

# Northern Marianas College

## Curriculum Action Request

Effective Semester / Session: Spring 2003

Type of Action:

- New  
 Modification  
 Cancellation

Course Alpha and Number: CH 141

Course Title: SURVEY OF ORGANIC AND BIOCHEMISTRY

Reason for initiating, modifying, or canceling course, or other pertinent comment:

Chemistry 141 provides a second semester of chemistry and an additional option for further study in physical sciences for students pursuing an Associate degree. Current NMC physical sciences are limited to one basic chemistry course, one physical science course, and one earth science course. CH 141 fulfills a chemistry requirement that may transfer to four-year schools.

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<i>Angelyn Siles</i>	<i>Nov. 5, 2002</i>
Proposer	Date
<i>Ray G.</i>	<i>11/5/02</i>
Department Chair	Date
<i>RA</i>	<i>11/8/02</i>
Division Review (Dean)	Date
<i>Thomas Colton</i>	<i>11/13/02</i>
English and Format Reviewer	Date
Academic Council Chair	Date
Executive Vice President	Date

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## Course Guide

### 1. Department

Science, Mathematics and Technology

### 2. Purpose

This course provides students with an understanding of fundamental chemical principles of organic and biological molecules and their functions and behavior in nature and in cells, and an opportunity to develop related laboratory skills. It is designed to provide the 2nd semester of a one-year Chemistry course.

### 3. Description

#### A. Required/Recommended Textbook(s) and Related Materials

Required:

Denniston, K. T., and J.J. Topping,  
General, Organic and Biochemistry, 3rd ed., New York, McGraw  
Hill, 2001.

Readability Level: Grade 12.5

Hendrickson, C.; Byrd, L. C. and N. W. Hunter,  
Laboratory Manual for General, Organic, and Biochemistry, 3rd ed.,  
New York, McGraw Hill, 2000.

Readability Level 12.

A calculator is required.

#### B. Contact Hours

1. **Lecture:** 3 per week/ 45 per semester
2. **Lab:** 3 per week/ 45 per semester
3. **Other:** Occasional labs will be replaced with field trips

#### C. Credits

1. **Number:** 4, including 1 science lab credit
2. **Type:** Regular degree credits

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### D. Catalogue Course Description

Introduction to organic and biological chemistry, nomenclature, common functional groups, their chemical properties and reactions with an emphasis on understanding the basic molecules that make up cells and the biochemical reactions that allow cells to function. This course is designed for majors in allied health, science, and education majors seeking a science endorsement but is open to all students. A weekly laboratory is required. Prerequisites: CH 124 or CH 100, MA 132. English Placement Level: EN 101

### E. Degree or Certificate Requirements Met by Course

This course satisfies:

1. An NMC General Education requirement for a physical science course with lab.
2. An elective course requirement.
3. An NMC Associate of Science requirement for a physical science course with lab
4. One of the science requirements for a B.S. in Elementary Education

### F. Course Activities and Design

Course activities include lecture; discussions; homework assignments; laboratory investigations; tests & quizzes; field trips; peer presentations and projects

### 4. Course Prerequisite(s); Concurrent Course Enrollment; Required English/Mathematics Placement Level(s)

Course Prerequisite(s): Prerequisite CH 124 or 100, MA 132

English Placement Level: EN 101

### 5. Estimated Cost of Course; Instructional Resources Needed

To the Student: Tuition for a 4-credit course, lab fee, cost of textbook, lab manual, calculator and instructional materials fee.

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To the College: Instructor's salary.

Instructional resources needed for this course include replacement of expendable lab supplies; chemistry lab equipment appropriate for the course; library reference materials.

#### 6. Method of Evaluation

Student learning will be evaluated on the basis of examinations, lab performance and adherence to safety procedures, homework, quizzes, peer presentations, class participation, research papers and student projects. NMC letter grading policy and NMC/departamental attendance policies will be followed.

