

CHEM - CHEMISTRY

CHEM 1151 Survey of Chemistry I (3-0-3)

First course in a two-semester sequence covering elementary principles of chemistry. Topics include classification of matter, measurements, atoms and periodic table, ionic and covalent bonding, stoichiometry, energy, rates and equilibrium, states of matter, solutions, and acids and bases.

CHEM 1151L Survey of Chemistry I Lab (0-2-1)

Corequisite: CHEM 1151. Lab experiments include laboratory measurements, density determination, separation of mixture, empirical formula, types of chemical reactions, consumer products, specific heat, rates of reactions, pH and buffers, and acid-base titration.

CHEM 1152 Survey of Chemistry II (3-0-3)

Second course in a two-semester sequence covering elementary principles of organic and biochemistry. Topics include hydrocarbons, alcohols, amines, carboxylic acids, amino acids and proteins, enzymes and vitamins, carbohydrates, and nucleic acids.

Prerequisite(s): (CHEM 1151 with a minimum grade of C and CHEM 1151L with a minimum grade of C and CHEM 1152L (may be taken concurrently)) or (CHEM 1211K with a minimum grade of C and CHEM 1152L (may be taken concurrently)) or (CHEM 1211 with a minimum grade of C and CHEM 1211L with a minimum grade of C and CHEM 1152L (may be taken concurrently))

CHEM 1152L Survey of Chemistry II Lab (0-2-1)

Lab experiments include identification of hydrocarbons, alcohols, carboxylic acids and amines, and carbohydrates; preparation of aspirin, analysis of vitamin C and antacids, and molecular models.

Prerequisite(s): (CHEM 1151 with a minimum grade of C and CHEM 1151L with a minimum grade of C and CHEM 1152 (may be taken concurrently))

CHEM 1165 Introductory Forensic Chemistry (3-0-3)

This course is designed as an introductory course for those who wish to pursue a career in forensic chemistry. The course will include the basic concepts of forensic chemistry, investigative techniques and methods used in the crime laboratory to analyze physical evidence. Does not count toward General Education requirements.

CHEM 1211 Principles of Chemistry I (3-0-3)

First course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science majors. Topics to be covered include composition of matter, stoichiometry, periodic relations, and nomenclature.

Prerequisite(s): (MATH 1111 with a minimum grade of C or MATH 1113 with a minimum grade of C or MATH 1125 with a minimum grade of C or MATH 1131 with a minimum grade of C) and CHEM 1211L (may be taken concurrently) with a minimum grade of D

CHEM 1211K Principles of Chemistry I and Lab (3-1-4)

First course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science majors. Topics to be covered include composition of matter, stoichiometry, periodic relations, and nomenclature. Laboratory exercises supplement the lecture material. Course available through eCore.

Prerequisite(s): Math Course Placement with a score of 1113 or MATH 1111 with a minimum grade of C

CHEM 1211L Principles of Chemistry I Lab (0-3-1)

Laboratory exercises designed to supplement the lecture material of CHEM 1211.

Prerequisite(s): CHEM 1211 (may be taken concurrently) with a minimum grade of D

CHEM 1212 Principles of Chemistry II (3-0-3)

Second course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science majors. Topics include liquids and solids, reactions and properties of solutions; equilibrium, chemical kinetics, acid-base theory, thermodynamics, oxidation and reduction, and electrochemistry.

Prerequisite(s): (CHEM 1211 with a minimum grade of C and CHEM 1211L with a minimum grade of C) or CHEM 1211K with a minimum grade of C and CHEM 1212L (may be taken concurrently) with a minimum grade of D

CHEM 1212K Principles of Chemistry II and Lab (3-1-4)

Second course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science majors. Laboratory exercises supplement the lecture material. Course available through eCore.

Prerequisite(s): CHEM 1211K with a minimum grade of C or (CHEM 1211 with a minimum grade of C and CHEM 1211L with a minimum grade of C)

CHEM 1212L Principles of Chemistry II Lab (0-3-1)

Laboratory exercises supplement the lecture materials and develop knowledge of chemical concepts. The laboratory experiments include complexometric titration; colligative properties; kinetics; equilibria; qualitative analysis.

