CHEMISTRY (CHEM)

CHEM 1018 Chemistry - The Central Science 3 cr
An atomic understanding of our world and ourselves impinges on every aspect of human life and culture. In this course students will learn the principles of chemistry that provide the deepest understanding of topics such as human health, the environment, energy, consumer products, fine arts, agriculture, technology, foods, industry, the history of science and more. The course will cover the classification of matter, chemical change as well as fundamental chemistry calculations. CHEM 1018 may not be used for credit in a Chemistry honours, joint honours, or major program. Not available to students who have previously obtained credit in (grade of C or better) CHEM 1100 or CHEM 1101 or the former CHEM 1300 or the former CHEM 1301.
Mutually Exclusive: CHEM 1100, CHEM 1101, CHEM 1300, CHEM 1301
Attributes: Science, Recommended Intro Courses

CHEM 1100 Introductory Chemistry 1: Atomic and Molecular Structure and Energetics 3 cr
This course provides a basic understanding of the fundamentals of chemistry. By the end of this course, students will understand the periodic table, energy in chemistry, atomic and molecular structures, and the concept of chemical reactivity. May not be held with CHEM 1101, the former CHEM 1300, or the former CHEM 1301.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [one of Chemistry 40S (50%), CHEM 1018, CSKL 0100 (P), or the former CHEM 0900 (P)] and [one of Applied Mathematics 40S (50%), Pre-calculus Mathematics 40S (50%), the former Mathematics 40S (300) (50%), MATH 1018, or MSKL 0100].
Equiv To: CHEM 1101
Mutually Exclusive: CHEM 1018, CHEM 1300, CHEM 1301
Attributes: Science, Recommended Intro Courses

CHEM 1110 Introductory Chemistry 2: Interaction, Reactivity, and Chemical Properties 3 cr
This course builds upon students' foundation in chemistry to give them a better understanding of chemical reactivity and physical properties. May not be held with CHEM 1111, the former CHEM 1310, or the former CHEM 1311.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: one of CHEM 1100, CHEM 1101, the former CHEM 1300, or the former CHEM 1301.
Equiv To: CHEM 1111
Mutually Exclusive: CHEM 1310, CHEM 1311
Attributes: Science, Recommended Intro Courses

CHEM 1120 Introduction to Chemistry Techniques 3 cr
This course builds understanding in chemistry through active learning in the lab. By performing lab experiments, students will gain skills in making observations, safe handling of chemicals, handling laboratory equipment, quantitative analysis, data processing, and scientific communication. These skills are fundamental for student success in chemistry. In addition, students will be given a broader appreciation of chemistry in the world by introducing them to chemical sustainability, chemical responsibility and chemical applications. May not be held with CHEM 1121, CHEM 1122, CHEM 1126, the former CHEM 1310, or the former CHEM 1311.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [(Chemistry 40S (70%) or CHEM 1018) and (one of Pre-Calculus Mathematics 40S (70%), Applied Mathematics 40S (70%), MATH 1018, or MSKL 0100 (B))] or [one of CHEM 1100, CHEM 1101, the former CHEM 1300, the former CHEM 1301, CSKL 0100 (P), or the former CHEM 0900 (P)].
Equiv To: CHEM 1121
Mutually Exclusive: CHEM 1122, CHEM 1126, CHEM 1310, CHEM 1311
Attributes: Science, Recommended Intro Courses

CHEM 1122 Introduction to Chemistry Techniques for Engineering 1 1.5 cr
For Price Faculty of Engineering students only. This course builds understanding in chemistry through active learning in the lab. By performing lab experiments, students will gain skills in making observations, safe handling of chemicals, handling laboratory equipment, quantitative analysis, data processing, and scientific communication. These skills are fundamental for student success in chemistry. In addition, students will be given a broader appreciation of chemistry in the world by introducing them to chemical sustainability, chemical responsibility and chemical applications. May not be held with CHEM 1120, CHEM 1121, the former CHEM 1310, or the former CHEM 1311.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [(Chemistry 40S (70%) or CHEM 1018) and (Pre-Calculus Mathematics 40S (70%), Applied Mathematics 40S (70%), MATH 1018, or MSKL 0100 (B))] or [one of CHEM 1100, CHEM 1101, the former CHEM 1300, the former CHEM 1301, CSKL 0100 (P), or the former CHEM 0900 (P)].
Mutually Exclusive: CHEM 1120, CHEM 1121, CHEM 1310, CHEM 1311
Attributes: Science

