

Area of Interest: Environmental and Applied Sciences

## Biotechnology - Advanced (Co-op and Non Co-op Version)

Ontario College Advanced Diploma  
3 Years  
Ottawa Campus

Program Code: 1020X01FWO

### Our Program

#### Learn the science that drives biotechnology careers.

The three-year Biotechnology - Advanced Ontario College Advanced Diploma program gives you a strong overview of the science that drives biotechnology. With a mix of laboratory and theory courses, you learn about:

- cellular and molecular biology
- microbiology and tissue culture
- chemistry, biochemistry and analytical instrumentation
- biochemical engineering, and
- quality systems for professional labs and manufacturing environments

As a student, you have the opportunity to carry out experiments and use state of the art laboratory instruments and tools throughout the program. You will meet alumni, and have the opportunity to attend industry talks and professional networking events.

You have the opportunity to work with government and industry professionals through optional field placements or through participation in industry-aligned applied research projects.

Students also have the option to gain real-world experience through a paid co-operative education (co-op) work term (see Additional Information for more details). Please note that places in the co-op work term are subject to availability and academic eligibility. Please note admission to the co-op program does not guarantee a co-op placement.

Graduates of this program can pursue careers as lab technologists or analysts in biotechnology, health, agriculture and environmental fields. Graduates may seek employment in the production and testing of medical devices, the manufacture of pharmaceuticals and biologics and the production and testing of food/beverage products.

### SUCCESS FACTORS

This program is well suited for students who:

- Are attracted to new technologies.
- Enjoy active and energetic job roles.
- Work well in team oriented environments.
- Are inquisitive and thorough.
- Enjoy working with their hands.

### Employment

Graduates may find employment opportunities in a diverse range of sectors such as the production of pharmaceuticals or medical devices, food and beverages production, or roles as lab technologists in biotechnology, agriculture, environmental fields or in academia. Graduates may also pursue advanced studies through articulation agreements between the college and various universities.

## Learning Outcomes

The graduate has reliably demonstrated the ability to:

- Perform laboratory duties independently and in compliance with pertinent legislation and regulations, as well as biotechnology standards and guidelines.
- Collaborate in implementing and evaluating quality control and quality assurance procedures to meet organizational standards and requirements.
- Select and implement best practices for sustainability.
- Complete complex biotechnological applications using advanced principles of chemistry, biology and biostatistics as well as basic principles of physics.
- Co-ordinate, implement and validate laboratory procedures to carry out quantitative and qualitative tests and analyses.
- Co-ordinate, implement and validate standard cell culture procedures under aseptic conditions.
- Co-ordinate, implement and validate molecular biology procedures.
- Manage biological data to support biological scientists and researchers in capturing, organizing/summarizing and storing data.
- Prepare, analyze, interpret, maintain and communicate scientific data effectively.
- Develop and present a strategic plan for ongoing personal and professional development to enhance work performance.
- Apply basic business principles to biotechnology practices.
- Identify and apply discipline-specific practices that contribute to the local and global community through social responsibility, economic commitment and environmental stewardship.

## Program of Study

| Level: 01 | Courses                       | Hours |
|-----------|-------------------------------|-------|
| BIO1300   | Introduction to Biology       | 42.0  |
| BIO1301   | Biology Lab                   | 42.0  |
| BTC1305   | Understanding Biotechnology   | 42.0  |
| CHE1302   | General Chemistry             | 56.0  |
| CHE1303   | Chemistry Lab                 | 42.0  |
| MAT1000   | Mathematics for Biotechnology | 42.0  |
| SCI1000   | Essential Lab Skills          | 42.0  |
| Level: 02 | Courses                       | Hours |
| BIO1005   | Cellular Biology              | 42.0  |
| BIO1006   | Cellular Biology Lab          | 42.0  |