Prerequisite(s): CHEM 1212 (may be taken concurrently) with a minimum grade of D

CHEM 1715 Introductory Chemistry Seminar (0-0-1)

This course is designed to introduce students to the emerging areas of research and development in chemistry through seminar presentations. The course will include skills, techniques and safety issues of conducting experiments in the laboratory.

Restriction(s):
Enrollment limited to students major in Secondary Education or Chemistry.

CHEM 2115 Quantitative Chemical Analysis (3-0-3)

An introduction into the field of analytical chemistry. Topics include acquisition of analytical data and statistical analysis; theory of simple and complex equilibria such as acid-base, precipitation, redox and complexation reactions, and their analytical applications; electrochemistry; spectroscopy, and chromatography.

Prerequisite(s): (CHEM 1212 with a minimum grade of C and CHEM 1212L with a minimum grade of C and CHEM 2315 (may be taken concurrently)) or (CHEM 1212K with a minimum grade of C and CHEM 2315 (may be taken concurrently))

CHEM 2315 Quantitative Chemical Analysis Lab (0-3-1)

Laboratory course emphasizing wet chemical methods of analysis. Topics include data handling, volumetric, gravimetric, precipitation, acid-base, metal chelation, and redox titrations, non-aqueous titrations, gravimetry, ion-exchange equilibria, and spectroscopic methods of analysis. The sequence of the experiments in the laboratory is chosen to coordinate with the lecture materials.

Prerequisite(s): (CHEM 1212 with a minimum grade of C and CHEM 1212L with a minimum grade of C and CHEM 2115 (may be taken concurrently)) or (CHEM 1212K with a minimum grade of C and CHEM 2115 (may be taken concurrently))

CHEM 3111 Organic Chemistry I (3-0-3)

Serving as an introduction to modern organic chemical theory and practice, topics covered in this course consist of the following: vocabulary of organic chemistry, covalent bonding models, thermodynamics and kinetics of organic reactions, systematic nomenclature, drawing structures, conformational analysis, stereochemistry, reaction mechanisms, and functional group interconversions involving ionic mechanisms.

Prerequisite(s): (CHEM 1212 with a minimum grade of C and CHEM 1212L with a minimum grade of C) or CHEM 1212K with a minimum grade of C

CHEM 3112 Organic Chemistry II (3-0-3)

A continuation of CHEM 3111 with an emphasis on the following topics: complex reaction mechanisms, multistep synthesis of organic compounds, molecular orbital theory, pericyclic reactions, and radical reactions.

Prerequisite(s): (CHEM 3111 with a minimum grade of C and CHEM 3311 with a minimum grade of C and CHEM 3312 (may be taken concurrently))

CHEM 3135 Inorganic Chemistry (3-0-3)

Prerequisites: CHEM 3112 and CHEM 3312 with a grade of C or better in each. Co-requisite: CHEM 3335. This course involves the principles and special topics in modern inorganic chemistry, including electronic structure, valence bond theory, molecular orbital theory, group theory, solid state chemistry, aqueous and non-aqueous solvents, coordination chemistry, crystal field theory, transition and inner transition metals, organometallics, and bioinorganic chemistry.

Prerequisite(s): (CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C and CHEM 3335 (may be taken concurrently))

CHEM 3136 Food Safety and Quality (3-0-3)

Topics include quality assurance; biological and chemical hazards; food safety; food safety modernization act, and the role of regulatory agencies and food safety education are also discussed.

Prerequisite(s): CHEM 3137 with a minimum grade of C

Restriction(s):

Enrollment limited to Sophomore, Junior or Senior students.

CHEM 3137 Introduction to Food Science (3-0-3)

Introduction to Food Science is a comprehensive course that includes basics of food processing and preservation principles; application of science and technology to various food products; and discussion of current issues related to food.

Prerequisite(s): (CHEM 1212 with a minimum grade of C and CHEM 1212L with a minimum grade of C) or CHEM 1212K with a minimum grade of C

Restriction(s):

Enrollment limited to Sophomore, Junior or Senior students.

CHEM 3141 Biochemistry I (3-0-3)

An introduction to various classes of biochemically significant molecules, membrane structure and dynamics, enzyme kinetics, catabolic and anabolic reactions, and the utilization of biochemical literature.

