

Northern Marianas College

CURRICULUM ACTION REQUEST

Course: CH124 General Chemistry

Effective Semester / Session: Spring 2023

Type of Action:

- New
- Modification
- Move to Inactive (Stop Out)
- Cancellation

Course Alpha and Number: CH124

Course Title: General Chemistry

Reason for initiating, revising, or canceling:

This course guide has been updated to reflect changes in purpose, catalog course description, pre-requisites, textbook, course outline, instructional goals, and student learning outcomes.

Lorna B. Liban
Lorna B. Liban 10/22/22

Proposer *Velma C. Deleon Guerrero* Date
Velma C. Deleon Guerrero (Jan 3, 2023 11:29 GMT+10)
Velma C. Deleon Guerrero Jan 3, 2023

Academic Unit Head Date
Adam Walsh
Adam Walsh 11.04.22

Language & Format Review Specialist Date
Ajani Burrell *Ajani Burrell* 12.06.22

Academic Council Chair Date
Clement Bermudes
Clement Bermudes, LTC (USA Ret.) Jan 3, 2023

Dean of Academic Programs and Services Date

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Course: CH124 General Chemistry

1. Department

Science, Mathematics, Health, & Athletics

2. Purpose

This course will enable students to develop an understanding of the major concepts in general chemistry, organic chemistry, and biochemistry, practice related chemical calculations, and acquire appropriate laboratory techniques and skills. CH124 is a transferable chemistry course to help students who intend to transfer to four-year colleges and universities and need to complete educational requirements for careers as nurses, chemists, physicists, biologists, agriculturists, medical doctors, numerous STEM and health-related occupations.

3. Description

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

Required:

Denniston, K.T., Topping, J.J., and Caret, R.L. 2022. General, Organic, and Biochemistry Textbook and Lab Manual. 11th ed. New York, U.S.A. McGraw Hill.

Recommended: None

B. Contact Hours

1. **Lecture:** 3 per week / 45 per semester
2. **Lab:** 3 per week / 45 per semester
3. **Other:** Occasional labs maybe replaced with field trips or seminars by guest speakers

C. Credits

1. **Number:** 4
2. **Type:** Regular Degree Credits

D. Catalog Course Description

This is a rigorous chemistry course covering the principles of chemistry and the application of these principles to technological society. Chemistry is the study of matter, its physical and chemical properties, the physical and chemical changes it undergoes, and the energy changes that accompany these processes. This course provides a comprehensive chemistry foundation through lab activities and lectures. The course is divided into three broad sections: general chemistry, organic chemistry, and biochemistry. Prerequisites: EN095 and MA091 (Offered Fall and Spring)

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E. Degree or Certificate Requirements Met by Course

This course satisfies the general education requirement for all degree programs requiring physical science with a laboratory, an Associate in Nursing from NMC, an AA in Liberal Arts Health and PE and Pre-engineering emphasis, and as an elective course for non-nursing majors.

F. Course Activities and Design

Course activities include: lectures, discussions, homework assignments, quizzes, tests, laboratory investigations, oral-reports, field trips or seminars by guest speakers, group-presentations, and lab research projects.

4. Course Prerequisite(s); Concurrent Course Enrollment

Prerequisites: EN095, MA091

Concurrent Course Enrollment: None

Required English/Mathematics Proficiency Level(s)

English Placement Level: EN101

Mathematics Placement Level: MA132

5. Estimated Cost of Course; Instructional Resources Needed

Cost to the Student: Tuition for a 4-credit course, lab fees, cost of the textbook, lab manual, graphing calculator, and research project materials.

Cost to the College: Instructor's salary and the cost of the instructional resources listed below.

Instructional resources needed for this course include: chemistry classroom and laboratory space, whiteboard and markers, television and multimedia projectors, audio-visual programs/software, chemicals, laboratory apparatus, computer, internet connection, and reference materials.

6. Method of Evaluation

Student learning will be evaluated on the basis of homework assignments, quizzes, tests, laboratory reports, research projects, and oral presentations. NMC's grading and 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 will be presented.

