

# CHEMISTRY (CHE)

## CHE-022 Coll Prep Chem (0 credits)

This is a course which prepares students who lack adequate chemistry background (either no high school chemistry or demonstrated need based on Learning Center testing and consultation with the instructor) to undertake the chemistry required by their major program. Required for students with an SAT Math Sub-Score below 520 (22 on ACT Math) - and No High School Chemistry OR Most Recent High School Chemistry Grade Below C (or below 75). Also for students who have not taken HS chemistry.

Course Types: Learning Skills

## CHE-100 Basic Chemistry Principles for Che-101/ Che-111/Che-114 (3 credits)

The course is intended to be a half-semester course that provides additional foundation work for general chemistry courses and assists students struggling with the basics and mathematical concepts of CHE-101, CHE-111, or CHE-114. The course will focus on the core concepts generally taught in the first few chapters of most general chemistry textbooks and the problem solving and math needed for Introductory Chemistry. Topics will include mass, the mole, unit conversions, balancing chemical equations, atomic theory, stoichiometry and solution chemistry. This course only counts as a Free Elective. Prerequisite: None

## CHE-101 General Chemistry I (3 credits)

This introduction to fundamental chemical principles includes topics such as atomic structure, bonding and properties of gases, liquids, solids and solutions. The course consists of three lectures and three hours of laboratory a week.

Prerequisite(s): High school chemistry and CHE-022 or 3 years of high school mathematics or MAT-117 or MAT-122

Corequisite(s): Take CHE-101L CHE-105

## CHE-101L General Chemistry Laboratory (1 credits)

Three hours of laboratory.

Course Types: Natural Sciences; Teamwork

Corequisite(s): Take CHE-101

## CHE-102 General Chemistry II (3 credits)

This course is a continuation of CHE-101. Topics include chemical equilibria, kinetics and oxidation reduction systems.

Prerequisite(s): Take CHE-101

Corequisite(s): Take CHE-102L

## CHE-102L General Chemistry Laboratory II (1 credits)

Three hours of laboratory.

Course Types: Natural Sciences; Technological Competency

Prerequisite(s): Take CHE-101L

Corequisite(s): Take CHE-102

## CHE-105 Problem Solving for Chemistry 101 (3 credits)

To be taken in conjunction with CHE-101 as recommended by placement testing. Required for non nursing and exercise sports studies students who have an SAT Math Sub-score below 540 (23 on ACT Math) and High School Chemistry Above C (75 +).

Corequisite(s): Take CPC-022; Take CHE-101

## CHE-111 Chemistry for Health Sciences (3 credits)

This is a survey of general and organic chemistry that emphasizes fundamental principles and the properties and characteristics of important groups of chemicals. This course consists of three lectures per week.

Prerequisite(s): Take CHE-022

Corequisite(s): Take CHE-115

## CHE-112 Chemistry for Health Sciences II (2 credits)

This survey of metabolism in the cell includes the instruction of compounds and other components involved in metabolism and regulation of metabolism. The course consists of two lectures per week

Prerequisite(s): Take CHE-111

## CHE-113L Chemistry for the Health Sciences Lab (1 credits)

The laboratory exercises illustrate principles, techniques and practices of general chemistry, organic chemistry and biochemistry. The lab consists of three hours of laboratory a week

Prerequisite(s): Take CHE-111

Corequisite(s): Take CHE-112

## CHE-114 Applied Chemistry for the Health Sciences (4 credits)

This is a one-semester introductory course emphasizing those areas in chemistry where biochemistry, the physical sciences and human health intersect. Interactive, student-centered learning is emphasized, as is the process of scientific inquiry. The scientific content is chosen with special emphasis on its applicability to medical issues and includes topics drawn from general, organic and physical chemistry as well as biochemistry, including the basics of atomic structure and chemical reactivity, pH, energy, force, pressure, fluid flow, organic reactions and compounds, biochemical molecules and the cycles of life

Prerequisite(s): Take CHE-022

Corequisite(s): Take CHE-114L; Take CHE-115

## CHE-114L Applied Chemistry for the Hlth Sci Lab (0 credits)

This laboratory accompanies CHE-114. Emphasis is on integrative coverage of material contained in its companion course and is conducted in an active learning environment

Corequisite(s): Take CHE-114

**CHE-115 Problem Solving for Chemistry 111/114 (3 credits)**

This three-credit course focuses on the mathematical applications of general chemistry. This is a companion course to be taken in conjunction with CHE-111 or CHE-114 as recommended by placement testing and cannot be taken as a freestanding elective. Required for students who have an SAT Math Sub-score below 540 (23 on ACT Math) and High School Chemistry Above C (75 +).