CHEM 1126 Introduction to Chemistry Techniques for Engineering 2 1.5 cr
For Price Faculty of Engineering students only. This course builds understanding in chemistry through active learning in the lab. By performing lab experiments, students will gain skills in making observations, safe handling of chemicals, handling laboratory equipment, quantitative analysis, data processing, and scientific communication. These skills are fundamental for student success in chemistry. In addition, students will be given a broader appreciation of chemistry in the world by introducing them to chemical sustainability, chemical responsibility and chemical applications. May not be held with CHEM 1120, CHEM 1121, the former CHEM 1310 or the former CHEM 1311.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Pre- or corequisite: CHEM 1122, the former CHEM 1300, or the former CHEM 1301.
Mutually Exclusive: CHEM 1120, CHEM 1121, CHEM 1310, CHEM 1311
Attributes: Science

CHEM 1130 Introduction to Organic Chemistry 3 cr
Structures, properties and reactions of organic molecules. May not be held with the former CHEM 1320, CHEM 2100, CHEM 2101, the former CHEM 2210, or the former CHEM 2211.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: one of CHEM 1100, CHEM 1101, the former CHEM 1300, or the former CHEM 1301.
Mutually Exclusive: CHEM 1320, CHEM 2100, CHEM 2101, CHEM 2210, CHEM 2211
Attributes: Science, Recommended Intro Courses

CHEM 2100 Organic Chemistry 1: Foundations of Organic Chemistry 3 cr
An introduction to the concepts of organic reactivity and bonding in organic molecules. Preparation and properties of functionalized organic molecules. May not be held with CHEM 1130, the former CHEM 1320, CHEM 2101, the former CHEM 2210, or the former CHEM 2211.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [(CHEM 1110 or CHEM 1111) and (one of CHEM 1120, CHEM 1121, or CHEM 1126)] or (the former CHEM 1310, or the former CHEM 1311).
Equiv To: CHEM 2101
Mutually Exclusive: CHEM 1130, CHEM 1320, CHEM 2210, CHEM 2211
Attributes: Science

CHEM 2110 Organic Chemistry 2: Foundations of Organic Synthesis 3 cr
An introduction to fundamental concepts of organic reactions and synthetic strategies. The application of functional group interconversions to organic synthesis will be discussed. May not be held with CHEM 2111, the former CHEM 2220, or the former CHEM 2221.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: one of CHEM 2100, CHEM 2101, the former CHEM 2210, or the former CHEM 2211.
Equiv To: CHEM 2111
Mutually Exclusive: CHEM 2220, CHEM 2221
Attributes: Science

CHEM 2122 Experimental Organic Chemistry 3 cr
This course will introduce organic chemistry synthetic methods, purification techniques and product analyses. As well, infrared,1lH and 13C NMR spectroscopy theory and applications as applicable to organic chemistry will be taught. Students will gain experience conveying information through different media as well as chemical literacy skills. May not be held with CHEM 2123, the former CHEM 2220, or the former CHEM 2221.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [(CHEM 1110 or CHEM 1111) and (one of CHEM 1120, CHEM 1121, or CHEM 1126)] or (the former CHEM 1310, or the former CHEM 1311).
Equiv To: CHEM 2123
Mutually Exclusive: CHEM 2220, CHEM 2221
Attributes: Science

CHEM 2240 Applied Chemistry for Engineers 3 cr
Bonding, surface chemistry, phase rule, electrochemistry, materials and descriptive inorganic chemistry of selected elements.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: CHEM 1100, CHEM 1101, the former CHEM 1300, or the former CHEM 1301.
Attributes: Science

CHEM 2300 Inorganic Chemistry 1: Structure and Applications 3 cr
Overview of chemical bonding, structure and reactivity across the Periodic Table, illustrated by examples highlighting inorganic aspects of materials science and biochemistry. This course will cover an overview of periodic trends and their relationships to some properties of the elements, aspects of chemical bonding, reactivity of some inorganic molecules and materials, with examples of applications of inorganic chemistry in a variety of settings. May not be held with CHEM 2301, the former CHEM 2380, the former CHEM 2381, the former CHEM 2400, or the former CHEM 2401.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [(CHEM 1110 or CHEM 1111) and (one of CHEM 1120, CHEM 1121, or CHEM 1126)] or (the former CHEM 1310, or the former CHEM 1311).
Equiv To: CHEM 2301
Mutually Exclusive: CHEM 2380, CHEM 2381, CHEM 2400, CHEM 2401
Attributes: Science

