

NEW COURSE PROPOSAL

PROGRAM: BIOLOGICAL AND PHYSICAL SCIENCES

- 1. Catalog Description of the Course.** [Include the course prefix, number, full title, and units. Provide a course narrative including prerequisites and corequisites. If any of the following apply, include in the description: Repeatability (May be repeated to a maximum of ___ units); time distribution (Lecture ___ hours, laboratory ___ hours); non-traditional grading system (Graded CR/NC, ABC/NC). Follow accepted catalog format.]

CHEM 314. ORGANIC CHEMISTRY II (3)

Three hours of lecture per week

Prerequisite: CHEM 311 with a grade of C or better.

An examination of the structure, reactions, and spectroscopy of organic compounds containing one or more functional groups, and the structures and reactions of biologically relevant molecules.

2. Mode of Instruction.

	Units	Hours per Unit	Benchmark Enrollment
Lecture	3	1	50
Seminar			
Laboratory			
Activity			

- 3. Justification and Learning Objectives for the Course.** (Indicate whether required or elective, and whether it meets University Writing, and/or Language requirements) [Use as much space as necessary]
Students interested in pre-professional programs (pre-medical, pre-veterinary, pre-dental, and pre-pharmacy) or a obtaining a minor in Chemistry should take this course.

Organic Chemistry is the study of chemical compounds that contain carbon and their chemical reactions. This course is the second semester of a two semester sequence that is generally an admission requirement for medical, veterinary, dental, or pharmacy schools. In combination with CHEM 311, CHEM 312, CHEM 315, and CHEM 400, this course completes the chemistry requirements for the Biology major.

Students who successfully complete this course will be able to:

- Outline the development of the field of organic chemistry from a historical perspective and how organic chemistry has impacted society
- Describe the scientific method and how it is used to approach the study of organic molecules
- Explain the behavior of organic reactions using their knowledge of thermodynamics and kinetics and the geometric and electronic structures of organic molecules
- Interpret infrared, mass, and nuclear magnetic resonance spectra of molecules that have arene rings and/or multiple functional groups
- Identify the reactions and synthesis of alcohols, ethers, aldehydes, ketones, esters, carboxylic acids, amides, amines, carboxylic acid halides, carboxylic acid anhydrides, and enolates
- Contrast organic reactions with biological reactions
- Describe the structure, reactions, and properties of carbohydrates and amino acids

- 4. Is this a General Education Course** **YES** **NO**
If Yes, indicate GE category:

- 5. Course Content in Outline Form.** [Be as brief as possible, but use as much space as necessary]

Aromaticity and Aromatic Compounds

Historical context of the structure of benzene and other organic molecules

- Examples of aromatic and heteroaromatic compounds
- Naming of aromatic compounds
- Hückel's Rule
- Molecular orbital description of aromatic compounds
- Aromatic ions and heterocycles
- Spectroscopy of aromatic compounds
- Reactions of Aromatic Compounds*
 - Electrophilic aromatic substitution
 - Substituent effects on reactivity and regioselectivity
 - Synthesis of substituted benzenes
 - Reactions of substituents
 - Nucleophilic aromatic substitution
 - Synthesis and reactions of diazonium salts
- Alcohols: Structures and Reactions*
 - Naming of alcohols
 - Acid-base reactivity of alcohols and phenols and substituent effects on acidity
 - Synthesis of alcohols by addition reactions
 - Oxidation of alcohols
 - Biological examples alcohol synthesis and reactions
 - Spectroscopy of alcohols
- Aldehydes and Ketones: Structures and Reaction*
 - Naming of aldehydes and ketones
 - Addition and addition-elimination reactions of aldehydes and ketones
 - Biological examples aldehyde and ketone synthesis and reactions
 - Spectroscopy of aldehydes and ketones
- Carboxylic Acids: Structures and Reactions*
 - Naming of carboxylic acids
 - Acid-base reactions of carboxylic acids
 - Synthesis of carboxylic acids
 - Reactions of carboxylic acids
 - Fatty acids
 - Biological examples alcohol of carboxylic acid synthesis and reactions
 - Spectroscopy of carboxylic acids
- Carboxylic Acid Derivatives and their Preparation*
 - Naming of esters, amides, acid halides, acid anhydrides, and nitriles
 - Nucleophilic acyl substitution mechanism and relative reactivity of carboxylic acid derivatives
 - Biological examples of carboxylic acid derivative synthesis and reactions
 - Spectroscopy of carboxylic acid derivatives
- Synthesis and Reactions of Enols and Enolates*
 - Enol-keto tautomerization
 - Acidity of α -hydrogens of carbonyl compounds and synthesis of enolates
 - Halogenation and alkylation of enols and enolates
 - Aldol and Claisen condensation reactions
 - Michael reaction
 - Biological examples of the reactions of enols and enolates
- Amines: Structures and Reactions*
 - Naming of amines and amino acids
 - Acid-base reactions of amines and anilines
 - Synthesis and reactions of amines
 - Tetraalkylammonium salts as phase-transfer agents
 - Biological examples of amines, their synthesis and reactions
 - Spectroscopy of amines
- Carbohydrates: Structures and Reactions*
 - Names and structures of monosaccharides
 - Reactions of monosaccharides
 - Glycoside formation
 - Disaccharides and polysaccharides

6. References. [Provide 3 - 5 references on which this course is based and/or support it.]

McMurray, J. *Organic Chemistry*, 5th Ed., 2000
Weeks, D. P. *Pushing Electrons*, 3rd Ed., 1998
Wade, L. G., Jr. *Organic Chemistry*, 5th Ed., 2002
Bruice, P. *Organic Chemistry*, 3rd Ed., 2000

7. List Faculty Qualified to Teach This Course.

Dr. Philip Hampton

8. Frequency.

a. Projected semesters to be offered: Fall _____ Spring X Summer _____

9. New Resources Required.

None.

10. Consultation.

Attach consultation sheet from all program areas, Library, and others (if necessary)

11. If this new course will alter any degree, credential, certificate, or minor in your program, attach a program modification.

Philip Hampton _____ 1/8/03 _____
Proposer of Course Date