Course Types: Problem-Solving; Thinking Process

Corequisite(s): Take CHE-111 - Exercise Sports Studies Students or (CHE-114 and CHE-114L) - Nursing Students at the same time as CHE-115.

**CHE-142 Molecules (4 credits)**

This is an introductory course in chemistry, which addresses the key concepts of chemistry by studying the structures and workings of the molecules that people encounter in everyday life. Material will be presented in a conceptual manner, with minimal mathematics, and, to the extent possible, in a manner which connects chemistry to the everyday experiences of 21st century human beings. Topics will include atoms, molecules, intermolecular forces, bonding, molecular structure, chemical reactions, heat and energy, rates and equilibrium, acids and bases, light, electrochemistry, polymers and biochemistry. Lab must be taken concurrently

Corequisite(s): Take CHE-142L

**CHE-142L Molecules Laboratory (0 credits)**

This course is the laboratory to accompany CHE-142

Corequisite(s): Take CHE-142

**CHE-144 Natural Disasters (3 credits)**

This course is for students of all majors. Students will be introduced to the basics of the causes and effects of a variety of natural disasters from volcanoes and earthquakes to hurricanes and blizzards. Specific disasters will be studied throughout the course and when appropriate, many of them focusing on the Buffalo area including the infamous Blizzard of '77. Students will also have an introduction to human-induced disasters and how humans are influencing the planet we live on. Basic chemistry will be introduced such as the periodic table, simple molecules such as various greenhouse gases and other pollutants and radioactivity. This course will satisfy a core science elective or it can also be taken as a free elective.

Course Types: Ethical Reasoning and Act; Natural Sciences

**CHE-145 The Process of Scientific Discovery (3 credits)**

This is an introductory science course where students will be introduced to the major elements of science and technology including the basic insights of chemistry, physics, biology and geology in the context of the social and historical development of technology. Special attention will be paid to the impact of the sciences on cultural and human endeavors, and on the role of social change and serendipity in the process of scientific discovery. This course could count as a non-major science core course, an IDS science elective or as a free elective for science majors. There are no prerequisite course requirements. Course may be offered with an emphasis on the field of biology (BIO-145), chemistry (CHE-145) or physics (PHY-145).

**CHE-170 The Wide World of Chemistry (3 credits)**

This course is an introductory chemistry course for non-science majors. The chemistry in this course will take us all over the globe and even beyond. Topics will include a history of the atom, the periodic table, chemistry in the Earth, the greenhouse effect, fuels, simple organic chemistry and radioactivity. This course cannot be used for elective credit in the chemistry major or minor.

Course Types: Natural Sciences; Scientific Reasoning

**CHE-170L The Wide World of Chemistry Lab (1 credits)**

This course is an introductory chemistry course for non-science majors. The exact experiments may change, dependent on new chemistry simulations being developed, but will include introductory chemistry topics. The experiments will introduce students to topics such as interactions of various compounds with light, the greenhouse effect, radioactivity, molecular shapes and organic molecules. This course cannot be used for elective credit in the chemistry major or minor.

Course Types: Natural Sciences; Scientific Reasoning

**CHE-189 Topics in Critical Inquiry (3 credits)**

Critical inquiry is the process of gathering and evaluating information, ideas, and assumptions from multiple perspectives to produce well-reasoned analysis and understanding, and leading to new ideas, applications and questions. This course is intended to introduce new students to intellectual inquiry at the university by engaging them in in-depth study of a single topic utilizing a variety of perspectives and methods. The course emphasizes the essential role of critical and creative thinking to their lives as students, citizens, future professionals, and productive members of their communities.

