Chemistry

Faculty

Alexandre Drouin,
B.Sc., M.Sc., Ph.D. (Sherbrooke);
Associate Professor
Chair of the Department

Dale Wood,
B.Sc., Ph.D. (UNB);
Associate Professor

Program Overview

The Chemistry Department currently offers one program - Chemistry Minor. It is aimed to provide students with a balanced and practical education in most sub-disciplines of Chemistry.

Class sizes in chemistry courses are small, which promotes close personal interaction between members of the faculty and students. The faculty are also directly involved in all undergraduate laboratories, which enhances personal contact and results in a friendly and very productive learning in experimental chemistry.

The Chemistry Department has an excellent set of modern instruments, such as a Benchtop NMR, a GC/MS, a MP-AES and a HPLC/MS which are used by undergraduates in their laboratory courses and in research projects. This is in contrast to most universities where many instruments are reserved for graduate students. Hands-on, extensive training on this modern instrumentation and equipment greatly benefits our students and ensures that they are very well prepared for graduate studies or future employment.

Chemistry Minor (24 credits) MINCHE

A Chemistry Minor will be awarded for the completion of 8 courses from the following list and their co-requisite laboratory courses.

CHM191 – General Chemistry I
CHM192 – General Chemistry II
CHM 111 – Organic Chemistry I: Introductory
CHM 121 – Inorganic Chemistry I
CHM 135 – Physical Chemistry - Thermal and Fluid Physics
CHM 141 – Analytical Chemistry
CHM 211 – Organic Chemistry II: Introductory
CHM 245 – Instrumental Analysis
CHM 311 – Organic Chemistry III
CHM 341 – Chemical Spectroscopy
CHM 350 – Integrative Projects in Chemistry
CHM 411 – Organic Chemistry IV
BCH 210 – General Biochemistry
BCH 313 – Metabolism

List of Chemistry courses

CHM 111 Organic Chemistry I: Introductory 3-3-0
An introduction to organic chemistry with an emphasis on basic organic chemistry concepts such as resonance, structure and bonding, acid-base reactions of organic compounds, conformations and stereochemistry, the naming and structures of organic compounds, functional groups and chemical reactivity, and some basic chemistry relevant to biological processes.
Prerequisites: CHM 191 and CHM 192 or Collegial Chemistry NYA and NYB
Co-requisite: CHL 111

CHL 111 Organic Chemistry Laboratory I 1-0-4
Experiments in the separation and purification of organic compounds including the use of chromatography. Introduction to functional group analysis and organic synthesis.
Co-requisite: CHM 111

CHM 121 Inorganic Chemistry I 3-3-0
The principles of nuclear, atomic, metallic, ionic, molecular structure. Valence bond and molecular orbital theory. Molecular and orbital symmetry**.**
Prerequisites: CHM 191 and CHM 192 or Collegial Chemistry NYA and NYB

CHM 135 Physical Chemistry - Thermal and Fluid Physics 3-3-0
Pressure, hydrostatics, and hydrodynamics. Properties of materials and Young's Modulus. Temperature and heat. Kinetic theory of gases. Energy, work, heat. First, second, and third laws of thermodynamics. Entropy and disorder. Specific heat of solids, black body radiation, statistical thermodynamics involving different distributions and their applications.
Prerequisite: PHY 191 (or equivalent)

CHL 135 Physical Chemistry Laboratory 1-0-4
A series of experiments in Physical Chemistry to complement CHM 135.
Prerequisite: PHY 191 (or equivalent)
Co-requisite: CHM 135

CHM 141 Analytical Chemistry 3-3-0
Data handling, stoichiometric calculations, gravimetric analysis, acid-base equilibria and titrations, redox equilibria and titrations, complexometric titrations, precipitation reactions and titrations, electrochemical cells and electrode potentials.
Prerequisites: CHM 191 and CHM 192 or Collegial Chemistry NYA and NYB
Co-requisite: CHL 141

CHL 141 Analytical Chemistry Laboratory 1-0-4
Quantitative analysis of unknown samples by volumetric, gravimetric, and spectrometric methods will be carried out.
Co-requisite: CHM 141

CHM 181 The Chemistry of Everyday Life 3-3-0
This course will discuss the chemistry underlying some everyday, or easily recognizable, products, processes, and policies. These may include: the chemistry of pollution, warfare, polymers and plastics, household products, and food.
This course cannot be taken for credit by students who have received credit for CHM 191 or the collegial equivalent course, Chemistry NYA, or equivalent credit elsewhere.
Course registration requires the instructor's permission.