CHEM 2510 Introduction to Analytical Chemistry 3 cr
This course will introduce students to the theoretical principles on which quantitative analytical methods are based, and will prepare students to plan and perform experimental work and to interpret the results. May not be held with the former CHEM 2470, the former CHEM 2471, or CHEM 2511.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [(CHEM 1110 or CHEM 1111) and (one of CHEM 1120, CHEM 1121, or CHEM 1126)] or (the former CHEM 1310, or the former CHEM 1311).
Equiv To: CHEM 2511
Mutually Exclusive: CHEM 2470, CHEM 2471
Attributes: Science

CHEM 2520 Introduction to Analytical Chemistry Techniques 2 cr
Practical laboratory designed to introduce students to the art of traditional/classical wet analytical chemistry techniques. Experiments focus on quantitative analytical chemistry determinations using gravimetric, titrimetric and spectrophotometric methods. May not be held with the former CHEM 2470, the former CHEM 2471, or CHEM 2521.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [(CHEM 1110 or CHEM 1111) and (one of CHEM 1120, CHEM 1121, or CHEM 1126)], or (the former CHEM 1310, or the former CHEM 1311).
Equiv To: CHEM 2521
Mutually Exclusive: CHEM 2470, CHEM 2471
Attributes: Science

CHEM 2560 Water Quality Analysis for Engineers 3 cr
(Lab Required) Principles and applications of chemical and instrumental methods for the analysis of water quality. This course is restricted to students in Civil Engineering.
Attributes: Science

CHEM 2600 Physical Chemistry 1 3 cr
An exploration of the underlying principles of atomic and molecular spectroscopy and the application of such tools to probe chemical and physical properties of matter on a microscopic scale. Aspects of ultraviolet, visible, vibrational, rotational and nuclear magnetic resonance spectroscopies are explored. May not be held with the former CHEM 2260, the former CHEM 2261, the former CHEM 2280, the former CHEM 2281, or CHEM 2601.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [(CHEM 1110 or CHEM 1111) and (one of CHEM 1120, CHEM 1121, or CHEM 1126) or (the former CHEM 1310, or the former CHEM 1311)] and [one of MATH 1230, MATH 1500, MATH 1501, MATH 1510, the former MATH 1520, or MATH 1524].
Equiv To: CHEM 2601
Mutually Exclusive: CHEM 2260, CHEM 2261, CHEM 2280, CHEM 2281
Attributes: Science

CHEM 2700 Biochemistry 1: Biomolecules and an Introduction to Metabolic Energy 3 cr
An introductory course dealing with the kinds of molecules encountered in biochemistry, and the concept of metabolic energy as a product of catabolism and a requirement for biosynthesis. Also offered as MBIO 2700. May not be held with the former CHEM 2360, the former CHEM 2361, CHEM 2701, CHEM 2730, the former CHEM 2770, the former CHEM 2860, the former MBIO 2360, the former MBIO 2361, MBIO 2700, MBIO 2701, MBIO 2730, or the former MBIO 2770.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [(CHEM 1110 or CHEM 1111) and (one of CHEM 1120, CHEM 1121, or CHEM 1126) or (the former CHEM 1310, or the former CHEM 1311)] and [BIOL 1030 or BIOL 1031].
Equiv To: CHEM 2701, MBIO 2700, MBIO 2701
Mutually Exclusive: CHEM 2360, CHEM 2361, CHEM 2730, CHEM 2770, CHEM 2860, MBIO 2360, MBIO 2361, MBIO 2730, MBIO 2770
Attributes: Science

CHEM 2710 Biochemistry 2: Catabolism, Synthesis, and Information Pathways 3 cr
An introductory course dealing with the basic metabolic processes that occur in living cells, including the production and use of metabolic energy, the breakdown and synthesis of biomolecules; the synthesis of DNA, RNA and proteins; and the regulation of these processes. Also offered as MBIO 2710. May not be held with the former CHEM 2370, the former CHEM 2371, CHEM 2711, CHEM 2750, the former CHEM 2780, the former MBIO 2370, the former MBIO 2371, MBIO 2710, MBIO 2711, MBIO 2750, or the former MBIO 2780.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [one of CHEM 2700, CHEM 2701, the former CHEM 2360, the former CHEM 2361, the former CHEM 2860, MBIO 2700, MBIO 2701, the former MBIO 2360, or the former MBIO 2361] and [one of CHEM 2100, CHEM 2101, the former CHEM 2210, or the former CHEM 2211].
Equiv To: CHEM 2711, MBIO 2710, MBIO 2711
Mutually Exclusive: CHEM 2370, CHEM 2371, CHEM 2750, CHEM 2780, MBIO 2370, MBIO 2371, MBIO 2750, MBIO 2780
Attributes: Science

