

# Minnesota State University Moorhead

## CHEM 360: Organic Chemistry II

### A. COURSE DESCRIPTION

Credits: 3

Lecture Hours/Week: 3

Lab Hours/Week: 0

OJT Hours/Week: \*.\*

Prerequisites:

CHEM 350 - Organic Chemistry I

Corequisites: None

MnTC Goals: None

The structure, nomenclature, reactions, reaction mechanisms, and synthesis of carbon compounds that contain oxygen and nitrogen.

**B. COURSE EFFECTIVE DATES:** 08/25/2008 - Present

### C. OUTLINE OF MAJOR CONTENT AREAS

1. Nuclear Magnetic Resonance Spectroscopy
2. Amines
3. Carboxylic Acids
4. Carboxylic Acid Derivatives
5. Conjugated Systems and Aromatic Compounds
6. Alcohols: Structure, Synthesis, and Reactions and Organometallics
7. Ketones and Aldehydes
8. Condensations and Alpha Substitutions of Carbonyl Compounds. (Enolates)

## D. LEARNING OUTCOMES (General)

1. Acid-Base: Predict, rank, and apply acidities of carboxylic acids, phenols, water, alcohols, ketones, esters, 1,3-dicarbonyls, and ammoniums, and predict, rank, and apply basicities of their conjugate bases, relative to other acids and bases. Apply the impact of electron donors or withdrawers, and the impact of lone-pair hybridization.
2. Classify, explain, and apply fundamental reactions. Be able to recognize, classify, explain, and apply fundamental organic reactions such as oxidation reactions; reduction reactions; Grignard reactions; anionic additions; acid-catalyzed additions, eliminations, and substitutions; enolate reactions; and hydrolysis reactions.
3. Demonstrate Understanding in Miscellaneous Scenarios Involving Alcohols, Aldehydes, Ketones, Amines, Carboxylic Acids, Acid Chlorides, Anhydrides, Esters, and Amides. Answer questions and explain/predict/apply physical properties, nomenclature, synthesis, reactions, mechanisms, and synthesis design/retrosynthesis to scenarios involving alcohols, aldehydes, ketones, amines, carboxylic acids, acid chlorides, anhydrides, esters, and amides.
4. Draw Mechanisms. Draw logical and detailed mechanisms for various fundamental reactions involving alcohols, aldehydes, ketones, amines, carboxylic acids, acid chlorides, anhydrides, esters, amides, and arenes.
5. NMR: Demonstrate understanding of fundamental 1D Nuclear Magnetic Resonance spectroscopy. This will include being able to solve for chemical structure given an H-NMR or C-NMR spectrum and a molecular formula; being able to predict <sup>1</sup>H-NMR chemical shifts, splitting and integration; being able to predict C-NMR chemical shifts; being able to diagnose NMR equivalence and non-equivalence; being able to demonstrate fluency in the terminology of NMR; and being able to use Infrared Spectroscopy to identify characteristic functional groups.
6. Predict and explain Patterns and Properties. Predict and explain patterns in structure, hybridization, acidity, basicity, solubility, and reactivity for alcohols, aldehydes, ketones, amines, carboxylic acids, acid chlorides, anhydrides, esters, amides, and arenes by understanding and applying concepts of organic structure and bonding and stability.
7. Predict reaction products. Be able to predict products in the reactions of alcohols, aldehydes, ketones, amines, carboxylic acids, acid chlorides, anhydrides, esters, amides, and arenes.
8. Nomenclature. Provide correct IUPAC names for aldehydes, ketones, amines, carboxylic acids, esters, and either alcohols or arenes.
9. Retrosynthetic analysis and Synthesis Design. Use retrosynthetic analysis to design efficient one-step or multistep syntheses involving alcohols, aldehydes, ketones, amines, carboxylic acids, acid chlorides, anhydrides, esters, amides, and arenes as starting materials, intermediates or final products.
10. Synthesis Design: Given a starting chemical, suggest reactants or sequences of reactions/reactants that could transform the starting material into a target product.
11. Synthesis Reactions: Demonstrate understanding of reactions and reaction pathways involved in the synthesis of organic structures.

## E. Minnesota Transfer Curriculum Goal Area(s) and Competencies

None

## F. LEARNER OUTCOMES ASSESSMENT

As noted on course syllabus

## G. SPECIAL INFORMATION

None noted