- 1.0 Scientific Method and Measurement
 - 1.1 Chemistry and the scientific method
 - 1.2 Classification, properties, and changes of matter
 - 1.3 Significant figures and scientific notation
 - 1.4 System of measurement and conversion of units
 - 1.5 Density and specific gravity

- 2.0 The Structure of the Atom and the Periodic Table
 - 2.1 Development of the atomic structure
 - 2.2 Atom composition
 - 2.3 Periodic table
 - 2.4 Writing electronic configuration

- 3.0 Structure and Properties of Ionic and Covalent Compounds
 - 3.1 Chemical bonds
 - 3.2 Cations, anions, and polyatomic ions
 - 3.3 naming ionic and covalent compounds
 - 3.4 Writing chemical formulas of ionic and covalent compounds
 - 3.5 Writing Lewis structures

- 4.0 Calculations and the Chemical Equation
 - 4.1 Mole concept and Avogadro's number
 - 4.2 Calculation of molar mass
 - 4.3 Identifying and balancing chemical equations
 - 4.4 Stoichiometry

- 5.0 States of Matter: Solids, Liquids, and Gases
 - 5.1 Gas laws
 - 5.1.1 Boyle's Law
 - 5.1.2 Charles' Law
 - 5.1.3 Gay-Lussac's Law
 - 5.1.4 Combined Gas Law
 - 5.1.5 Ideal Gas Law
 - 5.1.6 Dalton's Law of Partial Pressure
 - 5.1.7 Amagat's Law
 - 5.1.8 Avagadro's Law
 - 5.2 Liquids
 - 5.2.1 Properties and hydrogen bonding
 - 5.3 Solids
 - 5.3.1 Properties and structures

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- 6.0 Solutions
 - 6.1 Parts and properties of solutions
 - 6.2 Concentration based on % m/m, ppt, ppm, and ppb
 - 6.3 Concentration based on % m/v, % v/v, dilution
 - 6.4 Concentration based on molarity and molality
 - 6.5 Colligative properties

- 7.0 Energy, Rate, and Equilibrium
 - 7.1 Thermodynamics and kinetics
 - 7.2 Writing equilibrium constants
 - 7.3 Calculation of equilibrium constants

- 8.0 Acids, Bases, and Oxidation-Reduction
 - 8.1 Concepts of acids and bases
 - 8.2 Calculations of pH and hydrogen ion concentration
 - 8.3 Calculations of pOH and hydroxide ion concentration
 - 8.4 Redox relations

- 9.0 The Nucleus, Radioactivity, and Nuclear Medicine
 - 9.1 Alpha, beta, and gamma radiation
 - 9.2 Balancing nuclear equations
 - 9.3 Medical applications of radioactivity

- 10.0 Introduction to Organic Chemistry
 - 10.1 General formula, functional groups, structures, and nomenclature of hydrocarbons
 - 10.1.2 Alkanes
 - 10.2.2 Alkenes
 - 10.2.3 Alkynes
 - 10.2.4 Cyclic hydrocarbons
 - 10.2.5 Aromatic hydrocarbons
 - 10.2 General formal, functional groups, structures, and nomenclature of substituted hydrocarbons

- 11.0 Introduction to Biochemistry
 - 11.1 Carbohydrates
 - 11.2 Lipids
 - 11.3 Proteins

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8. Instructional Goals

The course will introduce students to:

- 1.0 The Scientific Method and measurement;
- 2.0 Atomic structure and the periodic table;
- 3.0 Structure and properties of ionic and covalent compounds;
- 4.0 Chemical nomenclature and chemical calculations;
- 5.0 Problem-solving in gas laws, solution concentration, equilibrium constants, acids and bases, and nuclear reactions;
- 6.0 Introduction to hydrocarbons and hydrocarbon derivatives;
- 7.0 Introduction to biomolecules; and
- 8.0 Laboratory apparatus, safety procedures, and techniques.

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9. Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- 1.0 Discuss the scientific method and its application in solving real-life problems;
- 2.0 Explain the composition, classification, properties, phases, and changes of matter;
- 3.0 Solve problems involving conversion of measurement;
- 4.0 Demonstrate safe laboratory techniques and appropriate use of common laboratory apparatus;
- 5.0 Explain the composition of atom and the development of atomic structure;
- 6.0 Use the periodic table to obtain information about an element and describe the relationship between the electronic structures of an element and its position in the periodic table;
- 7.0 Explain the major types of chemical bonds and nomenclature of ionic and covalent bonds;
- 8.0 Draw the Lewis structure of molecules and polyatomic ions;
- 9.0 Perform chemical calculations using Avogadro's number, molar mass, and the mole;
- 10.0 Balance and classify chemical reactions;
- 11.0 Solve problems involving gas laws;
- 12.0 Describe the parts and properties of solutions and solve solution concentration;
- 13.0 Write and calculate equilibrium constants;
- 14.0 Calculate pH, pOH, hydrogen ion concentration, hydroxide ion concentration and identify the types of nuclear reactions; and
- 15.0 Identify the major groups of organic compounds and biomolecules.

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10. Assessment Measures of Student Learning Outcomes

Assessment of student learning may include, but not be limited to, the following:

- 1.0 Homework;
- 2.0 Assignments;
- 3.0 Experiment and Laboratory Report Sheets;
- 4.0 Research Projects;
- 5.0 Tests; and
- 6.0 Final Exam.