Course Types: Critical Analysis; Topics; Thinking Process

Corequisite(s): Take CHE-189L

**CHE-189L Topics in Critical Inquiry - Lab (1 credits)**

Critical inquiry is the process of gathering and evaluating information, ideas, and assumptions from multiple perspectives to produce well-reasoned analysis and understanding, and leading to new ideas, applications and questions. This course is intended to introduce new students to intellectual inquiry at the university by engaging them in in-depth study of a single topic utilizing a variety of perspectives and methods. The course emphasizes the essential role of critical and creative thinking to their lives as students, citizens, future professionals, and productive members of their communities. The lab for the course is an interdisciplinary application lab, wherein students work in teams to demonstrate what they learned in the didactic portion of the course through the creation of a project, presentation, art object/installation, play, podcast, short film, co-authored reflection (debrief) on a simulation experience, etc. Faculty who design the didactic portion of the course together will design this portion as a 5-week experiential component of the course, which might include community partnerships or field trips. Students who take the course and lab will be invited to display their project results in a one-afternoon presentation at the end of each semester (to be arranged by college events personnel).

Course Types: Teamwork; Topics

Corequisite(s): Take CHE-189

**CHE-209 Principles of Organic Chemistry (3 credits)**

This is a survey of organic chemistry, including functional groups and their chemical behavior. Compounds of importance to biology and biochemistry are stressed. This course cannot be taken in place of either CHE-219 or CHE-220.

Prerequisite(s): Take CHE-102

Corequisite(s): Take CHE-209L or CHE-219L

**CHE-209L Principles of Organic Chemistry Lab (1 credits)**

This is a laboratory course to compliment the material discussed in CHE-209, which is one-semester survey course of organic chemistry.

Corequisite(s): Take CHE-209 or CHE-219

**CHE-219 Organic Chemistry (3 credits)**

This course is a survey of the functional groups germane to organic chemistry. In particular, emphasis is placed on the physical properties, nomenclature, conformation, synthesis and reactions of alkanes, alkenes, alkynes. Additionally, the recognition of isomers from constitutional stereoisomers such as enantiomers and diastereomers is also stressed.

Prerequisite(s): Take CHE-101, CHE-101L, CHE-102, CHE-102L

Corequisite(s): Take CHE-219L or CHE-209L

**CHE-219L Organic Chemistry Lab (1 credits)**

This lab emphasizes purification techniques central to organic chemistry such as recrystallization, distillation (simple and fractional), extraction, chromatography (column and thin layer), and chemical modification. Also, several syntheses are chosen to illustrate lecture material such as, but not limited to reactions such as substitution and bond cleavage. It consists of three hours of lab a week.

Corequisite(s): Take CHE-209 or CHE-219

**CHE-220 Organic Chemistry II (3 credits)**

This course is a continuation of CHE-219. The physical properties, nomenclature, synthesis and reactions of aromatic rings, alcohols, aldehydes and ketones. Amines, carboxylic acids and its derivatives, ethers, epoxides, sulfides, conjugated systems, aromaticity and enols are studied. The theory and application of a variety of spectroscopic (infrared, nuclear magnetic resonance and mass spec) methods are also covered.

Prerequisite(s): Take CHE-219

Corequisite(s): Take CHE-220L

**CHE-220L Organic Chemistry II Lab (1 credits)**

This lab emphasizes the reactions that are covered in lecture such as, but not limited to, ester synthesis, electrophilic substitution of an aromatic ring, Grignard reagents and reduction of carbonyl compounds. This lab also places an importance on mastering spectroscopic methods such as IR and NMR utilizing in-house instrumentation. It consists of three hours of lab a week.

Course Types: Information Literacy; Natural Sciences; Thinking Process

Prerequisite(s): Take CHE-219 CHE-219L

Corequisite(s): Take CHE-220

**CHE-289 Special Topics (3 credits)**

Course Types: Themed

**CHE-303 Biochemistry (3 credits)**

This one-semester course emphasizes structure/function relationships among the components responsible for the biochemical functions of life. Topics include proteins, enzymes, carbohydrates, bioenergetics, metabolism (catabolism and anabolism), lipids, membranes, nucleic acids, biotechnology, biochemical methods, vitamins and nutrition.