|   |   |              |
|---|---|--------------|
| CHE1401                                       | Organic and Applied Chemistry                           | 42.0         |
| CHE1402                                       | Organic and Applied Chemistry Lab                       | 42.0         |
| ENL1813T                                      | Communications I  | 42.0         |
| MAT1406                                       | Statistics for Biotechnology Applications               | 42.0         |
| <b>Choose one from equivalencies: Courses</b> |   | <b>Hours</b> |
| GED1020                                       | General Education Elective                              | 42.0         |
| <b>Level: 03</b>                              | <b>Courses</b>  | <b>Hours</b> |
| BCH2000                                       | Biochemistry  | 56.0         |
| BCH2001                                       | Biochemistry Lab  | 42.0         |
| BIO2302                                       | Microbiology Lab 1                                      | 42.0         |
| BIO2303                                       | Microbiology 1  | 28.0         |
| BTC2400                                       | Quality Assurance and Quality Control for Biotechnology | 28.0         |
| CHE2403                                       | Analytical Chemistry                                    | 42.0         |
| CHE2404                                       | Analytical Chemistry Lab                                | 42.0         |
| MGT3405                                       | Careers in the Bioeconomy                               | 28.0         |
| <b>Level: 04</b>                              | <b>Courses</b>  | <b>Hours</b> |
| BIO2000                                       | Molecular Biology                                       | 42.0         |
| BIO2001                                       | Molecular Biology Lab                                   | 42.0         |
| BIO2403                                       | Microbiology 2  | 28.0         |
| BIO2404                                       | Microbiology Lab 2                                      | 42.0         |
| BTC2405                                       | Analytical Instrumentation                              | 42.0         |
| BTC2406                                       | Analytical Instrumentation Lab                          | 42.0         |
| CST3301                                       | Introduction to Bioinformatic Tools                     | 42.0         |
| <b>Co-op:01</b>                               | <b>Courses</b>  | <b>Hours</b> |
| WKT2207                                       | Work Term 1   |              |
| <b>Level: 05</b>                              | <b>Courses</b>  | <b>Hours</b> |
| BTC3301                                       | Biotechnology Theory I                                  | 28.0         |
| BTC3303                                       | Biotechnology Lab 1                                     | 42.0         |
| BTC3304                                       | Industrial and Bioprocessing                            | 28.0         |
| BTC3305                                       | Bioprocessing Lab                                       | 42.0         |
| ENL2019T                                      | Technical Communication for Engineering Technologies    | 42.0         |
| <b>Elective: choose 1</b>                     | <b>Courses</b>  | <b>Hours</b> |

|   |                                       |              |
|---|---------------------------------------|--------------|
| BTC3500                                       | Experimental Design for Biotechnology | 84.0         |
| BTC3601                                       | Biotechnology Field Placement 1       | 84.0         |
| <b>Choose one from equivalencies: Courses</b> |                                       | <b>Hours</b> |
| GED1020                                       | General Education Elective            | 42.0         |
| <b>Level: 06</b>                              | <b>Courses</b>                        | <b>Hours</b> |
| BTC3405                                       | Biotechnology Theory 2                | 14.0         |
| BTC3406                                       | Biotechnology Lab 2                   | 42.0         |
| BTC3600                                       | Regulatory Affairs for Biotechnology  | 42.0         |
| <b>Elective: choose 1</b>                     | <b>Courses</b>                        | <b>Hours</b> |
| BTC3501                                       | Research Methods in Biotechnology     | 98.0         |
| BTC3603                                       | Biotechnology Field Placement 2       | 98.0         |
| <b>Choose one from equivalencies: Courses</b> |                                       | <b>Hours</b> |
| GED1020                                       | General Education Elective            | 42.0         |

## Fees for the 2023/2024 Academic Year

Tuition and related ancillary fees for this program can be viewed by using the Tuition and Fees Estimator tool at <https://www.algonquincollege.com/fee-estimator>.

Further information on fees can be found by visiting the Registrar's Office website at <https://www.algonquincollege.com/ro>.

Fees are subject to change.

