CHEMISTRY (CHEM)

CHEM*1040 General Chemistry I Fall and Winter (LEC: 3, LAB: 3) [0.50]
This course introduces concepts of chemistry, the central link between the physical and biological sciences. Principles discussed include chemical bonding, simple reactions and stoichiometry, chemical equilibria and solution equilibria (acids, bases, and buffers), and introductory organic chemistry.
Prerequisite(s): 4U Chemistry (or equivalent) or CHEM*1060
Restriction(s): CHEM*1140
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*1050 General Chemistry II Fall and Winter (LEC: 3, LAB: 3) [0.50]
This course provides an introductory study of the fundamental principles governing chemical transformations: thermodynamics (energy, enthalpy, and entropy); kinetics (the study of rates of reactions); and redox/electrochemistry.
Prerequisite(s): CHEM*1040
Restriction(s): CHEM*1150
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*1060 Introductory Chemistry Fall Only (LEC: 3) [0.50]
This course stresses fundamental principles of chemistry and is designed for students without Grade 12 or 4U Chemistry or equivalent. Topics include: atomic theory, the periodic table, stoichiometry, properties of gases and liquids, acid-base concepts and chemical equilibria. This course is intended only for students who require the equivalent of Grade 12 or 4U Chemistry in order to proceed to CHEM*1040.
Offering(s): Offered through Distance Education format only.
Restriction(s): CHEM*1040
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*1140 General Chemistry I Fall and Winter (LEC: 3, LAB: 0) [0.50]
This course introduces concepts of chemistry, the central link between the physical and biological sciences. Principles discussed include chemical bonding, simple reactions and stoichiometry, chemical equilibria and solution equilibria (acids, bases, and buffers), and introductory organic chemistry. This course consists of a lecture portion that is the same as CHEM*1040 and a 3-hour laboratory component that is offered virtually (no in-person laboratory activities). This course is intended for students who will not be taking any CHEM courses beyond first year, or BIOC*2580.
Prerequisite(s): 4U Chemistry (or equivalent) or CHEM*1060
Restriction(s): CHEM*1040. Not Available to BASC.AHN, BAS, BBRM, BIESP, BSAG, BSC, BSES, BENG.BIOE, BENG.BME, BENG.ENVE, BENG.WRE, BOH, CHEM minor, BIOC minor
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*1150 General Chemistry II Fall and Winter (LEC: 3, LAB: 0) [0.50]
This course provides an introductory study of the fundamental principles governing chemical transformations: thermodynamics (energy, enthalpy, and entropy); kinetics (the study of rates of reactions); and redox/electrochemistry. This course consists of a lecture portion that is the same as CHEM*1050 and a 3-hour laboratory component that is offered virtually (no in-person laboratory activities). This course is intended for students who will not be taking any CHEM courses beyond first year, nor BIOC*2580.
Prerequisite(s): CHEM*1040 or CHEM*1140
Restriction(s): CHEM*1050. Not Available to BASC.AHN, BAS, BBRM, BIESP, BSAG, BSC, BSES, BENG.BIOE, BENG.BME, BENG.ENVE, BENG.WRE, BOH, CHEM minor, BIOC minor.
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*2060 Structure and Bonding Fall Only (LEC: 3) [0.50]
This course introduces fundamental concepts related to molecular and supramolecular structure, models of chemical bonding and intermolecular interactions. Specific topics include: symmetry operations, symmetry elements and point groups; chirality and polarity; atomic electronic structure, ionization potential, electron affinity, and electronegativity; electrostatic interactions, including permanent and induced dipole moments; hydrogen-bonding; models of ionic bonding, ionic solids, crystal structures, and defects; introductory quantum mechanical concepts describing atomic structure and bonding; covalent bonding models; introductory VB theory and MO theory.
Prerequisite(s): CHEM*1050, [IPS*1500 or (MATH*1080 or MATH*1200), (1 of PHYS*1010, PHYS*1070, PHYS*1300, PHYS*1500)]
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*2070 Structure and Spectroscopy Winter and Summer (LEC: 3, LAB: 1.5) [0.50]
This course provides an introduction to spectroscopy and its relationship to molecular structure and dynamics. Rotational, vibrational, electronic and magnetic resonance spectroscopies will be studied. Concepts introduced in CHEM*2060 will be applied to chemical and biochemical problems through spectroscopic techniques. Central to this course is the use of spectroscopy for the determination of molecular structures and the investigation of molecular motions.
