CHEM - Chemistry

Global Citizenship Program Knowledge Areas **(....)**	
ARTS	Arts Appreciation
GLBL	Global Understanding
PNW	Physical & Natural World
QL	Quantitative Literacy
ROC	Roots of Cultures
SSHB	Social Systems & Human Behavior

Global Citizenship Program Skill Areas (....)	
CRI	Critical Thinking
ETH	Ethical Reasoning
INTC	Intercultural Competence
OCOM	Oral Communication
WCOM	Written Communication
** Course fulfills two skill areas	

CHEM 1040 Applied Chemistry for Technology Based Business (3)

Students will be taught basic principles in chemistry and apply that knowledge by analyzing chemical products used in industry and everyday life. They will be required to practice critical thinking through the analysis of business structures and how those organizations utilize chemical applications for product development. **GCP Coding**: **(PNW)** (CRI).

CHEM 1050 Concepts in Chemistry (3)

Concepts in Chemistry explores fundamental concepts within chemistry and will discuss issues that have a chemical basis. Included within the course are topics such as the scientific method, scientific measurements, laws of conservation, chemical bonding, chemical reactions, stoichiometry, acid-based chemistry, oxidation-reduction reactions, and food chemistry. The class will demonstrate how chemistry principles can be used to understand processes encountered in everyday life and the environment around us. **GCP Coding**: **(PNW)** (CRI).

CHEM 1060 Chemistry of Cooking (3)

This course offers students the opportunity to learn about chemistry through the kitchen. We will cover topics such as: what molecules and reactions are integral to cooking processes? How do our bodies digest and use macromolecules from our food? How can we alter the outcome of recipes by changing ingredients and cooking conditions? This course is designed for students of any major - no formal science background is needed, just curiosity and a willingness to try new things. An additional course fee is required. **GCP Coding**: **(PNW)** (CRI).

CHEM 1100 General Chemistry I (3)

An introduction to the general principles of modern chemistry. The major topics discussed include atomic and molecular structure, chemical bonding, stoichiometry, gases, solutions, and thermochemistry. In addition, the important classes of solution-phase reactions (acid-base, precipitation, and oxidation-reduction) are also treated. Laboratory required. Offered in the fall semester. **Prerequisites**: MATH 1430, College Algebra, concurrently or equivalent, or permission of the instructor. **Co-requisite**: CHEM 1101.

CHEM 1101 General Chemistry I: Lab (1)

This course is taken in conjunction with CHEM 1100. Laboratory experiments focus on such topics as scientific measurement, chemical separations, chemical laws, stoichiometry, light absorption, and atomic and molecular structure. A variety of laboratory techniques are emphasized including volumetric, gravimetric and spectroscopic. Students will also utilize a number of chemical software packages. **Co-requisite**: CHEM 1100.

CHEM 1110 General Chemistry II (3)

A continuation of CHEM 1100. Major topics include kinetics, chemical equilibrium, electrochemistry, and the properties of solids, liquids, and solutions. Laboratory required. Offered in the spring semester. **Prerequisite:** CHEM 1100 or permission of the instructor. **Co-requisite**: CHEM 1111.

CHEM 1111 General Chemistry II: Lab (1)

This course is taken in conjunction with CHEM 1110. Experimental topics include thermochemistry, chemical kinetics, acid-base equilibrium and redox titrations. These experiments employ a number of electronic instruments including spectrophotometers, pH meters and conductivity meters. **Co-requisite**: CHEM 1110.

CHEM 2100 Organic Chemistry I (3)

Organic Chemistry I is the study of the structure, nomenclature, properties, and reactions of hydrocarbons such as alkyl halides, alkenes, alkynes, and alcohols. Additional topics include the mechanism of substitution and elimination reactions as well as the stereochemistry of organic molecules. **Prerequisites**: CHEM 1100, CHEM 1101, CHEM 1110 and CHEM 1111, or permission of the instructor. **Co-requisite**: CHEM 2101.

