

# CHEMISTRY (CHEM)

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**CHEM 091 Basic Chemistry 2 Credit Hours (2,0)**

Thorough exposure to elementary chemistry designed to prepare students for college-level chemistry. Emphasis on drill to enhance problem-solving skills. Credit in this course does not apply toward graduation.

**Prerequisite(s):** MATH088 or equivalent

**CHEM 108 Applied Chemistry 3 Credit Hours (3,0)**

An introduction to selected principles of chemistry with emphasis on technological applications. Credit in this course does not apply toward a major or minor in chemistry.

**Prerequisite(s):** MATH102

**CHEM 109 Applied Chemistry Lab 1 Credit Hour (0,3)**

Laboratory experience for CHEM108 Applied Chemistry (must complete both lecture and laboratory to qualify for general education credit).

**Corequisite(s):** CHEM108

**CHEM 110 Applied Organic & Biochemistry 4 Credit Hours (3,2)**

An introduction to classes of organic molecules and their reactions which can be applied to biochemistry. Classes of biological compounds and major metabolic pathways of living systems will also be discussed.

**Prerequisite(s):** CHEM108, or equivalent, with a grade of C- or better

**CHEM 115 General Chemistry I 5 Credit Hours (4,2)**

Fundamental principles of chemistry with emphasis on scientific method, basic chemical reactions and acid base equilibria, stoichiometry, periodic trends of elements, an introduction to the energy of reactions, atomic structure, simple bonding models, molecular structure, intermolecular forces, and nuclear chemistry will be presented.

**Pre or Corequisite(s):** MATH111, MATH112 or MATH151

**CHEM 116 General Chemistry II 5 Credit Hours (4,3)**

An emphasis on physical chemical concepts such as bonding, gas laws, solids and solutions, kinetics, thermodynamics and equilibrium, including acid-base reactions and electron transfer processes.

**Prerequisite(s):** CHEM115, and MATH111, MATH112 or MATH151 all with a grade of C- or better

**CHEM 199 Chemistry First Year Seminar 1 Credit Hour (1,0)**

This course is designed to be a first-year seminar course as well as an introduction to the senior research project. There will be a focus on university and lifelong success skills including: development of critical thinking, strengthening study skills, use of campus resources, incorporation into campus culture.

**CHEM 208 Survey Organic Chem/Biol Apps 4 Credit Hours (3,3)**

A survey course in organic chemistry covering the nomenclature, structure, reactivity, synthesis, and spectroscopic analysis of important organic compounds with an emphasis on biological applications. This course will introduce students to the chemistry of bio-organic compounds and persistent organic pollutants. The laboratory will introduce basic organic laboratory techniques and will include experiments in organic synthesis, separations, and analysis.

**Prerequisite(s):** CHEM116 with a grade of C- or better

**CHEM 225 Organic Chemistry I 4 Credit Hours (3,3)**

Fundamental principles of organic chemistry, covering the structures, reactions and properties of aliphatic and alicyclic compounds. The course will introduce the study of organic nomenclature, functional group chemistry, stereochemistry, reactive intermediates, organic synthesis, reaction mechanisms and conjugated unsaturated systems. The laboratory introduces basic organic laboratory techniques and includes experiments in organic separations, synthesis, and analysis.

**Prerequisite(s):** CHEM116 with a grade of C- or better

**CHEM 231 Quantitative Analysis 4 Credit Hours (3,3)**

Evaluation of analytical data and study of gravimetric and titrimetric methods of analysis.

**Prerequisite(s):** CHEM116 with a grade of C- or better

**CHEM 236 Chemistry of Soil 3 Credit Hours (2,3)**

A detailed examination of the structure and surface chemistry of mineral and organic colloidal particles important to the function of soil chemical properties and processes. Emphasis will be placed on reactions that occur at the solid-solution interface (e.g., ion exchange, chemical and physical adsorption), mineral-solution equilibria, soil acidity, and redox reactions in soils.

**Prerequisite(s):** CHEM116 with a grade of C- or better

**CHEM 261 Inorganic Chemistry 4 Credit Hours (3,3)**

This course will provide a foundation in Inorganic Chemistry with a focus on understanding the properties of the elements, bonding and geometries of small molecules and their chemical reactivities. Survey of main group and transition metal chemistry and applications to bio-inorganic chemistry. The laboratory component will provide students with opportunities to observe and measure the changes that accompany inorganic reactions and to make predictions regarding these inorganic reactions.