CHEM 2720 Principles and Practices of the Modern Biochemistry Laboratory 3 cr
This course will provide an introduction to the practical and theoretical foundations of the most commonly used techniques in the modern biochemistry laboratory. May not be held with the former CHEM 2370, the former CHEM 2371, CHEM 2721, CHEM 2740, the former CHEM 2780, the former MBIO 2370, the former MBIO 2371, or the former MBIO 2780.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [(CHEM 1110 or CHEM 1111) and (one of CHEM 1120, CHEM 1121, or CHEM 1126)] or (the former CHEM 1310, or the former CHEM 1311).
Equiv To: CHEM 2721
Mutually Exclusive: CHEM 2370, CHEM 2371, CHEM 2740, CHEM 2780, MBIO 2370, MBIO 2371, MBIO 2780
Attributes: Science

CHEM 2730 Elements of Biochemistry 1 3 cr
Basic concepts of biochemistry including the properties of biomolecules (amino acids and proteins, enzymes, carbohydrates, lipids, and nucleic acids) and aspects of energy production in cells. Primarily for students in Agricultural and Food Sciences and four-year Biological Sciences programs in Science. May not be used as part of an Honours, Major, or Minor program in Chemistry. May not be used as part of an Honours or Major program in Microbiology. This course is also given in Microbiology as MBIO 2730. May not be held with the former CHEM 2360, the former CHEM 2361, CHEM 2700, CHEM 2701, the former CHEM 2770, the former CHEM 2860, the former MBIO 2360, the former MBIO 2361, MBIO 2700, MBIO 2701, MBIO 2730, or the former MBIO 2770.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [one of CHEM 1110, CHEM 1111, CHEM 1130, the former CHEM 1310, the former CHEM 1311, or the former CHEM 1320] and [six credit hours of university level BIOL courses or (HEAL 1500 and HEAL 1502)].
Equiv To: MBIO 2730
Mutually Exclusive: CHEM 2360, CHEM 2361, CHEM 2700, CHEM 2701, CHEM 2770, MBIO 2360, MBIO 2361, MBIO 2700, MBIO 2701, MBIO 2770
Attributes: Science

CHEM 2740 Introduction to the Biochemistry Laboratory 3 cr
This course is intended primarily for students in Agricultural and Food Sciences and four-year Biological Sciences programs who would benefit from hands-on experience of the most commonly used techniques in the modern biochemistry laboratory. The course will provide practical training in the use of micropipettors and spectrophotometers for the quantitation and analysis of proteins and enzymes, carbohydrates and DNA. Students will learn the application of various chromatographic and centrifugation-based techniques for biomolecule purification and analysis with an emphasis on topics of specific relevance to agriculture and food sciences. May not be used as part of an Honours, Major, or Minor program in Chemistry or in Microbiology. May not be held with the former CHEM 2370, the former CHEM 2371, CHEM 2720, CHEM 2721, the former CHEM 2780, the former MBIO 2370, the former MBIO 2371, or the former MBIO 2780.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: one of CHEM 1110, CHEM 1111, CHEM 1130, the former CHEM 1310, the former CHEM 1311, or the former CHEM 1320.
Mutually Exclusive: CHEM 2370, CHEM 2371, CHEM 2720, CHEM 2721, CHEM 2780, MBIO 2370, MBIO 2371, MBIO 2780
Attributes: Science