Course Types: Scientific Reasoning

Prerequisite(s): Take 1 group: ((CHE-209 CHE-209L or CHE-219 CHE-219L) and BIO-101 BIO-101L BIO-102 BIO-102L) or ((CHE-209 CHE-209L or CHE-219 CHE-219L) and BIO-107 BIO-107L BIO-108 BIO-108L) or be a chemistry major and take (CHE-219 CHE-219L CHE-220 CHE-220L)

Corequisite(s): Take CHE-303L

**CHE-303L Biochemistry Laboratory (1 credits)**

This laboratory supports the CHE-303 lecture course. Students required to take CHE-303 are also required to take CHE-303L (except for physician assistant students).

Course Types: Scientific Reasoning

Corequisite(s): Take CHE-303

**CHE-311 Physical Chemistry I (3 credits)**

This is the first semester of the Physical Chemistry sequence. Areas of study include kinetic theory and gas laws, rate laws, reaction mechanisms, reaction rate theories, thermochemistry, laws of thermodynamics, entropy, free energy, chemical and phase equilibria, and statistical thermodynamics.

Course Types: Natural Sciences; Quantitative Literacy

Prerequisite(s): Take MAT-126 - recommended but not required.; Take CHE-101 CHE-102 MAT-125

Corequisite(s): Take CHE-311L

**CHE-311L Physical Chemistry I Lab (1 credits)**

This is a laboratory course which will complement the first semester of physical chemistry (CHE-311). Students will perform experiments illustrating the major areas of physical chemistry covered in physical chemistry I.

Prerequisite(s): Take CHE-101 CHE-102 MAT-125

Corequisite(s): Take CHE-311

**CHE-312 Physical Chemistry II (3 credits)**

This is the second semester of the Physical Chemistry sequence. Areas of study include waves and particles, postulates, Schrodinger equation, quantum mechanical models with exact solutions, approximate methods, atomic and molecular structure, and spectroscopy.

Course Types: Natural Sciences

Prerequisite(s): Take CHE-101, 102 MAT-125 MAT-126

Corequisite(s): Take CHE-312L

**CHE-312L Physical Chemistry II Lab (1 credits)**

This is a laboratory course which will complement the second semester of physical chemistry (CHE-312). Students will perform experiments illustrating the major areas of physical chemistry covered in physical chemistry II.

Prerequisite(s): Take CHE-101 CHE-102 MAT-125

Corequisite(s): Take CHE-312

**CHE-321 Physical Chemistry for the Life Sciences (3 credits)**

This course will provide a focused exploration on the tenets that drive several core physical, chemical, and biochemical processes. Concepts covered will be explained in a broader context than is typically covered in a full (2) semester physical chemistry course emphasizing the usefulness and application of physical chemistry concepts to several "real world" applications in the life sciences. Topics covered will be thermodynamics, kinetics, and quantum mechanics, especially in relation to biomolecules.

Prerequisite(s): Take CHE-101 or CHE-102 and MAT-125

**CHE-331 Analytical Chemistry (4 credits)**

This is a first course in analytical chemistry emphasizing the basic concepts and laboratory techniques underlying quantitative analysis including analysis of quantitative measurements, simple and complex solution equilibria, volumetric and gravimetric techniques, electrochemistry, redox and potentiometric titrations, separations, and elementary photometric techniques.

Prerequisite(s): Take CHE-102 CHE-102L

**CHE-332 Instrumental Analysis (4 credits)**

This course will examine the basic tenets and applications of modern analytical instrumentation and their use in determining a wide variety of pertinent analytical data. Topics such as UV/Vis spectrometric methods, atomic absorption and emission spectrometry, gas chromatography, mass spectroscopy, luminescence and fluorescence spectrometry, HPLC, capillary electrophoresis, surface analysis and electrochemistry will be covered.

Course Types: Scientific Reasoning

Prerequisite(s): Take CHE-102 CHE-102L

**CHE-344 Advanced Biochemistry (3 credits)**

The Advanced Biochemistry course builds on the foundations taught in BIO 303 - Biochemistry, offering an in-depth overview of more complex topics related to all classes of biomolecules. The significant relationship between chemical structure and physiological role is discussed in the context of proteins, lipids, and carbohydrates. Topics include protein folding and functional interaction, biological membrane structure and transport, biosignaling, hormone action, and an overview of catabolic and anabolic biochemical pathways.