Additional program related expenses include:

- Books and supplies cost approximately \$1,000 per year and can be purchased from the campus store.
- For more information visit <https://www.algonquincollege.com/coursematerials>.
- Each student is required to purchase two lab coats, two sets of goggles and rent a locker. Lab coats and goggles may be purchased in the campus store. Lockers may be rented through Parking Services or the Registrar's Office.

## Admission Requirements for the 2024/2025 Academic Year

### College Eligibility

- Ontario Secondary School Diploma (OSSD) or equivalent. Applicants with an OSSD showing senior English and/or Mathematics courses at the Basic Level, or with Workplace or Open courses, will be tested to determine their eligibility for admission; OR
- Academic and Career Entrance (ACE) certificate; OR
- General Educational Development (GED) certificate; OR
- Mature Student status (19 years of age or older and without a high school diploma at the start of the program). Eligibility may be determined by academic achievement testing for which a fee of \$50 (subject to change) will be charged.

**Program Eligibility**

- English, Grade 12 (ENG4C or equivalent) with a grade of 60% or higher.
- Mathematics, Grade 12 (MAP4C or equivalent) with a grade of 65% or higher.
- Biology, Grade 11 or 12 with a grade of 65% or higher; OR
- Chemistry, Grade 11 or 12 with a grade of 65% or higher; OR
- Physics, Grade 11 or 12 with a grade of 65% or higher.
- Applicants with international transcripts must provide proof of the subject-specific requirements noted above and may be required to provide proof of language proficiency. Domestic applicants with international transcripts must be evaluated through the International Credential Assessment Service of Canada (ICAS) or World Education Services (WES).
- IELTS-International English Language Testing Service (Academic) Overall band of 6.5 with a minimum of 6.0 in each band; OR TOEFL-Internet-based (iBT)-overall 88, with a minimum of 22 in each component: Reading 22; Listening 22; Speaking 22; Writing 22; OR Duolingo English Test (DET) Overall 120, minimum of 120 in Literacy and no score below 105.

Not sure if you meet all of the requirements? Academic Upgrading may be able to help with that: <https://www.algonquincollege.com/access/> .

Should the number of qualified applicants exceed the number of available places, applicants will be selected on the basis of their proficiency in English, Mathematics, Biology and Chemistry or Physics.

**Admission Requirements for 2023/2024 Academic Year****College Eligibility**

- Ontario Secondary School Diploma (OSSD) or equivalent. Applicants with an OSSD showing senior English and/or Mathematics courses at the Basic Level, or with Workplace or Open courses, will be tested to determine their eligibility for admission; OR
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Physics.

## Application Information

### **BIOTECHNOLOGY - ADVANCED (CO-OP AND NON CO-OP VERSION)** **Program Code 1020X01FWO**

Applications to full-time day programs must be submitted with official transcripts showing completion of the academic admission requirements through:

ontariocolleges.ca  
60 Corporate Court  
Guelph, Ontario N1G 5J3  
1-888-892-2228

Students currently enrolled in an Ontario secondary school should notify their Guidance Office prior to their online application at <http://www.ontariocolleges.ca/>.

Applications for Fall Term admission received by February 1 will be given equal consideration. Applications received after February 1 will be processed on a first-come, first-served basis as long as places are available.

International applicants please visit this link for application process information:  
<https://algonquincollege.force.com/myACint/>.

For further information on the admissions process, contact:

Registrar's Office  
Algonquin College  
1385 Woodroffe Ave  
Ottawa, ON K2G 1V8  
Telephone: 613-727-0002  
Toll-free: 1-800-565-4723  
TTY: 613-727-7766  
Fax: 613-727-7632  
Contact: <https://www.algonquincollege.com/ro>

## Additional Information

### **CO-OP INFORMATION:**

All applicants apply directly to the non-co-op version of this program through <http://www.ontariocolleges.ca/> or our International Application Portal. Students may elect to participate in the co-op version, two terms prior to the first co-op work term, subject to availability and academic eligibility.

Co-operative education (Co-op) allows students to integrate their classroom learning with a real-world experience through paid work terms. Two academic terms prior to the cooperative education work term, students are required to actively participate in and successfully complete the self-directed co-op course, readiness activities and workshops.