Prerequisite(s): CHEM 3111 with a minimum grade of C and CHEM 3311 with a minimum grade of C

CHEM 3142 Biochemistry II (3-0-3)

A continuation of CHEM 3141 with emphasis on nucleic acid chemistry to include detailed study of replication, transcription and translation at the molecular level, genetic regulation and the basic tools associated with molecular biology.

Prerequisite(s): (CHEM 3141 with a minimum grade of C and CHEM 3345 with a minimum grade of C)

CHEM 3311 Organic Chemistry I Lab (0-3-1)

Corequisite: CHEM 3111. Introduction to laboratory techniques such synthesis, chromatography, spectroscopy, molecular modeling, stereochemistry, and writing scientific reports

CHEM 3312 Organic Chemistry II Lab (0-3-1)

Prerequisite: CHEM 3111 and CHEM 3311 with a grade of C or better in each; Corequisite: CHEM 3112. A continuation of CHEM 3311 with added emphasis on multi-step reactions, chromatographic techniques, obtaining and interpreting spectral data and access/utilization of the scientific literature.

Prerequisite(s): (CHEM 3111 with a minimum grade of C and CHEM 3311 with a minimum grade of C and CHEM 3112 (may be taken concurrently))

CHEM 3335 Inorganic Chemistry Lab (0-3-1)

Prerequisites: CHEM 3112 and CHEM 3312 with a grade of C or better in each. Co-requisite: CHEM 3135. Laboratory experiments emphasizing the synthesis inorganic compounds, including purification and characterization of coordination compounds, complex ions and salts (Course fee required)

Prerequisite(s): (CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C and CHEM 3135 (may be taken concurrently))

CHEM 3345 Biochemistry Lab I (0-3-1)

This course is an in depth treatment of enzyme purification, protein concentration determination, and enzyme kinetics. Students will be introduced to qualitative and quantitative biochemistry techniques.

Prerequisite(s): CHEM 3111 with a minimum grade of C

CHEM 3346 Biochemistry II Lab (0-3-1)

This course is a continuation of CHEM 3345, and introduces molecular biology experimental techniques, bioinformatics, and biotechnology.

Prerequisite(s): (CHEM 3141 with a minimum grade of C and CHEM 3345 with a minimum grade of C and CHEM 3142 (may be taken concurrently))

CHEM 3555 Selected Topics in Chemistry ((1-3)-0-(1-3))

Selected Topics provides study of one of the major branches of chemistry. Course may be repeated for credit with a different course topic.

Prerequisite(s): (CHEM 1212 with a minimum grade of C and CHEM 1212L with a minimum grade of C) or CHEM 1212K with a minimum grade of C

Repeatability: Repeatable for credit up to 99 times or 99 hours.

Restriction(s):

Freshman students may **not** enroll.

CHEM 3698 Internship (0-0-(1-4))

Academic credit may be earned for approved work experiences in the field of chemistry, either as a volunteer or through employment. An internship experience must be approved in advance. Successful completion requires written evaluation from a supervisor, a written report and an oral presentation to faculty and students summarizing and reflecting on the internship experience. May be repeated for credit for a total of 8 hours. (S/U grading)

Prerequisite(s): (CHEM 1212 with a minimum grade of C and CHEM 1212L with a minimum grade of C) or CHEM 1212K with a minimum grade of C

Repeatability: Repeatability for credit up to 3 times or 8 hours.

Restriction(s):

Enrollment limited to students in the following programs:

- BAAH01
- BAAL01
- BAAL13
- BAAP01
- BASB02
- BASC03
- BASM01
- BAUA09
- BSAC01
- BSSB02
- BSSC03
- BSSE01
- BSSM01
- BSSP01
- BSSP02

CHEM 4111 Physical Chemistry I (3-0-3)

Prerequisites: CHEM 3112, CHEM 3312, MATH 1132, PHYS 2212, PHYS 2312 with a grade of C or better in each, Co-requisite: CHEM 4311. Topics include properties of gases; first, second, and third laws of thermodynamics; phase diagrams and chemical potential of pure substances and mixtures; activities, and activity coefficients of ions in solutions; chemical equilibrium.