Course Types: Natural Sciences

Prerequisite(s): Take CHE-303

Corequisite(s): Take CHE-344L

**CHE-344L Advanced Biochemistry Lab (1 credits)**

The Advanced Biochemistry laboratory reinforces the concepts taught in the associated lecture through experimental design, modern lab technology use, and data analysis. In addition, current scientific papers describing the use of biochemical techniques are discussed, analyzed and presented. The main objectives are for students to develop hands-on experience with experimental methods used in biochemical and molecular biology research, as well as to introduce students to the fundamentals of scientific writing and data presentation.

Course Types: Natural Sciences; Written Communication

Prerequisite(s): Take CHE-303L

Corequisite(s): Take CHE-344

**CHE-351 Medicinal Chemistry (3 credits)**

This course will survey the relationships between organic chemistry, biochemistry, and physiology in the design and discovery of drugs. Strategies in optimizing drug-target interactions will be examined in select drug classes (e.g. NSAIDS, adrenergic agonists/antagonists).

Prerequisite(s): Take CHE-219 CHE-219L

Corequisite(s): Take CHE-303 CHE-303L

**CHE-389 Special Topics in Chemistry (4 credits)**

This course presents an opportunity to study a selected topic in chemistry. Topics can originate with faculty or students.

**CHE-389L Special Topics in Chemistry Lab (0 credits)****CHE-401 Inorganic Chemistry (3 credits)**

This is an intermediate course in inorganic chemistry suitable for the junior or senior level student. The course contains a detailed review of atomic structure and bonding, as well as a discussion of group and molecular orbital theories. This course also provides a brief synopsis of organometallic chemistry and catalysis.

Prerequisite(s): Take CHE-220 CHE-220L

**CHE-407 Research At DYC (1-3 credits)**

This course provides an introduction to research. While it is expected that most participants will be students majoring in chemistry, sufficiently motivated and prepared students from all majors can be admitted. Students will work on experimental projects under the individual supervision of a faculty member.

**CHE-408 Research At DYC (1-3 credits)**

This course provides an introduction to research. While it is expected that most participants will be students majoring in chemistry, sufficiently motivated and prepared students from all majors can be admitted. Students will work on experimental projects under the individual supervision of a faculty member.

**CHE-412 Spectroscopy (3 credits)**

This is a one-semester course in the fundamentals of spectroscopy. This course will cover ultra-violet spectrometry, mass spectrometry, infrared spectrometry, proton (H) magnetic resonance (NMR) spectrometry, <sup>13</sup>C NMR spectrometry, correlation spectrometry (1H-J1 COSY AND 1-13c COSTY) and spectrometry of other important nuclei (e.g., <sup>19</sup>F and <sup>31</sup>P) to aid in the elucidation and structural confirmation of a wide variety of organic molecules and/or biologically relevant molecules

Prerequisite(s): Take CHE-101 CHE-101L CHE-102 CHE-102L CHE-219 CHE-219L CHE-220 CHE-220L CHE-303 CHE-303L

**CHE-421 Survey of Organometallic Chemistry (3 credits)**

This is an introductory survey course in organometallic chemistry, which combines organic chemistry with inorganic chemistry. The course will include a general overview of the basics of organometallic chemistry. Topics include properties of ligands, bonding, oxidative addition, reductive eliminations, insertions, hydroformylation, C-H functionalization, olefin metathesis, gold catalysis, current research and industrial processes.

Prerequisite(s): Take CHE-219 CHE-219L

Corequisite(s): Take CHE-220 CHE-220L

**CHE-450 Chemistry Research (2-6 credits)**

Research is conducted in an area selected in consultation with the staff members.

**CHE-451 Chemistry Research (2-6 credits)**

Research is conducted in an area selected in consultation with the staff members.

**CHE-499 Capstone Experience (1-3 credits)**

This course will be a culmination of the lab and science skills acquired by the students in their respective academic programs. The capstone experience will use these skills in either an independent research project, an internship, or a service learning experience. These projects will be conducted under the supervision of a full-time professor. While working on this project students will learn how to maintain a research notebook or journal, complete a literature review using appropriate databases, and present their experience by using oral and/or written means of communication. In addition, there will be weekly scheduled meetings among all the students registered for this course to share their progress and be provided with career building exercises, such as writing a CV / resume and mock job or graduate school interviews. The capstone course will include a final assignment, requiring the student to reflect upon how their college and capstone experience relates to the general education themes.

Course Types: Capstone; Information Literacy; Natural Sciences