Students must actively conduct a guided, self-directed job search and are responsible for securing approved program-related paid co-op employment. Students compete for co-op positions alongside students from Algonquin College and other Canadian and international colleges and universities. Algonquin College's Co-op Department provides assistance in developing co-op job opportunities and guides the overall process, but does not guarantee that a student will obtain employment in a co-op work term. Co-op students may be required to relocate to take part in the co-op employment opportunities available in their industry and must cover all associated expenses; e.g., travel, work permits, visa applications, accommodation and all other incurred expenses.

Co-op work terms are typically 14 weeks in duration and are completed during a term when students are not taking courses. For more information on your program's co-op level(s), visit the courses tab on your program's webpage.

International students enrolled in a co-op program are required by Immigration, Refugees and Citizenship Canada (IRCC) to have a valid Co-op/Internship Work Permit prior to commencing their work term. Without this document International students are not legally eligible to engage in work in Canada that is part of an academic program. The Co-op/Internship Work Permit does not authorize international students to work outside the requirements of their academic program.

For more information on co-op programs, the co-op work/study schedule, as well as general and program-specific co-op eligibility criteria, please visit <https://www.algonquincollege.com/coop>.

## Contact Information

### Program Coordinator(s)

- Jacqueline Gilmet, <mailto:gilmetj@algonquincollege.com>,
- Charles Nasmit, <mailto:nasmitc@algonquincollege.com>, 613-727-4723, ext. 6932

## Course Descriptions

### BCH2000 Biochemistry

Biochemistry is both an interdisciplinary field and a distinct natural science that explains the underlying chemical processes that drive biological systems. Through interactive lectures, students explore the chemical basis and mechanisms of biological macromolecules including lipids, carbohydrates, nucleic acids and proteins.

Prerequisite(s): BIO1005  
Corerequisite(s):none

### BCH2001 Biochemistry Lab

A strong foundation in biochemical tools and techniques is required for careers in the life sciences. Through lab activities, students work with biological samples to separate and purify proteins, design, and carry out biochemical assays and employ basic molecular biology tools and techniques.

Prerequisite(s): BIO1006  
Corerequisite(s):none

### BIO1005 Cellular Biology

Understanding biological concepts at the cellular and molecular level is critical in the field of biotechnology. Through interactive lectures, students explore the central DNA dogma, cell cycles, and gene regulation. Advances in DNA technologies that are driving innovation in Biotechnology are explored.

Prerequisite(s): BIO1300  
Corerequisite(s):none

### BIO1006 Cellular Biology Lab

The cell is the basic unit of life. To understand larger organisms, biotechnologists require an understanding of cell structures and functions. Through hands on laboratories students explore prokaryotic and eukaryotic cells with an emphasis on modern techniques and fundamental skills used in biology laboratories.

Prerequisite(s): BIO1301  
Corerequisite(s):none

### BIO1300 Introduction to Biology

Biology helps us understand the living world. Students explore the biological characteristics of life including structure and function, evolution and biodiversity. Through lectures, case studies and interactive discussions students examine the structure of cells and their components, as well as the form and function prokaryotes and eukaryotes in natural systems as a foundation for future study in biotechnology.

Prerequisite(s): none  
Corerequisite(s):none



**BIO1301 Biology Lab**

Biotechnology students require hands-on experience working with living systems using the current laboratory tools and techniques. The process of scientific inquiry includes repeatable observations and testable hypotheses and is emphasized through traditional experimentation. Students perform microscopy, spectral analysis and gel electrophoresis. As students evaluate and implement safe working procedures, the principles of Good Laboratory Practice are introduced.

Prerequisite(s): none

Corerequisite(s):none

**BIO2000 Molecular Biology**

Molecular biology seeks to provide the explanation for biological processes at the subcellular and molecular level. Students explore recent and significant advances in the study of DNA and molecular genetics, including gene cloning, sequencing, mapping and bioinformatics. Through lectures and interactive online activities, students explore the revolutionary tools and techniques used in biotechnology research and development.