Prerequisite(s): (CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C and CHEM 1132 with a minimum grade of C and PHYS 2212 with a minimum grade of C and PHYS 2312 with a minimum grade of C and CHEM 4311 (may be taken concurrently))

CHEM 4112 Physical Chemistry II (3-0-3)

Topics include introduction and applications of quantum theory; atomic structure and spectra; valence bond and molecular orbital theory; introduction to rotational, vibrational and electronic spectra; molecular interactions; rate equations and rate laws, activation energy; kinetics of elementary and unimolecular reactions; homogeneous and heterogeneous catalysis.

Prerequisite(s): CHEM 4115 with a minimum grade of C and CHEM 4311 with a minimum grade of C and CHEM 4312 (may be taken concurrently)

CHEM 4115 Foundations of Physical Chemistry (3-0-3)

Topics include applications of thermodynamic laws; statistical thermodynamics; kinetics of first and second order, consecutive, and bimolecular surface reactions; quantum chemistry of translational, vibrational and rotational motion, and hydrogen atoms.

Prerequisite(s): (MATH 1131 with a minimum grade of C and PHYS 1112 with a minimum grade of C and PHYS 1312 with a minimum grade of C and CHEM 4315 (may be taken concurrently))

Restriction(s):

Enrollment limited to Junior or Senior students.

Enrollment limited to students major in Chemistry.

Enrollment limited to students in a Bachelor of Arts or Bachelor of Science in Educ. degrees.

Enrollment limited to students in the College of Letters Sciences college.

CHEM 4116 Advanced Physical Chemistry (3-0-3)

An in-depth treatment of quantum chemistry, chemical kinetics, and statistical thermodynamics.

CHEM 4165 Flavor Chemistry & Technology (3-0-3)

This course introduces the chemistry related to flavor compounds and their precursors in food systems; the relationship of flavor chemicals in foods impact on sensory and psychological aspects; and flavor compounds used in foods, their production, isolation, and specific attributes.

Prerequisite(s): CHEM 3137 with a minimum grade of C

Restriction(s):

Enrollment limited to Sophomore, Junior or Senior students.

CHEM 4175 Instrumental Methods of Chemical Analysis (3-0-3)

The course covers theory and applications of modern chemical instrumentation. The instruments and techniques studied include spectroscopic methods (UV-Vis, FTIR, fluorescence, atomic absorption and emission, separation methods (gas chromatography), selected electrochemical methods and mass spectrometry.

Prerequisite(s): (CHEM 2115 with a minimum grade of C and CHEM 2315 with a minimum grade of C and CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C and MATH 1131 with a minimum grade of C and CHEM 4375 (may be taken concurrently))

CHEM 4181 Forensic Chemistry I (3-0-3)

Prerequisites: CHEM 2115, CHEM 2315, CHEM 3112, CHEM 3312 with a grade of "C" or better in each. Co-requisite: CHEM 4381. Application of chemical principles to analysis of physical evidence from criminal investigations, including paints, glass, fibers, inks, and soil.

Prerequisite(s): (CHEM 2115 with a minimum grade of C and CHEM 2315 with a minimum grade of C and CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C and CHEM 4381 (may be taken concurrently))

Restriction(s):

Enrollment limited to students in the following programs:

- BSAC01
- BSSB02
- BSSC03
- BSSE01
- BSSH09
- BSSM01
- BSSP01
- BSSP02

Enrollment limited to students in the College of Letters Sciences college.

CHEM 4185 Food Chemistry (3-0-3)

Topics include chemical and biochemical reactions of vitamins, lipids, proteins, carbohydrates and other constituents in fresh and processed foods with respect to food additives (color, flavor, texture, and nutrition).

Prerequisite(s): CHEM 3141 with a minimum grade of C

Restriction(s):

Enrollment limited to Sophomore, Junior or Senior students.

CHEM 4311 Physical Chemistry I Lab (0-3-1)

Prerequisites: CHEM 2115, CHEM 2315, MATH 1132, PHYS 2212 and PHYS 2312 with a grade of C or better in each, Co-requisite: CHEM 4111.

