CHEM 111 - Introduction to Organic & Biological Chemistry
Course Outline

Approval Date: 03/16/2018
Effective Date: 06/01/2018

SECTION A

Unique ID Number	CCC000105777
Discipline(s)	Chemistry
Division	Science and Engineering
Subject Area	Chemistry
Subject Code	CHEM
Course Number	111
Course Title	Introduction to Organic & Biological Chemistry
TOP Code/SAM Code	1905.00 - Chemistry, General / E - Non-Occupational
Rationale for adding this course to the curriculum	The COR must be updated to conform to CID. The textbooks also need to be updated. These changes are non-substantive.
Units	4
Cross List	*N/A*
Typical Course Weeks	
Total Instructional Hours	

	Contact Hours
Lecture	54.00
Lab	54.00
Activity	0.00
Work Experience	0.00
Outside of Class Hours	108.00

Total Contact Hours	108
Total Student Hours	216
Open Entry/Open Exit	No
Maximum Enrollment	
Grading Option	Letter Grade or P/NP
Distance Education Mode of Instruction	

SECTION B

General Education Information:

SECTION C

Course Description

Repeatability May be repeated 0 times

Catalog Description An introduction to the important principles, compounds and reactions of organic and biological chemistry with an emphasis on biochemical behavior of the molecules. Laboratory includes an introduction to the basic techniques of organic and biological chemistry. For students pursuing nursing and allied health careers who need a year of chemistry that includes an introduction to organic and biological chemistry. CHEM 110 (or CHEM 120) and CHEM 111 will fulfill that requirement.

Schedule Description

SECTION D

Condition on Enrollment

1a. Prerequisite(s)

- CHEM 110

1b. Corequisite(s): *None*

1c. Recommended: *None*

1d. Limitation on Enrollment: *None*

SECTION E

Course Outline Information

1. Student Learning Outcomes:

A. Describe chemical and physical processes at the molecular level and how they relate to organic and biological systems.
B. Solve both qualitative and quantitative chemistry problems while demonstrating the reasoning clearly and completely.
C. Implement laboratory techniques correctly using appropriate safety procedures and express them clearly in written laboratory reports.

2. Course Objectives: Upon completion of this course, the student will be able to:

A. Explain how the principles of chemical measurement apply to biological systems, including the isolation, identification and characterization of bio-molecules.
B. Relate the functioning of chemicals to their structure and apply these concepts to enzyme assays.
C. Explain how chemical-bonding theory is used to correlate the function of chemicals in biological systems.
D. Explain the role of energy expenditure in biological systems to maintain the structural integrity of the system.
E. Show how water stabilizes the reaction rates and structures found in biological systems that have been stressed by changes in temperature, pH, and osmolality.
F. Relate how the chemical components of a cell interact to provide energy flow and structural integrity to the system. Include the role of DNA, RNA and proteins in this process and describe how inhibitory processes interact with life systems.
G. Explain how molecular structure relates to the flow of information in a cell and how these processes are used in biotechnology.
H.

3. Course Content

Lecture Content

A. Overview of chemistry in relation to physics and biology.
B. Historical perspective of organic and biochemistry.
C. Development of chemical principles in relation to organic and biological chemistry.
D. Bond energies.
E. Spontaneity and equilibrium as applied in biochemistry.
F. Rates of chemical reactions.
G. Simple Compounds of Carbon
    a. Nomenclature and structure
    b. Single, double and triple bonds
    c. Resonance: Structure and function
H. The Variety of Organic Compounds
    a. Functional groups
    b. Properties: Physical and chemical and structure
    c. Identification and analysis
    d. Synthesis
I. Molecules and Life
    a. Flow of biological information
    b. The water matrix
    c. Biomolecules in water
    d. Amino acids, peptides and proteins
J. Dynamic Function of Molecules
    a. Protein structure and function
    b. Enzymes: Reactions, kinetics, inhibition and applications
    c. Enzymes: Coenzymes, regulation, catalytic antibodies and ribozymes
    d. Carbohydrates: Structure and function
    e. Lipids: Biological membranes and cellular transport
K. Storage and Transfer of Biological Information
    a. DNA and RNA: Structure and function
    b. Metabolism of carbohydrates
    c. Production of NADH and NADPH citric-acid cycle
    d. ATP formation by electron - transport chains
    e. Metabolism of fatty acids and lipids
    f. Metabolism of amino acids and nitrogenous compounds

Lab Content

A. Molecular models and isomers
B. Identification of functional groups
C. Properties of sugars
D. Preparation of esters
E. Synthesis of aspirin
F. Preparation of soap
G. Preparation of hand cream
H. Properties of amines and amides
I. Analysis ofamino acids
J.

4. Methods of Instruction:

Lab:

Lecture:

Other: Lectures. Chemical demonstrations. Video presentations. Individual and group problem solving in the classroom. Individual and group laboratory experiments. Peer oriented guided instruction where the students help one another under the guidance of an instructor.

5. Methods of Evaluation: Describe the general types of evaluations for this course and provide at least two, specific examples.