Prerequisite(s): BCH2000

Corerequisite(s):none

**BIO2001 Molecular Biology Lab**

Biotechnology has become synonymous with manipulating organisms' DNA at the genetic level. Through hands-on sessions, students perform molecular biology techniques including DNA isolation and manipulation, biological transformations, traditional and quantitative PCR, gene expression, reverse transcription, cDNA, and protein analysis.

Prerequisite(s): BCH2001

Corerequisite(s):none

**BIO2302 Microbiology Lab 1**

Microbes claim a primary and fundamental role in biotechnology. Students differentiate between microorganisms microscopically. By growing, isolating and staining microorganisms, students evaluate the potential of physical and chemical agents to inhibit bacterial growth.

Prerequisite(s): BIO1006

Corerequisite(s):none

**BIO2303 Microbiology 1**

The ability to identify and differentiate microorganisms is essential in the field of biotechnology. Emphasis is placed on identification and morphology, life processes and metabolic requirements of bacteria. Students further identify physical methods and chemical agents used in the control and inhibition of bacterial cell growth.

Prerequisite(s): BIO1005

Corerequisite(s):none

**BIO2403 Microbiology 2**

Microbiology is the study of microorganisms. Students explore the beneficial and practical uses of microorganisms by examining applied microbiology, as it relates to food, drugs and the environment. Students gain knowledge of the immune system and immunity, monoclonal and polyclonal antibody production, serology and antibiotics.

Prerequisite(s): BIO2303

Corerequisite(s):none



**BIO2404 Microbiology Lab 2**

Microorganisms are ever present in our environment and in our bodies. Students further expand on techniques to identify microbes commonly found in our surroundings. Independently, students identify and classify an unknown bacterium. Focus is placed on standard procedures to analyze consumer products, fresh and spoiled foods and beverages for microbes. Antimicrobial susceptibility test and environmental monitoring strategies are also assessed.

Prerequisite(s): BIO2302

Corerequisite(s):none

**BTC1305 Understanding Biotechnology**

Biotechnology is revolutionizing the fields of medicine, agriculture, energy and more. Students review historical developments in biotechnology, analyze current industry developments and discuss the political, cultural, social and ethical implications of biotechnology. Through real-world examples, students explore ways in which biotechnology is improving quality of life through breakthroughs in healthcare, pharmaceuticals, agriculture, industrial and environmental processes. Students articulate and consider ethical viewpoints, cultural and Indigenous perspectives and core values throughout the discussion of biotechnology and its applications.

Prerequisite(s): none

Corerequisite(s):none

**BTC2400 Quality Assurance and Quality Control for Biotechnology**

In order to meet or exceed quality standards in Biotechnology, organizations commit to a culture of continuous improvement. Students investigate the regulatory requirements and quality management systems used in industry where products are manufactured. Through lectures, discussions and projects students apply classic quality tools to identify and understand the root cause of problems in manufacturing settings. Students justify the use of statistical tools to monitor process outputs and apply good documentation practice to produce standard operating procedures.

Prerequisite(s): none

Corerequisite(s):none

**BTC2405 Analytical Instrumentation**

Biotechnologists need to be familiar with figure of merits of analytical methods, and distinguish the most suited solution for an analytical question. Students identify and plan techniques such as sampling, transportation, sample preparation and qualitative/quantitative instrumental analysis of environmental, chemical and biological samples. Students establish an understanding of theory, operation, maintenance, calibration and output of instruments like polymerase chain reaction, electrophoresis, blotting, sequencing, chromatography, spectroscopy and spectrometry.

Prerequisite(s): CHE2403

Corerequisite(s):none

**BTC2406 Analytical Instrumentation Lab**

Biotechnologists require a solid foundation in the modern techniques of analytical chemistry and instrumentation. Students identify and carry out techniques for sample preparation and qualitative/quantitative analysis of a wide assortment of food, biological and environmental samples. Students develop tools for method development and operation of electrophoretic, microscopic, spectroscopic and chromatographic instruments and quantitative polymerase chain reaction.