Laboratory experiments include transport number, thermodynamics of mixture, thermodynamic properties of electrochemical cell, pKa of triprotic acid, potentiometric titrations, cyclic voltammetry, simulation lab on heat capacities

Prerequisite(s): (CHEM 2115 with a minimum grade of C and CHEM 2315 with a minimum grade of C and CHEM 1132 with a minimum grade of C and PHYS 2212 with a minimum grade of C and PHYS 2312 with a minimum grade of C and CHEM 4111 (may be taken concurrently))

CHEM 4312 Physical Chemistry II Lab (0-3-1)

Prerequisites: CHEM 4111 and CHEM 4311 with a grade of C or better in each; Co-requisite: CHEM 4112. Laboratory experiments include kinetics and mechanism of acid and base hydrolysis, persulfate-iodide reaction, viscosity of polymer, molecular modeling using Spartan program, coulometric titrations, uv-vis spectroscopy, surface area of heterogeneous catalysis.

Prerequisite(s): (CHEM 4111 with a minimum grade of C and CHEM 4311 with a minimum grade of C and CHEM 4112 (may be taken concurrently))

CHEM 4315 Foundations of Physical Chemistry Lab (0-3-1)

Laboratory experiments on viscosity of polymers, phase equilibria, thermochemistry, chemical equilibria, electrochemistry, rotational-vibrational spectroscopy, and chemical kinetics. (Course fee required).

Prerequisite(s): (MATH 1131 with a minimum grade of C and PHYS 1112 with a minimum grade of C and PHYS 1312 with a minimum grade of C and CHEM 4115 (may be taken concurrently))

Restriction(s):

Enrollment limited to Junior or Senior students.

Enrollment limited to students major in Chemistry.

Enrollment limited to students in a Bachelor of Arts or Bachelor of Science in Educ. degrees.

Enrollment limited to students in the College of Letters Sciences college.

CHEM 4375 Instrumental Methods of Chemical Analysis Lab (0-3-1)

Experimental studies of modern chemical instrumentation. Experiments include basic electronics, UV-Vis spectroscopy, fluorometry, FTIR, gas chromatography, gas chromatography-mass spectrometry, atomic absorption spectroscopy, potentiometry, polarography.

Prerequisite(s): (CHEM 2115 with a minimum grade of C and CHEM 2315 with a minimum grade of C and CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C and MATH 1131 and CHEM 4175 (may be taken concurrently))

CHEM 4381L Forensic Chemistry I Lab (0-3-1)

Prerequisite: CHEM 2115, CHEM 2315, CHEM 3112, and CHEM 3312 with a grade of "C" or better in each; Co-requisite: CHEM 4181. Use instrumental techniques to analyze forensic chemical evidence.

Topics include sample preparation, weighing, chromatography, and spectroscopy.

Restriction(s):

Enrollment limited to students in the following programs:

- BSAC01
- BSSB02
- BSSC03
- BSSE01
- BSSH09
- BSSM01
- BSSP01
- BSSP02

Enrollment limited to students in the College of Letters Sciences college.

CHEM 4385 Food Chemistry Lab (0-3-1)

This lab course is designed to supplement and expand the student's understanding of the lecture material and provide students with practical, hands-on analytical laboratory skills.

Prerequisite(s): (CHEM 3137 with a minimum grade of C and CHEM 4185 (may be taken concurrently))

Restriction(s):

Enrollment limited to Sophomore, Junior or Senior students.

CHEM 4794 Capstone Seminar (1-0-1)

Students will demonstrate their understanding by writing a review of the chemical literature of a chosen topic or their research topic and present their research in a seminar.

Prerequisite(s): CHEM 3112 with a minimum grade of C

CHEM 4899 Supervised Undergraduate Research (0-(2-9)-(1-3))

This course is a hands-on experience conducting chemical research under the guidance and mentorship of a faculty member. Enrollment is limited to students judged capable of performing supervised research. A faculty mentor must be identified before registration. Assessment of the course may include a written report, oral presentation, or poster presentation. The course could be taken multiple times for 1, 2, or 3 credits to a limit of 9 credits.

Prerequisite(s): (CHEM 1212 with a minimum grade of C and CHEM 1212L with a minimum grade of C) or CHEM 1212K with a minimum grade of C

Repeatability: Repeatability for credit up to 99 times or 9 hours.