**Prerequisite(s):** CHEM116 with a grade of C- or better

**CHEM 290 Independent Study: Chemistry 1-4 Credit Hours (1-4,0)**

Special studies and/or research in chemistry for individuals or small seminar groups. Course content to be arranged by student(s) and a supervising professor with approval of school dean. Independent study courses may be repeated for a maximum of eight credits.

**Prerequisite(s):** Students must have an overall GPA of at least 2.5, and no I grades on their transcript

**CHEM 299 Chemistry Sophomore Seminar 1 Credit Hour (1,0)**

Students will be introduced to reading and presenting scientific literature. Students will explore topics for their senior research project and work with faculty members to conduct a literature search in their area of interest.

**Prerequisite(s):** CHEM116 with a grade of C- or better and CHEM199

**CHEM 326 Organic Chemistry II 4 Credit Hours (3,3)**

The structures, properties, and reactions of aromatic compounds, carbonyl compounds, carboxylic acids and their functional derivatives, phenols, amines, organometallics, carbohydrates, amino acids, and proteins. The course will advance the study of spectral methods of structure determination and expand the study of organic synthesis and mechanisms. The laboratory will include experiments in spectroscopy, organic synthesis and mechanisms, qualitative organic analysis, and instrumental analysis.

**Prerequisite(s):** CHEM225 with a grade of C- or better

**CHEM 332 Instrumental Analysis 4 Credit Hours (3,3)**

Continuation of CHEM231. An instrumental analysis course involving the theory and use of spectrochemical, electroanalytical and separation methods for the characterization and determination of selected chemical substances.

**Prerequisite(s):** CHEM231 with a grade of C- or better; recommended either PHYS222 or PHYS232

**CHEM 351 Introductory Biochemistry 4 Credit Hours (3,3)**

Introduction to the chemistry of biological molecules, including the general properties and chemical transformation of amino acids, proteins, carbohydrates, lipids, vitamins, and nucleic acids. Emphasis will be on correlating chemical reactions with biological function. An introduction to the intermediary metabolism of the carbohydrates, amino acids, lipids and nucleic acids will also be presented.

**Prerequisite(s):** CHEM326 with a grade of C- or better

**CHEM 353 Medicinal Chemistry/Toxicology 3 Credit Hours (3,0)**

Principles of medicinal chemistry and the role of drugs in disease treatment including: biological target identification, methods of drug discovery and development, and drug pharmacokinetics will be explored in this course. The course will also give an introduction to toxicology including types of poisons, their mode of operation, and the biochemistry of detoxification.

**Prerequisite(s):** CHEM351 with a grade of C- or better

**CHEM 361 Physical Chemistry I 4 Credit Hours (4,0)**

Chemical thermodynamics with applications to both phase and chemical equilibria.

**Prerequisite(s):** CHEM116 with a grade of C- or better, MATH152

**Corequisite(s):** CHEM363

**CHEM 362 Physical Chemistry II 3 Credit Hours (3,0)**

Traditional quantum chemistry topics will be discussed that help explain chemical phenomena and provide descriptions and applications for spectroscopy.

**Prerequisite(s):** CHEM361 with a grade of C- or better

**CHEM 363 Phy Chem Lab:Kinetic/Reac Dy 1 Credit Hour (0,3)**

An advanced laboratory exploring reaction kinetics and dynamics with an emphasis on modern methods of physical chemistry measurement.

**Corequisite(s):** CHEM361

**CHEM 395 Junior Seminar 1 Credit Hour (1,0)**

Literature research, developing formal research proposal for senior seminar. Scientific writing and oral presentation of research proposal. Students will be expected to listen to presentation of peers enrolled in CHEM499.

**Prerequisite(s):** CHEM299

**CHEM 399 Internship in Chemistry 1-4 Credit Hours**

This course is designed to provide students with an opportunity to earn credit while obtaining meaningful discipline-related work experience outside the classroom setting. Students are expected to spend a minimum of 45 hours in an approved work setting for each credit hour earned. Work hours and activities must be documented daily and approved by both the on-site supervisor and the instructor to receive credit. The course may be repeated for a maximum of four credits. 1-4

**Prerequisite(s):** 2.5 GPA in major, Junior standing and permission of dean at least one semester in advance of registering for the course

**CHEM 410 Molecular Spectroscopy 4 Credit Hours (3,3)**

General principles of spectroscopy will be explored including underlying principles and theory, data acquisition and processing coupled with spectral interpretation. Different spectroscopic methods used for the structural determination of organic molecules and in chemical research are described including mass spectrometry (MS), ultraviolet and visible spectroscopy (UV-Vis), infra-red spectroscopy (IR), fluorescence spectroscopy, and both one-dimensional and two dimensional <sup>1</sup>H and <sup>13</sup>C nuclear magnetic resonance (NMR) spectroscopy.