Typical classroom assessment techniques

Exams/Tests -- Three mid term exams will be given along with a final exam. All exams will be fill in, multiple choice, true/false, and short answer, and will be graded on a point scale (100 pts for a mid term, 200 pts for the final). A sample question may be, What is the empirical formula of a compound that is 75% carbon and 25% hydrogen? or Please indicate the number of terpene units in the following compound, or perhaps, How many ATP are produced during the glycolysis of ribose? Exam grades are based on the sum of the points gained out of the total number of points available for the exam (100 to 200 pts). Grades are awarded as 100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, less than 60% F.

Quizzes -- Weekly quizzes will be given. Quizzes will be fill in, multiple choice, true/false, and short answer, and will be graded on a point scale. A sample question may be, What is the empirical formula of a compound that is 75% carbon and 25% hydrogen? or Please indicate the number of terpene units in the following compound, or perhaps, How many ATP are produced during the glycolysis of ribose? Quiz grades are based on the sum of the points gained out of the total number of points available for the quiz (10 to 20 pts). Grades are awarded as 100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, less than 60% F.

Home Work -- Students will have assigned reading and homework. Typical assignment may be, Read Chapter 11 and do homework problems 11.1 through 11.20. Reading and homework is evaluated with quizzes, exams, and class discussion.

Lab Activities -- Students are required to attend a weekly lab. Students will work individually and in groups. All labs will be checked off by the instructor prior to the student leaving the lab. Labs are graded and returned to the student upon completion. A typical lab will include the collection of experimental data, data analysis, graphical representations of the data, a report on the results and error analysis as well as a section on objectives, procedure, and conclusions. A sample lab might be, The Synthesis of an Ester, or The Identification of an Unknown Compound. Lab grades are based on the sum of the points gained out of the total number of points available for each lab (10 to 20 pts each). Grades are awarded as 100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, less than 60% F.

Final Exam -- A comprehensive final exam will be given. This exam will be fill in, multiple choice, true/false, short answer, and multistep chemical processes where work must be shown. The exam will be graded on a point scale. A sample question may be, What is the empirical formula of a compound that is 75% carbon and 25% hydrogen? or Please indicate the number of terpene units in the following compound, or perhaps, How many ATP are produced during the glycolysis of ribose? The final exam grade is based on the sum of the points gained out of the total number of points available for the exam (200 pts). Grades are awarded as 100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, less than 60% F.

Mid Term -- There will be three mid term exams. These exams will be fill in, multiple choice, true/false, and short answer, and will be graded on a point scale. A sample question may be, What is the empirical formula of a compound that is 75% carbon and 25% hydrogen? or Please indicate the number of terpene units in the following compound, or perhaps, How many ATP are produced during the glycolysis of ribose? Mid term exam grades are based

on the sum of the points gained out of the total number of points available for the exam (100 pts each). Grades are awarded as 100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, less than 60% F.

Additional assessment information:

Regular attendance in the laboratory is required. All labs will be checked off by the instructor prior to the student leaving the lab.

The final grade is based on the sum of the points gained out of the total number of points available for the class (about 700 pts). Grades are awarded as 100%-90% A, 89%-80% B, 79%-70% C, 69%-60% D, less than 60% F.

Letter Grade or P/NP

6. Assignments: State the general types of assignments for this course under the following categories and provide at least two specific examples for each section.

A. Reading Assignments
Daily reading of text; weekly reading of lab manual (ex: Read Chapter 2,"Organic Nomenclature," Sections 2.1 through 2.5 in your text and read the first lab, "Simple Distillations.")

B. Writing Assignments
Reading: Texts - approximately 500 pages per semester; supplemental materials taken from current journals - approximately 250 pages per semester; Problem-solving workbooks - approximately 200 pages per semester; Class Exercises - at least one per week; Laboratory Experiments - one experiment per week.
Writing: Notes taken during discussion and lecture; Notes based on reading; Notes detailing problem analysis and solution.
Class Notebook: Data recording, calculations, graphing, conclusions and depending upon the nature of the experiment, records of the experimental design and protocols of equipment and chemical manipulations.

C. Other Assignments
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7. Required Materials

A. EXAMPLES of typical college-level textbooks (for degree-applicable courses) or other print materials.

Book #1:

Author:	Bettelheim, Brown, Campbell, Farrell and Torres
Title:	Introduction to General, Organic and Biochemistry
Publisher:	Brooks Cole
Date of Publication:	2015
Edition:	11th

Book #2:

Author:	J. Smith
Title:	General, Organic, and Biological Chemistry
Publisher:	McGraw Hill
Date of Publication:	2015
Edition:	3rd

Book #3:

Author:	Timberlake
Title:	General, Organic, and Biological Chemistry: Structures of Life
Publisher:	Pearson
Date of Publication:	2014
Edition:	12th
Manual #1:	
Author:	R. LaRue
Title:	Introductory General, Organic, and Biochemistry Experiments for Allied Health
Publisher:	Kendall Hunt Publishing
Date of Publication:	03-24-2016
Manual #2:	
Author:	Bettelheim & Landesberg
Title:	Laboratory Manual for Introduction to General, Organic, and Biochemistry
Publisher:	Cengage Learning
Date of Publication:	01-01-2014

B. Other required materials/supplies.