Prerequisite(s): CHEM*2060
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*2400 Analytical Chemistry I: Chemical Analysis Summer, Fall, and Winter (LEC: 3, LAB: 6) [0.75]
This course provides instruction in quantitative analysis of important inorganic species in solution by volumetric, gravimetric and spectrophotometric techniques. The students will utilize spreadsheet applications to study solution equilibria and data analysis. This course is intended to build the foundations of good analytical laboratory practice.
Prerequisite(s): CHEM*1050
Restriction(s): CHEM*2480. This is a Priority Access Course. Enrolment may be restricted to particular programs or specializations or semester levels during certain periods. Please see the department website for more information.
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*2480 Analytical Chemistry I: Chemical Analysis Summer, Fall, and Winter (LEC: 3, LAB: 3) [0.50]
This course provides instruction in quantitative analysis of important inorganic species in solution by volumetric, gravimetric and spectrophotometric techniques. The students will utilize spreadsheet applications to study solution equilibria and data analysis. This course is intended to build the foundations of good analytical laboratory practice. This course consists of a lecture portion that is the same as CHEM*2400 and a 3 hour laboratory component.
Prerequisite(s): CHEM*1050
Restriction(s): CHEM*2400. This is a Priority Access Course. Enrolment may be restricted to particular programs or specializations or semester levels during certain periods. Please see the department website for more information.
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*2700 Organic Chemistry I: Fundamentals Summer, Fall, and Winter (LEC: 3, LAB: 3) [0.50]
This course provides an introduction to organic chemistry through the discussion of stereochemistry and major reaction mechanisms such as nucleophilic substitution and elimination, electrophilic addition, free radical reactions, electrophilic aromatic substitution, nucleophilic addition and nucleophilic acyl substitution. This course is intended for students who plan to enroll in additional organic chemistry courses.
Prerequisite(s): CHEM*1050
Restriction(s): CHEM*2720. This is a Priority Access Course. Enrolment may be restricted to particular programs, specializations or semester levels during certain periods. Please see the departmental website for more information.
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*2720 Fundamental Organic Chemistry Unspecified (LEC: 3) [0.50]
This course provides an introduction to organic chemistry through the discussion of stereochemistry and major reaction mechanisms such as nucleophilic substitution and elimination, electrophilic addition, free radical reactions, electrophilic aromatic substitution, nucleophilic addition and nucleophilic acyl substitution. This course is not acceptable for BSCH students in CHEM, BPCH, BIOC, MBG or BTOX majors, and their respective co-op programs. This course is intended for students who do not plan to enroll in any further organic chemistry courses.
Prerequisite(s): CHEM*1050
Restriction(s): CHEM*2700
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*2820 Thermodynamics and Kinetics Fall Only (LEC: 3, LAB: 3) [0.50]
This course examines the laws and applications of chemical thermodynamics and chemical kinetics.
Prerequisite(s): CHEM*1050, (1 of IPS*1510, MATH*1090, MATH*1210)
Restriction(s): CHEM*2880, PHYS*2240
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*2880 Physical Chemistry Fall Only (LEC: 3, LAB: 1.5) [0.50]
This survey course is intended for students who are not specializing in chemistry or chemical physics. Topics include basic thermodynamics, chemical equilibrium, macromolecular binding, chemical kinetics, enzyme kinetics, transport processes, colligative properties and spectroscopy. This course describes macroscopic observable properties of matter in terms of molecular concepts.
Prerequisite(s): CHEM*1050, (1 of IPS*1500, MATH*1080, MATH*1200)
Restriction(s): CHEM*2820
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*3360 Environmental Chemistry and Toxicology Winter and Summer (LEC: 3) [0.50]
This course examines the chemistry of the natural environment and the influence of pollutants upon the environment. Topics will include methods of introduction of pollutants to, and removal of pollutants from, the environment. (Also listed as TOX*3360.)
Offering(s): Also offered through Distance Education format.