**Prerequisite(s):** CHEM231 and CHEM326 with a grade of C- or better

**CHEM 445 Forensic Sci I: Bio/Trace Evid 3 Credit Hours (2,3)**

This is a capstone course for the forensic chemistry degree. Through lecture and laboratory, the course will focus on areas of forensic science that encompass forensic biology and trace evidence analysis including, but not limited to evidence handling; the analysis of bodily fluids, DNA typing, body decay, and bone structure; the analysis of pattern evidence; and microscopic analysis of paints, polymers, hairs, and glass. In this course, much time will be spent on mechanisms of analyses facilitating observational, critical thinking, and problem-solving skills.

**Prerequisite(s):** CHEM231 with a grade of C- or better, and CJUS444

**CHEM 446 Forensic Sci II:Drug/Explosive 3 Credit Hours (2,3)**

This is a capstone course for the forensic chemistry degree. Through lecture and laboratory, the course will focus on areas of forensic science that encompasses illicit drugs and explosives. There will be an emphasis on analytical procedures and instrumentation that are used in forensic analysis to identify controlled substances from a range of classes, fire debris, ignitable liquids, smokeless powders, and gunshot residue. In this course, significant time will be spent on mechanisms of the analyses facilitating observational, critical thinking, and problem-solving skills.

**Prerequisite(s):** CHEM231 with a C- or better; CHEM332 as a pre/co-requisite, and CJUS444

**CHEM 450 Laboratory Apprenticeship 1,2 Credit Hours**

Students will assist in laboratories, learning instructional techniques, under direction of faculty. Course may be repeated for a maximum of two credits. Students must gain approval of the faculty member in charge of the specific laboratory, and the school dean. Credits may be used as CHEM electives. This is a credit/no credit course. (0,3) 1-2 Per Credit

**CHEM 452 Adv Biochemical Molecular Tech 4 Credit Hours (2,4)**

A course covering advanced laboratory techniques for manipulating and analyzing bio-polymers such as proteins and nucleic acids. A brief discussion of bioinformatics will be presented. Protein expression vectors, PCR, and modern molecular techniques will be explored with potential applications for chemistry, biology, toxicology, forensic, and clinical lab science.

**Prerequisite(s):** CHEM351 with a grade of C- or better

**CHEM 461 Advanced Inorganic Chemistry 3 Credit Hours (3,0)**

Advanced concepts of inorganic chemistry will be examined, including atomic structure, ionic and covalent substances, acids and bases, main group elements, and transition metal elements.

**Prerequisite(s):** CHEM261 with a grade of C- or better

**Corequisite(s):** CHEM462

**CHEM 462 Adv Inorganic Chemistry Lab 1 Credit Hour (0,3)**

Advanced concepts of inorganic chemistry will be examined in a laboratory setting.

**Corequisite(s):** CHEM461

**CHEM 490 Independent Study: Chemistry 1-4 Credit Hours (1-4,0)**

Special studies and/or research in chemistry for individuals or small seminar groups. Course content to be arranged by student(s) and a supervising professor with approval of department chair. Independent study courses may be repeated for a maximum of eight credits.

**Prerequisite(s):** Students must have an overall GPA of at least 2.5, and no I grades on their transcript

**CHEM 493 Senior Internship Research 2 Credit Hours (0,6)**

A practicum course in which students, under the guidance of a faculty member, conduct an internship, REU, or similar, with a company, government laboratory, or other university in the areas of chemistry, biochemistry, forensic science, or cannabis chemistry.

**Prerequisite(s):** CHEM395 and permission of instructor

**CHEM 494 Senior Literature Research 2 Credit Hours (0,6)**

This is a practicum course in which students, under the guidance of a faculty mentor, conduct a scholarly literature research project mutually agreed upon by the student and the faculty mentor.

**Prerequisite(s):** CHEM395 and permission of instructor

**CHEM 495 Senior Laboratory Research 2 Credit Hours (0,6)**

This is a practicum course in which students, under the guidance of a faculty mentor, conduct a scholarly laboratory research project mutually agreed upon by the student and his/her faculty mentor.

**Prerequisite(s):** CHEM395 and permission of instructor

**CHEM 499 Senior Seminar 1 Credit Hour (1,0)**

Required for seniors majoring in chemistry, biochemistry, forensic science, and cannabis chemistry. Students will write a thesis based on results of their scholarly research. Students are required to give poster and oral presentations at the University symposium.

**Prerequisite(s):** CHEM493, or CHEM494 or CHEM495