CHM 182 The History and Science of Beer and Brewing 3-3-0
Beer is among the world's most popular beverages and the industry continues to grow at both the megabrewery and microbrewery levels. This course is a general interest course on the nature of beer from a historical, sociological, and scientific perspective. The diverse nature of beer will be explored, as well as how the beverage has developed from its origins many thousands of years ago to what it has become today. Of particular emphasis will be the development of a general understanding of the brewing process, and the science and engineering involved. Various examples of beer's impact on society and culture will also be discussed.
For science students, this course cannot be taken for science credit, but only for free elective credits. For non-science students, this course can count as a science elective course.

CHM 185 The Science of Cooking 3-3-0
Food processing is one of the most common activities worldwide, but do we really know what is happening at the molecular level? This course is a general interest course on the chemistry of cooking and is designed to answer questions such as: Why does plunging food in ice water not stop the cooking process? What is happening when baking? And why does deep-fried food taste best and brown better when the oil is older? A particular emphasis will be placed on understanding what chemical transformations are involved during food processing.
For science students, this course cannot be taken for science credit, but only for free elective credits. For non-science students, this course can count as a science elective course.

CHM 191 General Chemistry I 3-3-0
A course for students lacking Collegial Chemistry NYA or its equivalent.
Atoms, molecules, and ions. Chemical formulae and equations. Thermochemistry. Electronic structure of atoms. Periodic Table and properties of elements. Chemical bonds. Physical properties and structure. Chemical kinetics
Co-requisite: CHL 191

CHL 191 Introductory Chemistry Laboratory I 1-0-4
A series of experiments in Introductory Chemistry to complement Chemistry 191 which must be taken concurrently.
Co-requisite: CHM 191

CHM 192 General Chemistry II 3-3-0
A course for students lacking Collegial Chemistry NYB or its equivalent. Solutions. Chemical equilibrium. Acids and Bases. Gases, Solids, and Liquids. Ionic equilibria.
Prerequisite: CHM 191 (or permission of instructor) or Collegial Chemistry
Co-requisite: CHL 192

CHL 192 Introductory Chemistry Laboratory II 1-0-4
A series of experiments in Introductory Chemistry to complement CHM 192 which must be taken concurrently.
Co-requisite: CHM 192

CHM 211 Organic Chemistry II: Introductory 3-3-0
This course is a continuation of CHM 111 and will elaborate upon the chemistry of the organic functional groups and their involvement in organic synthesis, emphasizing the importance of electronic factors (resonance, induction, acidity, electrophiles, nucleophiles, leaving groups, and carbenium ions) in influencing organic reaction mechanisms. Factors influencing nucleophilic substitutions, eliminations and nucleophilic additions to carbonyls will be discussed.
Prerequisite: CHM 111 or Collegial Chemistry BFB
Co-requisite: CHL 211

CHL 211 Organic Chemistry Laboratory II 1-0-4
Further experiments in organic synthesis and in chromatographic separations. An introduction to multi-step synthesis.
Co-requisite: CHM 211

CHM 225 Inorganic Chemistry II 3-3-0
This course provides students with a survey of inorganic chemistry. The course begins with the general chemistry of the inorganic elements (properties, oxidation states, introduction to their chemistry). This is followed up with two distinct sections. 1) Transition Metal Chemistry will look at crystal and ligand field theory, Werner complexes, and introduce organometallic complexes. 2) Main Group Chemistry will look at the structure and bonding of a selection of compounds from each group of the p-block.
Prerequisites: CHM 111 / CHL 111, CHM 121
Co-requisite: CHL 225

CHL 225 Inorganic Chemistry II Lab 1-0-4
This lab is comprised of experiments that provide an illustration of many of the topics covered in CHM 225. It combines experimental methods typical of inorganic chemistry (e.g. inert atmosphere) with the use of the instrumentation necessary to probed the properties of interest (e.g. FT-IR, UV-Vis, Magnetochemistry
Co-requisite: CHM 225

CHM 245 Instrumental Analysis 3-3-0
This course provides students within depth coverage of the theory of instrumental methods of analysis. The topics covered will be chromatography theory and chromatographic methods, atomic absorption and emission spectrometry, and electrochemical methods.
Prerequisites: CHM 141 and CHL 141

CHL 245 Instrumental Analysis Laboratory 1-0-4
This lab focuses mainly on learning to use the Department's extensive suite of chromatographic instrumentation (GC, GC-MS, HPLC, LC-MS) by performing numerous analyses on each instrument. The analyses will illustrate the importance of chromatography as an analytical method by using examples from forensic, environmental, and food and beverage science.
Co-requisite: CHM 245

CHM 311 Organic Chemistry III 3-3-0
A more advanced discussion of organic reaction mechanisms; enolate chemistry; electrophilic aromatic substitutions; oxidations; and unpolarized π-bonds as nucleophiles. Concepts of retrosynthesis will be introduced.
Prerequisites: CHM 111 and CHM 211