CHEM 2101 Organic Chemistry I: Lab (1)

A laboratory class that introduces techniques that are used in modern organic synthesis such as extraction, heating under reflux, filtration, and distillation. The complete synthesis, purification, and analysis of various functional organic molecules will be performed. **Prerequisites**: CHEM 1100, CHEM 1101, CHEM 1110 and CHEM 1111, or permission of the instructor. **Co-requisite**: CHEM 2100.

CHEM 2110 Organic Chemistry II (3)

Organic Chemistry II is a continuation of Organic Chemistry I with emphasis on the structure and reactivity of thiols, ethers, epoxides, ketones, aldehydes, amines, carboxylic acids, and aromatic hydrocarbons. Additional topics included structural determination of organic molecules by utilizing spectroscopic and spectrometric methods. **Prerequisite**: CHEM 2100 and CHEM 2101, or permission of the instructor. **Co-requisite**: CHEM 2111.

CHEM 2111 Organic Chemistry II: Lab (1)

A laboratory class that is centered around the synthesis, purification, and analysis of various aromatic compounds. Additional topics included the use of Infrared, Nuclear Magnetic Resonance, and Ultraviolet spectroscopy as a means of

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characterization of organic molecules. **Prerequisites**: CHEM 2100 and CHEM 2101, or permission of the instructor. **Co-requisite**: CHEM 2110.

CHEM 3100 Biochemistry I (3)
CHEM 3101 Biochemistry I: Lab (1)

Studies the structure and function of proteins, enzyme kinetics, carbohydrates, lipids, amino acids, and nucleic acids. Molecular physiology is also reviewed. Laboratory required. Offered in the fall semester. **Prerequisite**: CHEM 2100 or permission of the instructor. **Co-requisites**: CHEM 3100 and CHEM 3101 must be taken concurrently.

CHEM 3110 Biochemistry II (3)
CHEM 3111 Biochemistry II: Lab (1)

Studies metabolism and the techniques and principles of molecular genetics. Offered in the spring semester. **Prerequisites**: CHEM 2100 and CHEM 3100, or permission of the instructor. **Co-requisites**: CHEM 3110 and CHEM 3111 must be taken concurrently.

CHEM 3250 Environmental Chemistry (3)

Covers an advanced study of the chemistry of Earth's water, soil and atmosphere, as well as the pollution of all three. Topics covered include chemistry of natural soils and waters; introductory toxicology; acid deposition and forest decline; drinking water treatment; wastewater treatment; eutrophication; pesticides; toxic organic compounds; toxic heavy metals. An emphasis is placed upon the relationship between chemical properties and biological effects of pollutants. **Prerequisites**: CHEM 2100.

CHEM 3251 Environmental Chemistry: Lab (1)

Laboratory course covering applied analytical chemistry of air, soil, and water, including fundamental instrumentation. Both the natural chemistry of Earth's air, soil and water and the anthropogenic effects on this chemistry are studied. An emphasis is placed on equilibrium kinetics, and the physico-chemical properties of gases, solutions, and solids. **Prerequisite**: CHEM 2100.

CHEM 3300 Analytical Chemistry (3)

An introduction to the general principles of classical quantitative analysis. Topics include sample handling, data treatment, error analysis, standards and calibration, gravimetric, titrimetric and electrochemical methods. Laboratory required. **Prerequisites**: CHEM 1100, CHEM 1101, CHEM 1110 and CHEM 1111. **Co-requisite**: CHEM 3301.

CHEM 3301 Analytical Chemistry: Lab (1)

An introduction to quantitative analytical laboratory techniques. Emphasis is placed on the development of the appropriate skills for precise chemical analysis. Experiments include gravimetric, electrochemical and a variety of titrimetric studies. Error propagation and data handing are also emphasized. **Prerequisites**: CHEM 1100, CHEM 1101, CHEM 1110 and CHEM 1111. **Co-requisite**: CHEM 3300.

CHEM 3500 Physical Chemistry I (3)

This course focuses on the laws of thermodynamics and their application to a variety of chemical systems. Special emphasis is placed on chemical equilibrium and solution chemistry. **Prerequisites:** MATH 1610 and MATH 1620, or permission of the instructor. **Co-requisite**: CHEM 3501.