CHEM 2750 Elements of Biochemistry 2 3 cr
The continuation of CHEM 2730/MBIO 2730, dealing with nitrogen and lipid metabolism, representative biosynthetic pathways, and synthesis and importance of DNA, RNA and proteins. Primarily for students in Agricultural and Food Sciences and four-year Biological Sciences programs in Science. May not be used as part of an Honours, Major, or Minor program in Chemistry. May not be used as part of an Honours or Major program in Microbiology. This course is also given in Microbiology as MBIO 2750. May not be held with the former CHEM 2370, the former CHEM 2371, CHEM 2710, CHEM 2711, the former CHEM 2780, the former MBIO 2370, the former MBIO 2371, MBIO 2710, MBIO 2711, MBIO 2750, or the former MBIO 2780.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: one of CHEM 2730, CHEM 2700, CHEM 2701, the former CHEM 2770, the former CHEM 2360, the former CHEM 2361, the former CHEM 2860, MBIO 2730, MBIO 2700, MBIO 2701, the former MBIO 2770, the former MBIO 2360, or the former MBIO 2361.
Equiv To: MBIO 2750
Mutually Exclusive: CHEM 2370, CHEM 2371, CHEM 2710, CHEM 2711, CHEM 2780, CHEM 2860, MBIO 2370, MBIO 2371, MBIO 2710, MBIO 2711, MBIO 2780
Attributes: Science

CHEM 3100 Organic Chemistry 3: Advanced Organic Synthesis 3 cr
The course consists of a detailed discussion of the reactions that facilitate functional group interconversions in organic synthesis. The opportunity to explore specific topics in considerable detail will develop a solid foundation for strategies in organic synthesis. The concept of retrosynthesis will be used to further develop these strategies. May not be held with the former CHEM 3390.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: one of CHEM 2110, CHEM 2111, the former CHEM 2220, or the former CHEM 2221.
Mutually Exclusive: CHEM 3390
Attributes: Science

CHEM 3120 Advanced Organic Chemistry Laboratory Techniques 2 cr
This course will develop advanced techniques of organic chemistry synthetic methods as well as introduce advanced physical organic methods in the studying of thermodynamics and/or kinetics of organic reactions. The application of 1H and 13C NMR spectroscopy to the analysis of reaction mixtures and purified products will be taught. Students will further refine their skills in the analysis and accurate reporting of chemical characterization data. May not be held with the former CHEM 3580 or the former CHEM 4690.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [(CHEM 2110 or CHEM 2111) and (CHEM 2122 or CHEM 2123)] or (the former CHEM 2220, or the former CHEM 2221).
Mutually Exclusive: CHEM 3580, CHEM 4690
Attributes: Science

CHEM 3300 Inorganic Chemistry 2: Reactivity and Properties 3 cr
Advanced chemistry of the elements with emphasis on chemical reactivity, electronic structure and physical properties of inorganic compounds. May not be held with the former CHEM 3380 or the former CHEM 3400.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: one of CHEM 2300, CHEM 2301, the former CHEM 2380, the former CHEM 2381, the former CHEM 2400, or the former CHEM 2401.
Mutually Exclusive: CHEM 3380, CHEM 3400
Attributes: Science

CHEM 3320 Inorganic Chemistry Laboratory 2 cr
Laboratory with focus on synthesis, reactivity and characterization of inorganic compounds. This course will explore a range of inorganic compounds using various synthetic methods, characterization tools and property measurements. Data recording, data analysis and report writing are integral parts of this course. May not be held with CHEM 3331, the former CHEM 3380, or the former CHEM 3400.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: one of CHEM 2300, CHEM 2301, the former CHEM 2380, the former CHEM 2381, the former CHEM 2400, or the former CHEM 2401.
Mutually Exclusive: CHEM 3331, CHEM 3380, CHEM 3400
Attributes: Science

CHEM 3500 Instrumental Analysis 3 cr
A course dealing with the theory of standard instruments used for chemical and biochemical analyses. An introduction to the interpretation of data obtained from such analyses. May not be held with the former CHEM 3590 or ENVR 3550.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: [(CHEM 2510 or CHEM 2511) and (CHEM 2520 or CHEM 2521)] or (the former CHEM 2470, or the former CHEM 2471).
Mutually Exclusive: CHEM 3590, ENVR 3550
Attributes: Science

CHEM 3520 Instrumental Analysis Laboratory 2 cr
A course dealing with the practical use of standard instruments used for chemical and biochemical analyses. Students will learn a variety of state-of-the-art analytical techniques that will benefit their training as chemists, and learn the principles of experimental method development. May not be held with CHEM 2523, the former CHEM 3590, or ENVR 3550.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: [(CHEM 2510 or CHEM 2511) and (CHEM 2520 or CHEM 2521)] or (the former CHEM 2470, or the former CHEM 2471). Pre- or corequisite: CHEM 3500.
Mutually Exclusive: CHEM 2523, CHEM 3590, ENVR 3550
Attributes: Science