Restriction(s):

Enrollment limited to students major in Chemistry.

Enrollment limited to students in the Department Prerequisite college.

CHEM 5105G Polymer Chemistry (3-0-3)

An overview of polymer chemistry that focuses on those topics considered most important by the chemical industry. Topics include molecular weight averages of polymers, kinetics and statistics of step-growth polymerization, kinetics and statistics of addition polymerization, copolymerization, the glass transition temperature, and polymer characterization.

Prerequisite(s): (STAT 1127 with a minimum grade of C and CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C) or (STAT 1127H with a minimum grade of C and CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C) or (STAT 1401 with a minimum grade of C and CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C)

Restriction(s):

Enrollment is limited to Graduate Level level students.

CHEM 5105U Polymer Chemistry (3-0-3)

An overview of polymer chemistry that focuses on those topics considered most important by the chemical industry. Topics include molecular weight averages of polymers, kinetics and statistics of step-growth polymerization, kinetics and statistics of addition polymerization, copolymerization, the glass transition temperature, and methods of polymer characterization.

Prerequisite(s): (STAT 1401 with a minimum grade of C and CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C) or (STAT 1127 with a minimum grade of C and CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C) or (STAT 1127H with a minimum grade of C and CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C)

CHEM 5106G Advanced Biochemistry (3-0-3)

An examination of protein structure, folding, and function, with a special emphasis on enzyme active sites, and enzyme kinetics.

Restriction(s):

Enrollment limited to Degree - Graduate students.

CHEM 5106U Advanced Biochemistry (3-0-3)

An examination of protein structure, folding, and function, with a special emphasis on active sites, enzyme mechanisms, and enzyme kinetics.

CHEM 5110G Synthetic Organic Chemistry (3-0-3)

An introduction to advanced topics in the synthesis of organic molecules. Principles of retrosynthetic analysis will be applied to the synthesis of complex organic molecules, emphasizing control over stereochemistry and the use of protecting groups. Named reactions will be described along with their mechanisms.

Restriction(s):

Enrollment is limited to Graduate Level level students.

CHEM 5110U Synthetic Organic Chemistry (3-0-3)

An introduction to advanced topics in the synthesis of organic molecules. Principles of retrosynthetic analysis will be applied to the synthesis of complex organic molecules, emphasizing control over stereochemistry. Named reactions will be described along with their mechanisms.

CHEM 5115G Spectroscopic Identification of Organic Compounds (3-0-3)

Prerequisites: CHEM 3112 and CHEM 3312 with a grade of "C" or better in each. A systematic study of spectroscopic methods and techniques for identification of small and large organic compounds. Applications of Mass, Infrared, ultraviolet / Visible, and Nuclear Magnetic Resonance spectroscopy for the identification and characterization of organic compound.

Prerequisite(s): (CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C)

Restriction(s):

Enrollment is limited to Graduate Level level students.

CHEM 5115U Spectroscopic Identification of Organic Compounds (3-0-3)

Prerequisites: CHEM 3112 and CHEM 3312 with a grade of "C" or better in each. A systematic study of spectroscopic methods and techniques for identification of small and large organic compounds. Applications of Mass, Infrared, ultraviolet / Visible, and Nuclear Magnetic Resonance spectroscopy for the identification and characterization of organic compound.

Prerequisite(s): (CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C)

CHEM 5116G Catalysis (3-0-3)

Topics include advance concepts, problem solving and applications of homogeneous and heterogeneous catalysis and reactions at solid surfaces.

Prerequisite(s): CHEM 4111 with a minimum grade of C or CHEM 4115 with a minimum grade of C

CHEM 5116U Catalysis (3-0-3)

Topics include advance concepts, problem solving and applications of homogeneous and heterogeneous catalysis and reactions at solid surfaces.

CHEM 5555 Selected Topics in Chemistry ((1-4)-0-(1-4))

Prerequisite: CHEM 3112 and CHEM 3312 with a grade of "C" or better in each. Selected Topics provides an in-depth study of one of the major branches of chemistry. Course may be repeated for credit with a different course topic.