Prerequisite(s): CHE2404

Corerequisite(s):none

**BTC3301 Biotechnology Theory I**

Biotechnology is providing innovative products and technologies. Students explore nucleic acid

manipulation. Nucleic acid replication, regulation, mutation and repair mechanisms are presented along with an overview of genetic engineering. Model organisms illustrate various genetic concepts, along with current applications in biotechnology.

Prerequisite(s): BIO2000  
Corerequisite(s):none

### **BTC3303 Biotechnology Lab 1**

Biotechnologists require knowledge of current molecular biology techniques. Through Laboratory experiments, students gain practical experience in nucleic acid and protein manipulation. Experimental applications include DNA recombination and PCR.

Prerequisite(s): BIO2001  
Corerequisite(s):none

### **BTC3304 Industrial and Bioprocessing**

Industrial Biotechnology is disrupting traditional industries by producing consumer goods that are sustainable and cost effective. Industrial processes studied include the production of fuel from sustainable sources, production of biocatalysts and the production of food products and food additives through aerobic and anaerobic bio-processes. Students model fermentation processes and evaluate downstream separation and purification techniques in order to select best practices for safe, profitable and sustainable operations.

Prerequisite(s): BIO2403  
Corerequisite(s):none

### **BTC3305 Bioprocessing Lab**

The ability to use various organisms and cell cultures to produce high value bio-products is essential in the field of industrial biotechnology. Students gain practical experience by operating various systems and culture conditions, work aseptically during standard techniques and use different methodologies to produce, isolate and purify bio-products. Students apply qualitative and quantitative techniques for the characterization and assessment of bio-product quality.

Prerequisite(s): BIO2404  
Corerequisite(s):none

### **BTC3405 Biotechnology Theory 2**

Biotechnology is a field of science that involves engineering organisms to have new abilities. Students learn cutting edge biotechnology techniques for manipulation and characterization of macromolecules such as DNA, RNA and proteins. Emphasis is placed on various techniques that support molecular cloning and genetic engineering approaches.

Prerequisite(s): BTC3301  
Corerequisite(s):none

### **BTC3406 Biotechnology Lab 2**

Collaboration and problem-solving in the biotechnology lab are skills that support innovation. Students acquire practical experience in cutting edge biotechnology techniques for manipulation and characterization of macromolecules such as proteins, DNA and RNA. Emphasis is placed on various PCR, qPCR, molecular cloning, genetic engineering approaches and different technologies for identification and characterization of wild type and genetically modified organisms. Students apply bioinformatics in experimental design and data analysis. Students also gain practical experience in experimental design, multitasking and time management in the laboratory work environment.

Prerequisite(s): BTC3303  
Corerequisite(s):none

**BTC3500 Experimental Design for Biotechnology**

Scientific research applies the scientific method to find solutions to problems. Students participate in collaborative applied research projects generated by industry partners, or faculty & student led initiatives. Through this experiential learning model, students perform literature reviews, participate in professional meetings and manage project priorities to meet milestones. Students use knowledge and skills acquired throughout the program to develop experimental protocols, standard operating procedures, and design sampling protocols to study defined research problems.

Prerequisite(s): BIO2000 and BIO2001 and BIO2403 and BIO2404 and BTC2405 and BTC2406 and CST3301

Corerequisite(s):none

**BTC3501 Research Methods in Biotechnology**

Scientific investigation requires planning, data collection and analysis to provide answers to research questions. Students carry out their experimental design to study a research problem in the laboratory. Students are responsible to plan weekly lab activities, collect, manage and manipulate scientific data and provide progress updates. Students report findings through oral reports and scientific reports. This course should be taken within the same academic year as BTC3500.