CHEM 3600 Physical Chemistry 2 3 cr
This course provides an introduction to thermodynamics and related topics in chemistry. The thermodynamics governing processes will be explored. In particular, the behaviour of real gases, ideal and non-ideal solutions and reactions involving these materials will be explored from a detailed thermodynamic perspective. May not be held with the former CHEM 2290 or the former CHEM 2291.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [one of CHEM 2600, CHEM 2601, the former CHEM 2260, the former CHEM 2261, the former CHEM 2280, or the former CHEM 2281] and [one of MATH 1700, MATH 1701, MATH 1710, MATH 1690, or MATH 1232].
Mutually Exclusive: CHEM 2290, CHEM 2291
Attributes: Science

CHEM 3620 Physical Chemistry Laboratory 2 cr
This laboratory course introduces students to a wide range of experimental methods to explore the physical properties of matter and the important thermodynamic and kinetic aspects of reactions. May not be held with the former CHEM 2290 or the former CHEM 2291.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [one of CHEM 2600, CHEM 2601, the former CHEM 2260, the former CHEM 2261, the former CHEM 2280, or the former CHEM 2281] and [one of MATH 1700, MATH 1701, MATH 1710, MATH 1690, or MATH 1232].
Mutually Exclusive: CHEM 2290, CHEM 2291, CHEM 3331
Attributes: Science

CHEM 3700 Biophysical Chemistry 3 cr
The application of physical chemistry to biological problems, with an emphasis on quantitative interpretation. Topics include enzyme kinetics, bioenergetics, transport processes and spectroscopy. May not be held with the former CHEM 3570, the former CHEM 3571, or CHEM 3701.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [one of CHEM 2700, CHEM 2701, the former CHEM 2360, the former CHEM 2361, the former CHEM 2860, MBIO 2700, MBIO 2701, the former MBIO 2360, or the former MBIO 2361] and [one of MATH 1230, MATH 1500, MATH 1501, MATH 1510, the former MATH 1520, or MATH 1524].
Equiv To: CHEM 3701
Mutually Exclusive: CHEM 3570, CHEM 3571
Attributes: Science

CHEM 3760 Advanced Methods for the Biochemistry Laboratory 4 cr
A laboratory-focused course introducing students to advanced methods in the purification, structural and functional analysis of important biomolecules. Registration is restricted to students in a B.Sc. Honours or Major program in Biochemistry. Space permitting, students in B.Sc. Honours or Major programs in Chemistry or Microbiology may register with permission from the course instructor. May not be held with CHEM 3761 or the former CHEM 4700.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [(one of CHEM 2710, CHEM 2711, MBIO 2710, or MBIO 2711) and (CHEM 2720 or CHEM 2721)] or (one of the former CHEM 2370, the former CHEM 2371, the former MBIO 2370, or the former MBIO 2371).
Equiv To: CHEM 3761
Mutually Exclusive: CHEM 4700
Attributes: Science

CHEM 3820 Integrated Chemistry Laboratory 1 2 cr
This course will serve as an introduction to laboratory projects that are designed to be conducted in an independent manner by individual students. This course will provide an opportunity for students to get laboratory experience that is beyond what is typically offered in a discipline-specific undergraduate laboratory course.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: [one of CHEM 2122, CHEM 2123, the former CHEM 2220, or the former CHEM 2221] and [one of CHEM 2520, CHEM 2521, the former CHEM 2470, or the former CHEM 2471] and nine additional credit hours of CHEM courses at the 2000 level or above.
Attributes: Science

CHEM 3840 Integrated Chemistry Laboratory 2 3 cr
This course will serve as an advanced laboratory project course that is designed for independent study by individual students. This course will provide an opportunity for students to get laboratory experience that is more reflective of a research environment.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: CHEM 3820.
Attributes: Science

CHEM 3980 Work Term 1 0 cr
Work assignments in business, industry or government for students registered in the Chemistry Honours or Major Cooperative program. Requires submission of a written report covering the work completed during the four-month professional assignment. (Pass/Fail grade only).
Attributes: Science

CHEM 3990 Work Term 2 0 cr
Work assignments in business, industry or government for students registered in the Chemistry Honours or Major Cooperative program. Requires submission of a written report covering the work completed during the four-month professional assignment. (Pass/Fail grade only).
Attributes: Science

CHEM 4100 Materials Chemistry 3 cr
This course emphasizes the synthesis, structure, properties and applications of a wide variety of materials, providing insight into the chemistry behind many common and high-tech materials and devices. Specific examples include solar cells, fibre optics, batteries, polymer composites, magnetic and multiferroic materials. May not be held with CHEM 4570 when titled "Materials Chemistry".
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: CHEM 3300, the former CHEM 3400, or the former CHEM 3380.
Attributes: Science