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### 7. Course Outline

This is a topical outline and does not necessarily indicate the sequence in which the material is presented

- 1.0 Introduction to Organic Chemistry
  - 1.1 Differences between organic and inorganic chemistry
  - 1.2 Saturated hydrocarbons: structure, physical and chemical properties and reactions
  - 1.3 Related medical, clinical and environmental perspective
- 2.0 Unsaturated Hydrocarbons: structure, physical and chemical properties and reactions
  - 2.1 Alkenes
  - 2.2 Alkynes
  - 2.3 Aromatics
  - 2.4 Related medical, clinical and environmental perspective
- 3.0 Derivative Hydrocarbons I: structure, physical and chemical properties and reactions
  - 3.1 Alcohols and phenols
  - 3.2 Thiols and ethers
  - 3.3 Related medical, clinical and environmental perspective
- 4.0 Derivative Hydrocarbons II: structure, physical and chemical properties and reactions
  - 4.1 Aldehydes
  - 4.2 Ketones
  - 4.3 Related medical, clinical and environmental perspective
- 5.0 Carbohydrates: structure, physical and chemical properties and reactions
  - 5.1 Classification and nomenclature
  - 5.2 Related medical, clinical and environmental perspective
- 6.0 Carboxylic Acids and their Derivatives: structure, physical and chemical properties and reactions
  - 6.1 Carboxylic acids
  - 6.2 Esters
  - 6.3 Acid chlorides and acid anhydrides
  - 6.4 Energy compounds: phosphoesters
  - 6.5 Related medical, clinical and environmental perspective

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- 7.0 Lipids: structure, physical and chemical properties
  - 7.1 Classification and nomenclature
  - 7.2 Chemical reactions
  - 7.3 Metabolic importance
  - 7.4 Related medical, clinical and environmental perspective
  
- 8.0 Amines and Amides structure, physical and chemical properties
  - 8.1 Classification and nomenclature
  - 8.2 Chemical reactions
  - 8.3 Metabolic importance
  - 8.4 Related medical, clinical and environmental perspective
  
- 9.0 Protein structure and function
  - 9.1 Amino acids, peptides and proteins
  - 9.2 Protein structure related to function
  - 9.3 Related medical, clinical and environmental perspective
  
- 10.0 Enzymes
  - 10.1 Classification and nomenclature
  - 10.2 Factors affecting enzyme substrate interactions
  - 10.3 Biological and medical roles and importance of enzymes in medicine and health
  
- 11.0 Carbohydrate Metabolism
  - 11.1 ATP, energy and catabolism
  - 11.2 Glycolysis, fermentation
  - 11.3 Pentose phosphate pathway
  - 11.4 Gluconeogenesis, and the glycogen pathways
  - 11.5 Pyruvate and acetyl Co-A
  - 11.6 Related medical, clinical and environmental perspectives
  
- 12.0 Aerobic Respiration and Energy
  - 12.1 Mitochondria and aerobic respiration
  - 12.2 Citric acid cycle and ATP synthesis
  - 12.3 Anabolism
  - 12.4 Related medical, clinical and environmental perspectives
  
- 13.0 Fatty Acid Metabolism
  - 13.1 Lipids, degradation and synthesis
  - 13.2 Regulatory and feed back mechanisms for lipid and carbohydrate metabolism
  - 13.3 Related medical, clinical and environmental perspectives

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- 14.0 Introduction to Molecular Genetics
  - 14.1 Structure of genetic molecules
  - 14.2 Genetic code: DNA and RNA replication, protein synthesis
  - 14.3 Mutations, carcinogens, recombinant DNA and genetic engineering
  - 14.4 Related medical, clinical and environmental perspectives
  
- 15.0 Radioactivity and Nuclear Medicine
  - 15.1 Natural radioactivity, products of nuclear decay, units of radiation measurement
  - 15.2 Properties of isotopes
  - 15.3 Biological effects of radiation
  - 15.4 Related medical, clinical and environmental perspectives

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### 8. Instructional Goals

This course will expand and enhance students' understanding of:

- 1.0 The scientific method
- 2.0 The properties of organic and biological molecules
- 3.0 Medical, clinical and environmental perspectives related to organic and biological molecules
- 4.0 Specific terminology relevant to the topics covered
- 5.0 Procedures and laboratory techniques as applied to organic and biological chemical problems and solutions
- 6.0 Important chemical reactions found in living systems
- 7.0 The importance of laboratory safety protocols

### 9. Student Competencies

Upon successful completion of this course the student will be able to:

- 1.0 Apply the scientific method in solving problems
- 2.0 Identify the important classes of organic and biological molecules and their properties
- 3.0 Relate chemical processes and laboratory analytic techniques to everyday life, environment, health, medicine and technology
- 4.0 Discuss topics using appropriate terminology and vocabulary
- 5.0 Safely follow laboratory protocols in the correct use of common chemistry equipment
- 6.0 Explain important chemical reactions such as metabolic pathways and genetic processes essential to living systems
- 7.0 Apply safety protocols and guidelines in the execution of laboratory procedures and in the proper use of apparatus and equipment