Prerequisite(s): CHEM*1050
Equate(s): TOX*3360
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*3430 Analytical Chemistry II: Instrumental Analysis Summer, Fall, and Winter (LEC: 3, LAB: 3) [0.50]
This course is designed to introduce students to modern methods of instrumental analysis in analytical chemistry. The focus of the course is on trace analysis, and therefore methods for the identification, separation and quantification of trace substances in solids, liquids and vapors will be described. The course is intended to build the foundations of good laboratory practice with good understanding of new concepts and principles of instrumental chemical analysis.
Prerequisite(s): (CHEM*2400 or CHEM*2480)
Restriction(s): This is a Priority Access Course. Enrolment may be restricted to particular programs or specializations. See department for more information.
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*3440 Chemical Instrumentation Fall Only (LEC: 3, LAB: 3) [0.50]
Modern chemistry hinges upon measurements with advanced instrumentation, ranging from pH meters to chromatographs to spectrometers. This course looks at basic electronic circuits, operational and instrumentation amplifiers, and analog-to-digital (ADC) and digital-to-analog (DAC) converters. The various sources of noise that limit precision and accuracy are studied. Several spectrometric instruments (including UV-Visible, Infrared, Raman, X-ray, and Mass) along with calorimetric and radiochemical experiments are examined with a view to understanding the electronic signals arising from a system's chemical properties.
Offering(s): Offered in even-numbered years.
Prerequisite(s): CHEM*3430
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*3640 Main Group Chemistry Fall Only (LEC: 3, LAB: 3) [0.50]
A comprehensive introduction to concepts used by inorganic chemists to describe the structure, properties, and reactivity of compounds of the main group elements. The most important concepts covered are: Electronic fine structure of atoms, symmetry, VSEPR, VB and MO theory, theory of acids and bases, structure of solids, trends in the periodic system, survey of typical main group elements compounds and their reactivity.
Prerequisite(s): CHEM*2060
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*3650 Transition Metal Chemistry Winter Only (LEC: 3, LAB: 3) [0.50]
This course will cover the chemistry and structure of transition metal compounds; electronic, spectral and structural properties of transition metal complexes; VB and MO theory of metal complexes; mechanisms of their substitution and redox reactions. Students will also be introduced to organometallic chemistry and homogeneous catalysis, principles of metallurgy and technical applications of transition metals.
Prerequisite(s): CHEM*3640
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*3750 Organic Chemistry II: Structure and Synthesis Fall Only (LEC: 3, LAB: 3) [0.50]
This course provides continued coverage of fundamental aspects of organic chemistry using an assimilation of carbonyl chemistry, unsaturated systems and carbon-carbon bond forming processes to acquaint students with methods of organic synthesis. Topics also include an introduction to spectroscopic methods for the identification of organic compounds.
Prerequisite(s): CHEM*2700
Restriction(s): This is a Priority Access Course. Enrolment may be restricted to particular programs, specializations or semester levels during certain periods. Please see the departmental website for more information.
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*3860 Quantum and Computational Chemistry Fall Only (LEC: 3, LAB: 1) [0.50]
This course provides an introduction to quantum chemistry and how it applies to the understanding of the electronic structure of atoms and molecules, as well as the geometric structure of molecules. The theoretical background needed to understand molecular spectroscopy is also provided. An integral part of this course is the use of commercial software for the computation of molecular properties.
Prerequisite(s): CHEM*2060, (MATH*2170 or MATH*2270)
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*4010 Chemical Industry, Safety and Sustainability Winter Only (LEC: 3) [0.50]
This course examines the challenges, requirements, and hazards for the production of organic and inorganic chemicals. The environmental, health and safety, economic, regulatory and legal requirements that govern the chemical industry will be considered alongside the actual chemical processes involved.
Prerequisite(s): CHEM*2700 or CHEM*2720
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*4020 Chemical Discovery Winter Only (LAB: 4, LEC: 1) [0.50]
This advanced laboratory course will provide students the opportunity to consolidate laboratory skills in all areas of chemistry. Emphasis will be placed on synthesis, separations, purification, organic and analytical spectroscopies and methods. Individual and group projects will be required. The laboratory will operate similar to conditions found in current industrial settings.