CHM 341 Principles and Practices of Chemical Spectroscopy and Mass Spectrometry 3-3-0
Theory and applications of multinuclear magnetic resonance, UV/VIS, EPR, and electron spectroscopies for chemical analysis. Mass spectrometry and hyphenated methods. Use of chemical spectroscopy and mass spectrometry for the identification of organic compounds. 2D- and imaging techniques, including MRI. This course may be taken online.
Prerequisites: CHM 111 and CHM 141
Co-requisite: CHL 341

CHL 341 Principles and Practices of Chemical Spectroscopy and Mass Spectrometry Laboratory 1-0-4
Experiments related to topics of CHM 341, which must be taken concurrently by chemistry and biochemistry students.
Co-requisite: CHM 341

CHM 350F Integrative Project in Chemistry 3-1-4
This course will provide students with the opportunity to engage in a project that integrates at least two disciplines of chemistry. Key aspects of the course will include literature search, experimental design, chemical synthesis, chemical analysis and communication of results.
CHM 350 is a full-year (Fall and Winter), 3-credit course. Chemistry students must enrol in CHM 350 as part of their degree program and may only take this course in their third year.
Prerequisites or co-requisites: CHM 111, CHM 211, CHM 141, CHM 121, CHM 135

CHM 371F Scientific Writing and Chemical Literature 3-0-0
This course introduces Chemistry Students to chemical information retrieval and requires two major term papers - one in the Fall semester and one in the Winter semester – each presented also in two short oral presentations. Students will use SciFinder to perform searching in structure/substructure, reaction and bibliographic databases. The literature searcing will be used in preparing the two term papers, chosen from a list of topics approved byth the Chemistry Department, under the supervision of a faculty member.
Note: CHM371 is a full-year (Fall and Winter), 3-credit course. Chemistry Major and Honours students must enroll in CHM371 as part of their degree program and may only take this course in their final year. Students receiving credits for CHM 371 cannot also receive credit for CHM 471.

CHM 381 Experiential Learning Project in Chemistry 3-0-9
This course is designed as an opportunity for science students to gain experience in a research lab and be involved in modern research in the different fields of chemistry. Students will engage in a research project under the supervision of a faculty member in the Chemistry Department.

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CHM 411 Organic Chemistry IV 3-3-0
Selected advanced topics in organic chemistry are introduced; pericyclic reactions, organometallic chemistry; radical chemistry; and/or stereoselective reactions.
Pre-requisite: CHM 311

CHM 491 Independent Study 3-0-0

CHM 492 Independent Study 3-0-0

CHM 499 Honours Chemistry Research Project 6-0-12
Under the guidance of a faculty member, the student does an experimental research project requiring approximately 12 hours per week in both the Fall and Winter semesters and presents the results of the project in a seminar and a written dissertation. The project chosen must be approved in advance by the Department and maybe in any field of chemistry plus material science.
Prerequisites: Third Year Honours Chemistry registration or permission of the Department.

Computer Science

Faculty

Madjid Allili,
B.Sc.(Algiers), M.Sc., Ph.D.(Sherbrooke);
Professor

Layachi Bentabet,
B.Sc.(Eng.National Polytechnic, Algeria),
M.Sc.(Elec.Eng. Institut national des sciences appliquées, Lyon),
Ph.D.(Sherbrooke); Professor

Stefan D. Bruda,
B.Sc.Eng., M.Sc., Ph.D. (Queen's);
Professor

Russell Butler
B.Sc. (Bishop's), M.Sc., Ph.D. (Sherbrooke);
Associate Professor
Chair of the Department

Rachid Hedjam
B. Eng.(University of Setif, Algeria), M.Sc. (Montreal),
Ph.D. (ÉTS);
Assistant Professor

Yasir Malik,
M.Sc. (Ajou University, S. Korea), Ph.D. (Sherbrooke);
Associate Professor

Program Overview

Computer Science is the study of how abstract ideas are made to run and halt on a physical machine. The Bishop's Computer Science program develops this understanding progressively, grounding students in algorithms, data structures, and computer organization before advancing to the design and analysis of complex computing systems, including security-critical and intelligent systems. Students pursue focused pathways, in Theory, AI, or Cybersecurity, completing advanced applied or research work under close faculty supervision, culminating in a year-long capstone or honours thesis.

The department offers a range of programs, from broad foundational study to focused specialization:

1.) Undergraduate Programs
- B.Sc. Honours in Computer Science
- B.Sc. Major in Computer Science

2.) Multidisciplinary Program
- B.A. with a Major in Information Technology (BAIT)

3.) Additional Options
- Minor in Computer Science
- Certificate in Computer Science

The department also offers a Master's degree in Computer Science *(see Graduate Studies section of calendar).*