Prerequisite(s): BTC3500 or BTC3601

Corerequisite(s):none

**BTC3600 Regulatory Affairs for Biotechnology**

Biotechnologists must understand the role of regulation in serving public interest. Students explore the purpose and impact of regulations, examine risk management strategies and discuss the roles of employers and employees working in regulated environments. Through case studies and projects students develop an understanding of the ethical and socioeconomic implications of biotechnology regulations.

Prerequisite(s): BTC2400

Corerequisite(s):none

**BTC3601 Biotechnology Field Placement 1**

Work integrated learning provides students an opportunity to enhance professional skills and advance theoretical knowledge. Students participate in field placements (internship) with partners from the public or private sector. Through this experiential learning model, students integrate and apply skills acquired throughout the program in a work place setting.

Prerequisite(s): BIO2000 and BIO2001 and BIO2403 and BIO2404 and BTC2405 and BTC2406 and CST3301

Corerequisite(s):none

**BTC3603 Biotechnology Field Placement 2**

Work integrated learning provides students an opportunity to enhance professional skills and advance theoretical knowledge. Students participate in field placement (internship) with partners from the public or private sector. Students are encouraged to call upon prior learning to engage in project development and management to reach project milestones and objectives.

Prerequisite(s): BTC3500 or BTC3601

Corerequisite(s):none

**CHE1302 General Chemistry**

Biotechnologists require a strong background in the fundamentals of chemistry and principles of applied physics. Students gain an understanding of the periodic table and the chemical/physical properties of elements and compounds. Additionally, topics such as atomic structure, reaction

stoichiometry, solution preparation, chemical equilibrium, chemical kinetics, acid-base chemistry and the use of buffers in biotechnology are studied.

Prerequisite(s): none

Corerequisite(s):none

### **CHE1303 Chemistry Lab**

Chemistry is a physical science that helps explain our natural world. Students explore a chemistry from an atoms first approach. Through hands-on laboratory activities, students explore physical and chemical properties of matter and chemical bonding and chemical reactions. Illustrative experiments will provide hands on training with standard equipment used in laboratories.

Prerequisite(s): none

Corerequisite(s):none

### **CHE1401 Organic and Applied Chemistry**

Biotechnologists require a strong understanding of the chemical and physical properties of molecules. Students examine various representations of molecular structure, identify functional groups, and use basic nomenclature for molecules. Students survey the influence of molecular structure on physical properties and chemical reactivity and predict relative physical and chemical behaviour of simple molecules. Students investigate applications of applied Chemistry in the field of biotechnology.

Prerequisite(s): CHE1302

Corerequisite(s):none

### **CHE1402 Organic and Applied Chemistry Lab**

Biotechnologists investigate the physical and chemical properties of different classes of organic compounds, as well as carry out a variety of reactions and purifications. Students carry out and evaluate the success of purifications, such as distillation, liquid-liquid extraction and recrystallization. Students comply with environmental legislation and regulations when disposing of chemicals.

Prerequisite(s): CHE1303

Corerequisite(s):none

### **CHE2403 Analytical Chemistry**

Students must demonstrate a sound understanding of the principles of analytical chemistry and show how these principles are applied in chemistry and related disciplines. Topics include chemical measurements, calibration and operation of analytical equipment, analytical titrations, and sample handling, preservation and transportation.

Prerequisite(s): CHE1302

Corerequisite(s):none

### **CHE2404 Analytical Chemistry Lab**

Analytical Chemistry uses instruments to separate, identify and quantify chemical samples. Students demonstrate the ability to prepare chemical solutions using precise volumetric tools and glassware. Students prepare analytical standards to produce and apply standard curves for quantitative analysis within the laboratory. Laboratory topics include studies related to gravimetric analysis, volumetric analysis, potentiometric and complexometric titrations, and spectroscopy applications. Students manage, manipulate and report scientific data.