Prerequisite(s): CHEM*3430, CHEM*3750
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*4400 Electrochemistry and Sensors Fall Only (LEC: 3) [0.50]
This course is an introduction to chemical and biochemical sensors. It includes an overview of their importance, principles, main components, functionality, and challenges. A number of chemical and biochemical sensors will be discussed in detail. Emphasis will be put on electrochemical sensors. To this end, basic principles of electrochemistry, as well as some electrochemical techniques will be discussed, including polarography cyclic voltammetry, coulometry and amperometry.
Offering(s): Offered in odd-numbered years.
Prerequisite(s): CHEM*3430
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*4620 Materials and Solid State Chemistry Fall Only (LEC: 3) [0.50]
This course provides a contemporary treatment of subjects of current interest in materials and solid-state chemistry. Possible topics include polymers, metal organic frameworks, magnetic materials, nanomaterials, principles of X-ray diffraction, and structural and electronic properties of solid materials. Students will explore various synthetic and characterization techniques, and discover applications of these materials in fields such as electronics, energy storage and drug delivery.
Offering(s): Offered in odd-numbered years.
Prerequisite(s): CHEM*2060
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*4630 Bioinorganic Chemistry Winter Only (LEC: 3) [0.50]
This course covers the role and importance of transition metal systems in biological processes.
Offering(s): Offered in odd-numbered years.
Prerequisite(s): BIOC*2580, CHEM*3640
Co-requisite(s): CHEM*3650
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*4720 Organic Reactivity Winter Only (LEC: 3) [0.50]
This course is an introduction to physical organic chemistry, including discussion of reactive intermediates, substituent effects, medium effects, the mechanisms of organic reactions and the theoretical description of the bonding in organic molecules.
Offering(s): Offered in even-numbered years.
Prerequisite(s): CHEM*3750
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*4730 Advanced Organic Synthesis Fall Only (LEC: 3) [0.50]
This course provides an advanced understanding of synthetic organic chemistry, including discussion of retrosynthetic analysis, modern synthetic methods, organic reaction, and syntheses of natural products. The integration of these topics for the rational design of synthetic schemes will also be discussed.
Prerequisite(s): CHEM*3750
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*4740 Bioorganic Chemistry Winter Only (LEC: 3) [0.50]
This course covers the principles, methods and techniques of current bioorganic chemistry with emphasis on modern synthetic and analysis methods applied to biological molecules, a molecular based approach to structure recognition, and an introduction to molecular modeling and drug design.
Offering(s): Last offering Fall 2023. Offering(s): Offered in odd-numbered years.
Prerequisite(s): BIOC*2580, CHEM*3750
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*4880 Advanced Physical Chemistry Winter Only (LEC: 3) [0.50]
This course will cover selected topics in advanced physical chemistry. Possible topics include statistical thermodynamics, advanced quantum chemistry, spectroscopy, and magnetic resonance.
Offering(s): Offered in even-numbered years.
Prerequisite(s): CHEM*3860, (CHEM*2820 or PHYS*3240)
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*4900 Chemistry Research Project I Summer, Fall, and Winter (LAB: 12) [1.00]
This research project and seminar in chemistry is designed to provide senior undergraduates with an opportunity to conduct research in an area of chemistry. Students must make arrangements with both a faculty supervisor and the course coordinator prior to registration. The project supervisor must be a faculty member of the Chemistry Department. Students should note that most projects are of two semesters' duration, and should plan their studies on the expectation that they will also register in CHEM*4910 in a subsequent semester.
Prerequisite(s): 5.00 credits in chemistry including 3 of CHEM*3430, CHEM*3640, CHEM*3650, CHEM*3750, CHEM*3760, CHEM*3860, CHEM*3870, CHEM*4020, NANO*3800
Restriction(s): Instructor consent required.
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*4910 Chemistry Research Project II Summer, Fall, and Winter (LAB: 12) [1.00]
This is a research project and seminar in chemistry . Students must make arrangements with both a faculty supervisor and the course coordinator prior to registration.
Prerequisite(s): CHEM*4900
Restriction(s): Instructor consent required.
Department(s): Department of Chemistry
Location(s): Guelph