CHEM 3501 Physical Chemistry I: Lab (1)

Laboratory experiments focus on a variety of thermodynamic topics including heat capacities, reaction enthalpies and gas laws. Computer simulations are also employed to examine the molecular foundation for a number of chemical properties. **Co-requisite**: CHEM 3500.

CHEM 3510 Physical Chemistry II (3)

This course centers on quantum mechanics and its application to chemical systems. Topics include the general principles of quantum mechanics, the particle in a box, rigid rotor, harmonic oscillator, atoms, molecules, approximation methods, and spectroscopy. **Prerequisites:** MATH 1610 and MATH 1620, or permission of the instructor. Note that it is not necessary to take CHEM 3500 and CHEM 3501 prior to taking this course. **Co-requisite**: CHEM 3511.

CHEM 3511 Physical Chemistry II: Lab (1)

This course illustrates and explores in more detail topics covered in CHEM 3510. Significant emphasis is given to spectroscopic methods including atomic emission, ultraviolet-visible absorption and infrared absorption. In addition, extensive use is made of computational methods including electronic structure calculations. **Co-requisite**: CHEM 3510.

CHEM 3600 Topics in Chemistry (1-4)

Provides for an in-depth analysis of issues and topics of specialized interest to advanced students in chemistry-related topics. May be repeated for credit if content differs. **Prerequisite**: Junior standing or permission of the instructor.

CHEM 4100 Inorganic Chemistry (3)

Introduction to modern chemistry that will emphasize how structure and bonding relate to the chemical and physical properties of compounds. Sections on acid-base, oxidation-reduction, solid state, and transition metal chemistry will be discussed. **Prerequisites**: CHEM 1100, CHEM 1101, CHEM 1110 and CHEM 1111, or permission of the instructor.

CHEM 4300 Instrumental Analysis (3)

An introduction to the general principles of modern instrumental analysis. Topics include basic electronics, signal and noise processing and the components of scientific instruments. A variety of spectroscopic techniques will be included such as ultraviolet, infrared, NMR, atomic absorbance and mass spectroscopy. Chromatographic techniques will also be addressed. **Prerequisite**: CHEM 3300 and CHEM 3301. **Co-requisite**: CHEM 4301.

CHEM 4301 Instrumental Analysis: Lab (1)

This course provides the student with hands on experience with a variety of modern chemical instruments. Measurements are performed on a number of chemical systems using ultraviolet-visible, infrared, nmr, fluorescence, HPLC and various other instruments. **Prerequisite**: CHEM 3300 and CHEM 3301. **Co-requisite**: CHEM 4300.

CHEM 4400 Research Methods (3)

Provides students with a thorough examination of the research process from hypothesis formulation to planning, design, methodology, and analysis of experimental data and preparing the data for publication.

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CHEM 4430 Bachelor of Science Senior Thesis (4)

Students working toward a bachelor of science in chemistry will enroll to complete their senior research project in the laboratory. Completion of the project will culminate with a scientific paper and oral presentation of research results at a formal lecture to faculty and peers. **Prerequisite**: BIOL 4400 or CHEM 4400.

CHEM 4700 Independent Research in Chemistry I (1-4)

A specialized course for students working on an independent, research-oriented project in a topic of current interest. Students should select among the equivalent courses BIOL 4700/CHEM 4700/PHYS 4700 for the one that is most consistent with their chosen project. For CHEM 4700, the topic should have a primary basis in chemistry. Also offered during the summer term. May be repeated once for credit if content differs. **Prerequisite**: Permission of the instructor.

CHEM 4710 Independent Research in Chemistry II (1-4)

A specialized course for students working on an independent, research-oriented project in a topic of current interest. Students should select among the equivalent courses BIOL 4710/CHEM 4710/PHYS 4710 for the one that is most consistent with their chosen project. For CHEM 4710, the topic should have a primary basis in chemistry. Also offered during the summer term. May be repeated once for credit if content differs. **Prerequisite**: Permission of the instructor.