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY:**
Three hours lecture per week and three hours of laboratory per week

H. **CATALOGUE DESCRIPTION:**

This course is a continuation of Organic Chemistry I. The lecture portion of the course will include oxygen containing functional groups, aromaticity, benzene and its derivatives, carbanions, nitrogen containing functional groups, and heterocyclics. The laboratory portion of the course will be comprised of organic syntheses. Three hours lecture and three hours laboratory per week.

- I. **PRE-REQUISITES/CO-COURSES:** Prerequisites: CHEM 301 (Organic Chemistry I)

J. **GOALS (STUDENT LEARNING OUTCOMES):**

The student learning outcomes listed in the following table are applicable to both CHEM 301 and 302 and are consistent with the American Chemical Society's Committee on Professional Training Organic Chemistry Curriculum Supplement(August 2008)

| <i>Course Objective</i> | <i>Institutional SLO</i> |
|---|--|
| 1. Define chemical bonding and its consequences on the molecular structure and reactivity of organic chemicals | 3. Prof. Competence |
| 2. Define polar bonds , molecular polarity, acids and bases and predict how the terms influence the chemical behavior of organic chemicals | 2. Crit. Thinking 3. Prof. Competence |
| 3. Know the structure, IUPAC/CAS nomenclature, stereochemistry, preparation and reactions of organic chemical functional groups | 3. Prof. Competence |
| 4. Using the basic preparative reactions and the reactions of organic functional groups to perform multistep syntheses including retrosynthetic analysis of target molecules | 2. Crit. Thinking 3. Prof. Competence |
| 5. Define the basic principles of infrared spectroscopy, CMR/PMR resonance spectroscopy, ultraviolet spectroscopy, and mass spectroscopy Interpret the aforementioned spectroscopies to elucidate the structure and/or identification of an organic chemical compound | 2. Crit. Thinking 3. Prof. Competence |
| 6. Perform basic laboratory skills associated with the | 1.Communication |

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|---|--|
| synthesis, isolation, and purification of organic chemical compounds, monitor the progress of an organic chemical reaction and maintain a laboratory notebook as a record of laboratory exercises | 2. Crit. Thinking 3. Prof. Competence |
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K. **TEXTS:**
Karty, Joel, *Organic Chemistry: Principles and Mechanisms*, W.W. Norton and Co. Inc., New York, NY, 2014, with *SmartWork*® Online Homework Access

Heldt, N., *Organic Chemistry II, Laboratory Manual, Spring 2016*, on-line via Blackboard

L. **REFERENCES:** N/A

M. **EQUIPMENT:** N/A

N. **GRADING METHOD:** (A-F)

O. **MEASUREMENT CRITERIA/METHODS:**

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| Class Grade (quizzes, exams, online graded homework) | 60% |
| Laboratory Assignments and Practical | 25% |
| Comprehensive Final Exam | 15% |

P. **DETAILED TOPICAL OUTLINE:**

Lecture

1. Organic Synthesis 1: Beginning Concepts
2. Orbital Interactions 2: Extended π Systems, Conjugation, and Aromaticity
3. Structure Determination 1: Ultraviolet- Visible and Infrared Spectroscopies
4. Structure Determination 2: Nuclear Magnetic Resonance Spectroscopy and Mass Spectrometry
5. Nucleophilic Addition to Polar π Bonds 1: Addition of Strong Nucleophiles
6. Nucleophilic Addition to Polar π Bonds 2: Addition of Weak Nucleophiles and Acid and Base Catalysis
7. Organic Synthesis 2: Intermediate Topics of Synthesis Design; Useful Reduction and Oxidation Reactions
8. Nucleophilic Addition– Elimination Reactions 1: The General Mechanism Involving Strong Nucleophiles
9. Nucleophilic Addition– Elimination Reactions 2: Weak Nucleophiles
10. Electrophilic Aromatic Substitution 1: Substitution on Benzene; Useful Accompanying Reactions
11. Electrophilic Aromatic Substitution 2: Substitution on Mono- and Disubstituted Benzene and Other Aromatic Rings
12. The Diels– Alder Reaction and Other Pericyclic Reactions
13. Reactions Involving Free Radicals
14. Polymers

Laboratory

1. Extraction and Distillation of Clove oil
2. Hydrolysis of an Ester

3. Biodiesel Reaction (Transesterification)
4. Spectroscopy lab (FTIR, UV-Vis, and NMR)
5. Nitration of aromatic compound (methyl benzoate)
6. Synthesis of an Ether
7. Preparation of Camphor
8. Synthesis of Grignard Reagent
9. Synthesis of Triphenylmethanol Using Grignard Reagent
10. Friedel-Crafts Reaction
11. Wittig Reaction
12. Diels Adler Reaction
13. Lab Practical