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
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
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.
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*1100  Chemistry Today  Winter Only (LEC: 3) [0.50]
This chemistry course for non-scientists will outline the involvement of chemistry in our daily lives and will provide an appreciation of chemistry from atoms to important complex molecules. Topics will include energy sources, air and water pollution, natural and synthetic polymers, household chemicals, foods, drugs and biochemicals.
Offering(s): Offered through Distance Education format only.
Restriction(s): CHEM*1040. Students in the BASC.AHN, BAS, BBRM.EM, BENG, BSAG, BSES and BSC programs cannot take this course for credit.
Department(s): Department of Chemistry
Location(s): Guelph

CHEM*2060  Structure and Bonding  Fall Only (LEC: 3, LAB: 1.5) [0.50]
This course covers the applications of symmetry, simple crystal structures and principles of bonding. Molecular orbital theory is used to explain the fundamental relationship between electronic and molecular structure. This course provides the elementary quantum background for an understanding of the electronic structures of atoms and molecules.
Prerequisite(s): CHEM*1050, [IPS*1510 or (MATH*1210, (1 of PHYS*1010, PHYS*1070, PHYS*1300))]
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  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  Summer, Fall, and Winter (LEC: 3, LAB: 6) [0.50]
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  Winter and Summer (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.
Prerequisite(s): CHEM*1050
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 department website for more information.
Department(s): Department of Chemistry
Location(s): Guelph
**CHEM*2720** Fundamental Organic Chemistry Winter and Summer (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, or BIOL, or for students in MBG or BTOX majors who intend to enroll in CHEM*3750 as a restricted elective. 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: 1.5) [0.50]
This course examines the laws and applications of chemical thermodynamics and chemical kinetics.
*Prerequisite(s):* CHEM*1050, (1 of IPS*1510, MATH*1210, MATH*2080)
*Restriction(s):* CHEM*2880, PHYS*2240
*Department(s):* Department of Chemistry
*Location(s):* Guelph

**CHEM*2880** Physical Chemistry Fall Only (LEC: 3, LAB: 3) [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*1000, 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):* TOX*3300. 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** Analytical Chemistry III: Analytical Instrumentation Fall Only (LEC: 3, LAB: 3) [0.50]
Analytical Instrumentation, data acquisition, processing and applications in Chemistry and Biological Chemistry.
*Prerequisite(s):* CHEM*3430
*Department(s):* Department of Chemistry
*Location(s):* Guelph

**CHEM*3640** Chemistry of the Elements I 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 Structure of Atoms, Symmetry, MO theory, Acids and Basis, Structure of Solids, Trends in the Periodic System.
*Prerequisite(s):* CHEM*2070
*Department(s):* Department of Chemistry
*Location(s):* Guelph

**CHEM*3650** Chemistry of the Elements II Winter Only (LEC: 3, LAB: 3) [0.50]
The chemistry and structure of transition metal compounds; electronic spectral and structural properties of transition metal complexes; mechanisms of their substitution and redox reactions. Introduction to organometallic chemistry.
*Prerequisite(s):* CHEM*3640
*Department(s):* Department of Chemistry
*Location(s):* Guelph

**CHEM*3750** Organic Chemistry II Summer and Fall (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*3760 Organic Chemistry III

Winter Only (LEC: 3, LAB: 3) [0.50]

This course provides an in-depth treatment of various aspects of organic chemistry. This will include such topics as the chemistry of heterocycles, polar rearrangements, organic photochemistry, synthetic planning and a detailed discussion of organic spectroscopy.

**Prerequisite(s):** CHEM*3750
**Department(s):** Department of Chemistry
**Location(s):** Guelph

### CHEM*3860 Advanced Topics in Inorganic 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*2070, (MATH*2170 or MATH*2270)
**Department(s):** Department of Chemistry
**Location(s):** Guelph

### CHEM*3870 Molecular Spectroscopy

Winter Only (LEC: 3, LAB: 3) [0.50]

This course covers elementary group theory with applications to molecular spectroscopy and provides a continuation of the topics of rotational, vibrational and electronic spectroscopy and their applications in chemistry from CHEM*2070.

**Offering(s):** Offered in odd-numbered years.
**Prerequisite(s):** CHEM*3860, (MATH*2150 or MATH*2160)
**Department(s):** Department of Chemistry
**Location(s):** Guelph

### CHEM*4010 Chemistry and Industry

Winter Only (LEC: 3) [0.50]

This course examines industrial processes for the production of organic and inorganic chemicals. The environmental impact and the challenges of a large-scale operation will be considered alongside the actual chemical processes involved.

**Prerequisite(s):** CHEM*2700, (CHEM*3430 or TOX*3300), (1 of IPS*1510, MATH*1210, MATH*2080)
**Department(s):** Department of Chemistry
**Location(s):** Guelph

### CHEM*4400 Advanced Topics in Analytical Chemistry

Winter Only (LEC: 3) [0.50]

Recent developments in instrumental methods of chemical analysis. A typical selection will include topics from the areas of surface analysis and the applications of lasers in chemical analysis.

**Prerequisite(s):** CHEM*3430
**Department(s):** Department of Chemistry
**Location(s):** Guelph

### CHEM*4620 Advanced Topics in Inorganic Chemistry

Fall Only (LEC: 3) [0.50]

This course provides a contemporary treatment of subjects of current interest in modern inorganic chemistry. Possible topics include solid state chemistry, main group chemistry and organometallic chemistry.

**Prerequisite(s):** CHEM*3650
**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*3650
**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*3760
**Department(s):** Department of Chemistry
**Location(s):** Guelph

### CHEM*4730 Synthetic Organic Chemistry

Winter Only (LEC: 3) [0.50]

This course provides an introduction to 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 Topics in Bio-Organic Chemistry

Fall Only (LEC: 3) [0.50]

This course covers the role and importance of transition metal systems in biological processes. Possible topics include statistical thermodynamics, advanced quantum chemistry, spectroscopy, and magnetic resonance.

**Offering(s):** Offered in even-numbered years.
**Prerequisite(s):** CHEM*2820 or PHYS*3240, CHEM*3860
**Department(s):** Department of Chemistry
**Location(s):** Guelph

### CHEM*4880 Topics in Advanced Physical Chemistry

Winter Only (LEC: 3) [0.50]

This course covers the role and importance of transition metal systems in biological processes. Possible topics include statistical thermodynamics, advanced quantum chemistry, spectroscopy, and magnetic resonance.

**Offering(s):** Offered in even-numbered years.
**Prerequisite(s):** CHEM*2820 or PHYS*3240, CHEM*3860
**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. Students cannot choose a supervisor with whom they already have research experience in another capacity (e.g. a summer research position). 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 (1.50 credits from CHEM*3430, CHEM*3640, CHEM*3650, CHEM*3750, CHEM*3760, CHEM*3870)
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