Prerequisite(s): CHE1303

Corerequisite(s):none

### **CST3301 Introduction to Bioinformatic Tools**

Bioinformatics is the use of computers to manage, organize and analyze biological information. Students develop the skills to find online records such as literature review, sequences, genomes and molecular structures, as well as to assess the quality of those records. Students develop a basic understanding of algorithms of sequence alignment tools and their limitations, and employ them to find homology and phylogeny. Students utilize online resources and tools essential for molecular biology procedures such as cloning, genetic material amplification, sequencing, microarray, fingerprinting and protein analysis.

Prerequisite(s): BCH2000

Corerequisite(s):none

### **ENL1813T Communications I**

Communication remains an essential skill sought by employers, regardless of discipline or field of study. Using a practical, vocation-oriented approach, students focus on meeting the requirements of effective communication. Through a combination of lectures, exercises, and independent learning, students practise writing, speaking, reading, listening, locating and documenting information and using technology to communicate professionally. Students develop and strengthen communication skills that contribute to success in both educational and workplace environments.

Prerequisite(s): none

Corerequisite(s):none

### **ENL2019T Technical Communication for Engineering Technologies**

The ability to communicate effectively in a technically-oriented interdisciplinary workplace is a foundational skill in an innovation-driven economy. Students are exposed to exercises and assignments designed to foster independent and collaborative critical thinking, research, writing, visual communication and presentation skills related to technical topics.

Prerequisite(s): ENL1813T

Corerequisite(s):none

### **GED1020 General Education Elective**

Students choose one course, from a group of general education electives, which meets one of the following five theme requirements: Arts in Society, Civic Life, Social and Cultural Understanding, Personal Understanding, and Science & Technology.

Prerequisite(s): none

Corerequisite(s):none

### **GED1020 General Education Elective**

Students choose one course, from a group of general education electives, which meets one of the following five theme requirements: Arts in Society, Civic Life, Social and Cultural Understanding, Personal Understanding, and Science & Technology.

Prerequisite(s): none

Corerequisite(s):none

### **GED1020 General Education Elective**

Students choose one course, from a group of general education electives, which meets one of the following five theme requirements: Arts in Society, Civic Life, Social and Cultural Understanding, Personal Understanding, and Science & Technology.

Prerequisite(s): none

Corerequisite(s):none

### **MAT1000 Mathematics for Biotechnology**

A strong foundation in mathematics, data management and analysis is crucial for roles in the field of biotechnology. Through interactive lectures and hands on computer laboratories, students apply technical functions, algebraic manipulations and statistics to solve biotechnology problems and present datasets in tables and graphs.

Prerequisite(s): none  
Corerequisite(s):none

### **MAT1406 Statistics for Biotechnology Applications**

Biotechnologists require an understanding of statistical methods in order to summarize and interpret data from experiments or studies. Using software packages, students will manage, manipulate, analyze and display scientific data. Topics include descriptive statistics, probability and probability models, correlation and regression, and hypothesis testing.

Prerequisite(s): MAT1000  
Corerequisite(s):none

### **MGT3405 Careers in the Bioeconomy**

Biotechnology has the capacity to revolutionize medicine, agriculture, and energy industries. Students gain an overview of the current marketplace trends in biotechnology and the potential effects these may have on the world economy. Students identify and exploit biotechnological opportunities, organize resources to implement ideas and learn to manage risks. In addition, students develop a plan to anticipate and adapt to changing workforce demands and trends. Students prepare and present up-to-date portfolios and curriculum vitae and practice interviewing skills.

Prerequisite(s): none  
Corerequisite(s):none

### **SCI1000 Essential Lab Skills**

To work safely and efficiently in a laboratory environment requires a set of core skills, and an understanding of laboratory environment and good scientific process. Through instructor demonstrations and hands-on laboratory practice students acquire new skills and techniques using a range of standard laboratory equipment that support laboratory activities in Biology and Chemistry. Laboratory proficiency is assessed through in-lab practical assessments and lab reports.

Prerequisite(s): none  
Corerequisite(s):none

### **WKT2207 Work Term 1**

Students gain valuable on-the-job experience. This Cooperative education work term develops further technical expertise for students.

Prerequisite(s): WKT2100  
Corerequisite(s):none