Prerequisite(s): CHEM 3112 with a minimum grade of C and CHEM 3312 with a minimum grade of C

CHEM 5555G Selected Topics in Chemistry ((1-4)-0-(1-4))

Prerequisite: CHEM 3112, CHEM 3312 with a grade of "C" or better in each. Selected Topics provides an in-depth study of one of the major branches of chemistry. Course may be repeated for credit with a different course topic. pic.

Prerequisite(s): CHEM 4111 with a minimum grade of C or CHEM 4115 with a minimum grade of C

Repeatability: Repeatable for credit up to 99 times or 99 hours.

Restriction(s):

Enrollment is limited to Graduate Level level students.

CHEM 5555U Selected Topics in Chemistry ((1-4)-0-(1-4))

Prerequisite: CHEM 3112 and CHEM 3312 with a grade of "C" or better in each. Selected Topics provides an in-depth study of one of the major branches of chemistry. Course may be repeated for credit with a different course topic.

Prerequisite(s): CHEM 3112 with a minimum grade of C or CHEM 3312 with a minimum grade of C

Repeatability: Repeatable for credit up to 99 times or 99 hours.

Restriction(s):

Enrollment limited to students in the Department Prerequisite college.

CHEM 6105 Advanced Analytical Chemistry (3-0-3)

This course includes methods of chemical analysis, with emphasis on operating principles and applications of analytical instruments and methods. The topics include the calibration of analytical instruments, data acquisition and signal enhancement; optical spectroscopy methods and instrumentation; atomic and molecular mass spectrometry; chromatography and electrophoresis. Additionally, the course will discuss the applications of the instrumental techniques in environmental sciences, materials science and pharmaceuticals.

Restriction(s):

Enrollment limited to Degree - Graduate students.

CHEM 6106 Advanced Inorganic Chemistry (3-0-3)

This course will involve an in-depth study of modern inorganic chemistry with a focus on symmetry and group theory, bonding models, coordination chemistry, crystal field and ligand field theories, reaction kinetics and mechanisms, organometallics, and bioinorganic systems.

Restriction(s):

Enrollment limited to Degree - Graduate students.

CHEM 6125 Physical Chemistry (3-0-3)

Topics include matter waves in simple systems; quantum mechanics and molecular orbital theory for diatomic and triatomic molecules; statistical thermodynamics; nonequilibrium thermodynamics; advanced chemical kinetics including free energy relationships; reversible, consecutive, parallel, and unimolecular gas phase reactions; progress in heterogeneous catalysis and surface reactions, experimental techniques (XRD, STM, LEED, XPS).

CHEM 6136 Advanced Organic Chemistry (3-0-3)

This course is an overview of advanced physical organic chemistry. The chemical reactivity of organic compounds will be interpreted using valence and bonding, stereochemistry and conformational analysis, structural effects, basicity and acidity, resonance, and detailed mechanisms of selected reactions. The principles of kinetics and thermodynamics will be applied to calculate energetics and rates of organic reactions.

Restriction(s):

Enrollment is limited to Graduate Level level students.

CHEM 6699 Graduate Chemistry Internship (0-0-(2-4))

Academic credit may be earned for approved work experiences in the field of chemistry, either as a volunteer or through paid employment. An internship experience must be approved in advance by the instructor. Successful completion requires submission of a written work proposal before the project begins, a written final evaluation from a supervisor, a written final report and an oral presentation to faculty and students summarizing and reflecting on the internship experience.

Restriction(s):

Enrollment limited to Degree - Graduate students.

CHEM 6706 Graduate Chemistry Seminar (1-0-1)

Graduate Chemistry Seminar is intended to provide graduate students in the chemistry track with instruction concerning the organization, communication (oral, visual, and written) and defense of scientific data. Students will be required to attend seminars presented by chemistry faculty, graduate students, and guest lecturers. Additionally, students will refine their skills by giving presentations based on peer reviewed publications. The class will meet one hour per week.

Restriction(s):

Enrollment limited to Degree - Graduate students.

CHEM 6999 Graduate Chemistry Thesis Research (0-0-(1-3))

The thesis research will include a literature search, preparation of a thesis proposal, laboratory research to design experiments and collect data, analysis and interpretation of that data, and preparation of a written thesis.