CHEM 4110 Introduction to Computational Chemistry 3 cr
This course provides an introduction to modern Computational Chemistry and its application to chemical problems, with a strong focus on practical applications. May not be held with the former CHEM 3260 or the former CHEM 4660.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [one of CHEM 2600, CHEM 2601, the former CHEM 2260, the former CHEM 2261, the former CHEM 2280, or the former CHEM 2281] and nine additional credit hours of CHEM courses at the 2000 level or above.
Mutually Exclusive: CHEM 3260, CHEM 4660
Attributes: Science

CHEM 4126 Natural Products Chemistry and Biosynthesis 3 cr
An advanced course describing the biosynthesis of natural products from an organic chemistry structural perspective. Natural products will be classified according to biogenic origin of precursor molecules. The latest trends in the field will also be discussed. May not be held with CHEM 4580 when titled Naturally Produced Chemistry and Biosynthesis.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: CHEM 2110, CHEM 2111, the former CHEM 2220, or the former CHEM 2221.
Attributes: Science

CHEM 4130 Elementary Quantum Chemistry and Molecular Bonding 3 cr
Elementary quantum chemistry and its applications to structure and bonding in molecules and solids. May not be held with the former CHEM 3360.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: CHEM 2600, CHEM 2601, the former CHEM 2260, the former CHEM 2261, the former CHEM 2280, or the former CHEM 2281.
Mutually Exclusive: CHEM 3360
Attributes: Science

CHEM 4150 Symmetry, Spectroscopy, and Structure 3 cr
Applications of symmetry in chemistry; molecular spectroscopy; structure of solids. May not be held with the former CHEM 3370.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: CHEM 2600, CHEM 2601, the former CHEM 2260, the former CHEM 2261, the former CHEM 2280, or the former CHEM 2281.
Mutually Exclusive: CHEM 3370
Attributes: Science

CHEM 4170 Introduction to Polymer Chemistry 3 cr
This course will provide a general introduction to important aspects of polymer chemistry. Specifically, students will be introduced to concepts relevant to the synthesis, characterization of physical chemistry and properties of polymers and polymer materials. Additionally, topics such as specialty polymers and advanced applications from contemporary literature will be explored. May not be held with the former CHEM 3490.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: CHEM 3600, the former CHEM 2290, or the former CHEM 2291.
Mutually Exclusive: CHEM 3490
Attributes: Science

CHEM 4360 Signalling and Regulation of Gene Expression 3 cr
The biochemistry of cell response to external stimuli, with emphasis on animals. Cell surface receptors and ligands; signalling to the nucleus; phosphorylation and proteolysis; transcription; gradients in cell patterning. May not be held with CHEM 4361.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: one of CHEM 2710, CHEM 2711, the former CHEM 2370, the former CHEM 2371, MBIO 2710, MBIO 2711, the former MBIO 2370, or the former MBIO 2371.
Equiv To: CHEM 4361
Attributes: Science

CHEM 4370 Glycobiology and Protein Activation 3 cr
The role of carbohydrate containing biomolecules in biochemistry and their importance for understanding some genetic diseases. The importance of limited proteolysis in activation of biomolecules. May not be held with CHEM 4371.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: one of CHEM 2710, CHEM 2711, the former CHEM 2370, the former CHEM 2371, MBIO 2710, MBIO 2711, the former MBIO 2370, or the former MBIO 2371.
Equiv To: CHEM 4371
Attributes: Science

CHEM 4570 Topics in Inorganic Chemistry 3 cr
A variety of topics from recent literature. This is an advanced 4000 level course. Registration requires departmental permission. This course may not be offered every year - check with department for availability.
Attributes: Science

CHEM 4580 Topics in Organic Chemistry 3 cr
Selected topics dealing with the structure and reactivity of organic compounds. This is an advanced 4000 level course. Registration requires departmental permission. This course may not be offered every year - check with department for availability.
Attributes: Science

CHEM 4590 Bioanalytical Methods 3 cr
(Lab required) This course introduces different methods used currently for the analysis of biological materials. Qualitative and quantitative aspects are explored. Instrumentation is described and practical methods are designed.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: one of CHEM 3500, the former CHEM 3590, or ENVR 3550.
Attributes: Science

CHEM 4610 Advanced Chemical Techniques 6 cr
A workshop course consisting of lectures, problem solving, and lab based advanced instrumental techniques. The course is designed to train potential research students in techniques like NMR, mass spectroscopy, and chromatography. This course is required of all final year Honours students in Chemistry. May not be held with the former CHEM 4600.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [CHEM 3300, the former CHEM 3400, or the former CHEM 3380] and [CHEM 3500 or the former CHEM 3590] and [CHEM 3600, PHYS 3670, the former CHEM 2290, or the former CHEM 2291].
Mutually Exclusive: CHEM 4600
Attributes: Science

CHEM 4620 Biochemistry of Nucleic Acids 3 cr
The structure of nucleic acids; synthesis and sequence determination; interaction with drugs and protein. May not be held with CHEM 4621.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: one of CHEM 2710, CHEM 2711, the former CHEM 2370, the former CHEM 2371, MBIO 2710, MBIO 2711, the former MBIO 2370, the former MBIO 2371.
Equiv To: CHEM 4621
Attributes: Science

CHEM 4630 Biochemistry of Proteins 3 cr
The structure and function of proteins, their physical and chemical properties and methods for studying them. May not be held with CHEM 4631.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: one of CHEM 2710, CHEM 2711, the former CHEM 2370, the former CHEM 2371, MBIO 2710, MBIO 2711, the former MBIO 2370, or the former MBIO 2371.
Equiv To: CHEM 4631
Attributes: Science

CHEM 4670 Drug Design and Drug Discovery 3 cr
An understanding of the design, synthesis and interactions of drug molecules. Emphasis will be on novel drug-like molecules in the early stages of drug discovery with special focus on brain diseases and infectious diseases.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisites: [one of CHEM 2110, CHEM 2111, the former CHEM 2220, or the former CHEM 2221] and [one of CHEM 2700, CHEM 2701, the former CHEM 2360, the former CHEM 2361, MBIO 2700, MBIO 2701, the former MBIO 2360, the former MBIO 2361, or the former CHEM 2860].
Attributes: Science

CHEM 4680 Organometallic Chemistry 3 cr
Chemistry of organometallic compounds of the transition metals and representative elements.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: one of CHEM 3100, CHEM 3300, the former CHEM 3400, the former CHEM 3380, the former CHEM 3390.
Attributes: Science

CHEM 4710 Research Project in Chemistry or Biochemistry 6 cr
(Lab required) A research project in any aspect of chemistry or biochemistry, chosen in consultation with the course administrator and an appropriate supervising faculty member. Written reports and oral presentation at the end of the project will be required. The course is normally available only to final year students in chemistry programs. May not be held with CHEM 4711 or MBIO 4530.
PR/CR: A minimum grade of C is required unless otherwise indicated.
Prerequisite: Permission of the course administrator.
Equiv To: CHEM 4711
Mutually Exclusive: BGEN 4010, BTEC 4000, MBIO 4530, MBIO 4531
Attributes: Science

CHEM 4800 Topics in Physical/Theoretical Chemistry 3 cr
Selected topics related to physical chemistry properties of matter, their measurement, and computational methods for studying them. This is an advanced 4000 level course, registration only by Departmental permission. This course may not be offered every year - check with department for availability.
Attributes: Science

CHEM 4802 Topics in Analytical Chemistry 3 cr
Selected topics on the most recent and sensitive techniques described in the literature in the Analytical, Bioanalytical and Environmental areas. A selection of topics among separation, surface, ionization, spectroscopy, voltammetry and spectrometry techniques will be covered. This is an advanced 4000 level course, registration only by Department permission. This course may not be offered every year - check with department for availability.
Attributes: Science

CHEM 4804 Topics in Biochemistry 3 cr
Selected advanced topics relevant to the study of biomolecules. This is an advanced 4000 level course, registration only by Departmental permission. This course may not be offered every year - check with department for availability.
Attributes: Science

CHEM 4980 Work Term 3 0 cr
Work assignments in business, industry or government for students registered in the Chemistry Honours or Major Cooperative program. Requires submission of a written report covering the work completed during the four-month professional assignment. (Pass/Fail grade only).
Attributes: Science

CHEM 4990 Work Term 4 0 cr
Work assignments in business, industry or government for students registered in the Chemistry Honours or Major Cooperative program. Requires submission of a written report covering the work completed during the four-month professional assignment. (Pass/Fail grade only).
Attributes: Science